



**UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, DC 20555 - 0001**

July 27, 2017

MEMORANDUM TO: ACRS Members

FROM: Maitri Banerjee, Senior Staff Engineer **/RA/**
Technical Support Branch
Advisory Committee on Reactor Safeguards

SUBJECT: CERTIFICATION OF THE MINUTES OF THE ACRS FUTURE
PLANT DESIGNS SUBCOMMITTEE ON MARCH 8, 2017,
ROCKVILLE, MARYLAND

The minutes for the subject meeting were certified on July 24, 2017. Along with the transcripts and presentation materials, this is the official record of the proceedings of that meeting. A copy of the certified minutes is attached.

Attachment: As stated

cc with Attachment: A. Veil
M. Banks
M. Snodderly



**UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, DC 20555 - 0001**

MEMORANDUM TO: Maitri Banerjee, Senior Staff Engineer
Technical Support Branch
Advisory Committee on Reactor Safeguards

FROM: Dennis Bley, Chairman
Future Plant Designs Subcommittee
Advisory Committee on Reactor Safeguards

SUBJECT: CERTIFIED MINUTES OF THE ACRS FUTURE PLANT DESIGNS
SUBCOMMITTEE MEETING ON MARCH 8, 2017

I hereby certify, to the best of my knowledge and belief, that the minutes of the subject meeting on March 8, 2017, are an accurate record of the proceedings for that meeting.

/RA/

July 24, 2017

Dennis Bley, Chairman
Future Plant Designs Subcommittee

Dated

**ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
FUTURE PLANT DESIGNS SUBCOMMITTEE
NRC NON-LWR VISION AND STRATEGY IMPLEMENTATION ACTION PLANS
MARCH 8, 2017, ROCKVILLE, MARYLAND – OPEN TO PUBLIC**

The ACRS Future Plant Designs Subcommittee held a meeting on March 8, 2017 in T2B1, 11545 Rockville Pike, Rockville, Maryland. The meeting convened at 8:30 a.m. and adjourned at 5:56 p.m. The meeting was open to the public.

ATTENDEES

ACRS Members/Staff:

Dennis Bley, Chairman	Michael Corradini, Member
Charles Brown, Member	Walter Kirchner, Member
Dana Powers, Member	Jose March-Leuba, Member
Harold Ray, Member	Joy Rempe, Member
John Stetkar, Member	Gordon Skillman, Member
Matthew Sunseri, Member	Margaret Chu, Member
Ron Ballinger, Member	Peter Riccardella, Member
M. Snodderly, ACRS Staff (Designated Federal Official)	
M. Banerjee, ACRS Staff*	

NRC Staff and Other Attendees:

Jan Mazza, NRO	Amy Cabbage, NRO
John Segala, NRO	Steve Bajorek, RES
William Reckley, NRO	Jim Kinsey, INL
Michael Tschiltz, NEI	Peter Hastings, NIA
David Blee, USNIC	Amir Afzali, Southern Nuclear

*Connected via telephone

SUMMARY

The purpose of the briefing was for the ACRS members to review the NRC Non-Light Water Reactor (Non-LWR) vision and strategy implementation action plans for developing a licensing framework for non-LWRs, and receive feedback from stakeholders including the nuclear industry and developers. The transcript of the meeting is attached, which includes the presentation slides and handouts used during the meeting.

The following list describes significant issues discussed during the meeting with corresponding pages of the transcript referenced.

SIGNIFICANT ISSUES	
Issue	Reference Pages in Transcript
Chairman Bley convened the meeting by introducing the ACRS members present. He noted the NRC staff (staff) had been working with stakeholders for some time in developing the regulatory framework for future licensing applications on non-LWR advanced reactors. He mentioned that the Subcommittee had a meeting on Advanced Reactor Design Criteria in February, and a full committee meeting was scheduled on March 9 on both of these topics. He invited John Segala, NRO, to introduce the staff presenters and start the briefing.	4-7
Mr. Segala introduced the NRO speakers, and provided a background on events and activities that led to the development of the NRC draft near, mid and long-term Implementation Action Plans (IAPs). He then outlined the staff presentation. Member Corradini mentioned a Department of Energy (DOE) Option Study for Test and Demonstration Reactors. A discussion followed.	8-15
Ms. Amy Cabbage started the staff presentation on the vision and strategy document that was published for informal comment. There are six strategies involved. She noted that the NRC goal of assuring readiness to issue licenses in the 2030 time frame supports the DOE deployment goals. Discussion took place on industry expectation of shorter time frame, NRC budget, and possible impediments for licensing non-LWRs. Ms. Cabbage noted that NRC is capable of reviewing an application at the present time, and ability for the applicant to that resulting dose to the public would be acceptable was the ultimate consideration. A discussion followed.	15-23 Slides 2-4
Ms. Cabbage provided an introduction to the IAPs. She noted stakeholder feedback was being factored in. Chairman Bley asked if staff wanted a letter on the near-term IAPs.	23-28 Slides 5-7
Ms. Cabbage provided an outline of the five strategies in the near term IAPs, with examples of ongoing near-term IAP activities. Upon a members' question, Ms. Cabbage noted that training on molten salt reactors (MSRs) was prioritized because that's the area where staff had the least knowledge. Priorities were discussed, the extent of expenditure under Strategy 2, and difficulty that one may encounter under Strategies 3 and 5 were noted. NRC's flexible and staged approach to licensing recognizes that non-LWR developers who want to engage with the NRC will have a range of financing capabilities, business plans, and time horizons. Canadian vendor design review process was discussed. The staff has asked designers to develop a licensing project plan in	28-49 Slides 8-9

collaboration with the staff. Design and licensing stages were discussed.	
Member Powers asked if the agency had given consideration to abandoning the design-basis-accident concept, in lieu of risk considerations. An approach to use design basis accidents for certain purposes, and use of PRA to determine licensing basis events (LBEs), similar to what was proposed for NGNP was noted. Ms. Cabbage mentioned the fuel cycle issues included in the mid-term plan may need to be expedited.	50-56 Slides 10-11
Ms. Cabbage discussed outreach activities. She also noted pre-application interactions with some developers of advanced reactors. A discussion followed after member Powers noted the need for communicating with a range of entities, like the learned societies, outside the normal outreach.	56-66 Slide 12-13
Dr. Steve Bajorek, RES, presented details of Strategy 2, Computer Codes & Tools. He discussed the purpose, noting that activities under this strategy go far beyond computer codes, with particular attention to the experimental needs over the next several years. Upon member Powers question a long discussion ensued regarding when staff may need to do a confirmatory analysis while reviewing an application.	66-75 Slides 14
Strategy 2, Functional Areas & Prioritization: Dr. Bajorek stated the purpose was to identify major issues and work needed for each reactor type. Chairman Bley noted some inconsistencies between the report and the slide. Staff had seen much tighter coupling between the kinetics, thermal fluids and the fuel performance for non-LWRs. Dr. Bajorek stated the secondary focus activities play a greater role in mid-term. Staff focus is on areas where they need to develop independent capability and area that are drastically different from an LWR. Members pointed out that Strategy 2 should be about knowledge, and filling gaps in knowledge through experiments, analyses, and development of tools. Member Skillman wanted to know to what extent the new design criteria were informed by research, the answer was negative, but staff had RES representation on the design criteria team.	75-88 Slide 15
Dr. Bajorek discussed the technical challenges staff was encountering regarding the physical processes in new designs, areas of fuel performance, neutronics, severe accident phenomena, and materials. Member Powers questioned the responsibility of the staff vs. the applicant regarding needed research data, and noted that operating experience like periodic shutdowns should be considered as they impose challenges to material properties. The staff vs. applicant's responsibility of confirming the applicant's analysis were discussed. Significant issues for materials in MSR were noted.	86-97 Slide 16
Dr. Bajorek noted technical benefits from previous NGNP efforts, and its characteristics like single phase coolant that poses lesser challenges and complexity. Member Powers countered the assumption of single phase in that	97-106 Slide 17

<p>certain aspects may not be modeled well in CFD analysis; e.g., little particles of corrosion products in MSRs creating abrasion, and likewise diffusion and phoretic phenomena of aerosol fission products in gas coolant.</p> <p>Staff noted that significant safety margin may allow for large modeling and simulation uncertainties. Member Kirchner pointed to additional challenges like liquid fuel, tighter coupling of fuel, neutronics and thermal performance. Member Brown commented on the respective roles of the staff and the applicant, and that plans should be more risk focused.</p>	
<p>Staff's initial efforts involve identification of the phenomena, scenarios and issues that drive the code selection, and need for experimental data. Chairman Bley questioned if the focus on identifying technical gaps was consistently applied across the functional areas. Dr. Bajorek described pre-PIRT type of evaluations on molten salt and sodium fast reactors. Member Corradini wanted to know how the staff would handle an applicant coming in the next few years. A discussion followed and use of the prototype provision and imposing operational constraints were noted.</p>	<p>107-118 Slide 18</p>
<p>After a recess, the meeting reconvened and Ms. Cabbage pointed out the connection between Strategies 2, 3 and 5; e.g., identifying technical gaps being a Strategy 3 issue. The evolving nature of the IAP document (current version provides a snapshot in time), and that it was to inform budget requests were noted. A long discussion ensued. Mr. Segala noted the IAPs were developed independently of the budget, critical skills, and applicants' plans; the idea being to write down what NRC needed to do to get ready. Hence continuous course correction is being done. It was noted some work by NEI may be endorsed by the NRC. Use of foreign codes was discussed.</p> <p>Dr. Bajorek summarized the steps of staff plan in this area, pre-PIRT, selection of codes to work on, identifying experimental data needs, and NRC's participation in Codes and standards activities.</p>	<p>119-146</p>
<p>Dr. Bajorek presented examples, the sodium fast reactor and MSR (liquid fuel) code suites that staff is considering and options available. A discussion followed on various code options.</p>	<p>146-155 Slide 19-21</p>
<p>Mr. Bill Reckley presented Strategy 3, a flexible non-LWR regulatory review process. He presented seven near-term activities. Regarding the activity on non-LWR licensing bases, members asked if the goal was to come up with something generic (technology neutral), and if integration of safety and security was being considered. NEI white paper on the latter was noted. A discussion took place on perceived finality of staff feedback during pre-conceptual interactions with potential applicants.</p>	<p>157-163 Slide 22,23</p>
<p>Activity 4: Flexible Approach, Roadmap: Mr. Reckley presented the steps in DOE critical decision process and how NRC's flexible approach fits into that. The staff is adopting individual designers' licensing project plans in the</p>	<p>163-201 Slide 24-26</p>

<p>guidance. He discussed the scope of the pre-application design assessments and various levels of feedback a designer can get from the NRC. A discussion took place on perceived finality of staff feedback during pre-conceptual interactions with potential applicants, or the impact of an overly conservative staff decision.</p> <p>Mr. Reckley discussed staff's plan on revising Part 52 rule regarding the standard design approval process. He mentioned NRC outreach with designers to inform them about NRC processes (documented in the draft regulatory roadmap), and a future industry document on how to engage with the NRC at various stages that the NRC may endorse. Member Kirchner recommended more clarity and definition of the steps noted on Slide 24 that used DOE critical decision process steps. A discussion ensued on how to address linkage that exists among various steps and organization of information to be submitted. Regarding the pre-application phase, Mr. Reckley noted the importance of identifying critical design aspects early on for NRC review.</p>	
<p>Regarding technology specific or generic standard review plan Mr. Reckley noted that the staff was considering the safety-focused review approach as it was developed for NuScale design certification review. Staff will have a review plan for each design and technology, which might evolve into a standard review plan if the number of applications justify the need for a standard. He discussed the key considerations of a safety focused review.</p> <p>Member Skillman asked if the staff had considered other countries' processes. NRC processes in 10 CFR Parts 50 or 52 were chosen by the staff because of the existence of guidance and acceptance criteria, and a discussion followed. The Canadian process was discussed, and the predictability of time and resources to do various phases of their pre-application review was mentioned. Industry voices calling for modernization of NRC framework was discussed.</p>	<p>201-213 Slide 27</p>
<p>Presentation of non-LWR licensing basis: Mr. Reckley discussed the current LBE construct for LWRs, and the NGNP construct that was to use PRA in designing LBEs and design basis accidents. The frequency/consequence curve (Slide 29) shows 1 rem as a goal to limit the degree of emergency preparedness, a discussion point on how to be applied. Member Skillman described his experience with the German seven step licensing system and that its thoroughness was extraordinary as long as there was a QA program applied. He noted it established the accident requirements up-front, and encouraged NRC staff to look at it. Mr. Reckley pointed out that discussion on how to balance the use of the risk information with more traditional deterministic or engineering analysis approaches was ongoing. He noted for some of the simpler designs, the traditional approach of deterministic assessment of fission product barriers might be an easier approach.</p>	<p>213-226 Slides 28-30</p>

<p>Policy issues: Ms. Cabbage went over a list of policy issues. The staff does not plan SRP changes at this time, and plans to follow the NuScale safety focused review approach for non-LWRs especially for use of PRA for DBE selection. The staff is drafting a guidance document for prototype reactors that will be available in April. Relating to multi-module staffing, Ms. Cabbage stated that current review process and exemptions as needed could be used for non-LWRs. Ms. Cabbage described the interrelationship between several policy issues, and upcoming rulemaking on emergency preparedness.</p> <p>Ms. Cabbage completed staff's presentation stating that the staff was open for more dialogue, and would provide documents as requested.</p>	<p>226-237 Slides 31-34</p>
<p>Mr. Jim Kinsey, Idaho National Laboratory, provided feedback on behalf of the DOE. He stated there was good alignment between DOE and NRC plans. He mentioned the DOE vision and strategy document on the deployment of both LWR based SMRs and advanced non-LWRs, and its near-term focus on the development of an NRC regulatory framework for advanced non-LWRs. He elaborated on DOE schedule for commercial deployment of SMRs in the mid-2020s and that of advanced non-LWRs by the 2030s. Member Rempe wondered if the schedule for less mature technologies like the MSR was realistic given the status of fuel qualification.</p>	<p>237-243 Slides 2-4</p>
<p>Mr. Kinsey discussed the four key constituents of the regulatory framework, and elements needed for near term deployment. He elaborated on why an entirely new regulatory framework, e.g., 10 CFR Part 53 was not needed for near-term deployment. Mr. Kinsey mentioned the elements of "focused retirement of regulatory risk," i.e., reduction or retirement of regulatory uncertainty. Regarding the strategies he noted the MSR training course available at the ORNL.</p>	<p>244-248 Slides 5-7</p>
<p>Mr. Kinsey noted that the DOE seeks industry input on regulatory framework needs and deployment support priorities from a number of industry sources. He presented a figure showing the typical key licensing inputs required to arrive at a decision that radiological release limits are met. He elaborated on the mechanistic source term. He noted how policy issues in areas of largest uncertainty fit together, and the supporting research (Slide 9). He responded to member Rempe's question on DOE funding allocation on fuel research.</p>	<p>249-254 Slides 8-9</p>
<p>Resolve Open Commission Policy Issues and Establish Licensing Technical Requirements: Mr. Kinsey noted the DOE was supporting the utility-led licensing technical requirements modernization project. He discussed DOE involvement in developing non-LWR design criteria. In the area of revising the SRP, he noted the DOE pilot study on Chapter 4 for both the sodium fast reactor and the modular HTGR.</p>	<p>254-256 Slide 10</p>
<p>In the area of analytical tool development, Mr. Kinsey stated the DOE effort was to address the more important tools and how the national lab complex can</p>	<p>256-260 Slides 11-13</p>

<p>support these efforts keeping the industry and the NRC adequately independent. In the area of the codes and standards, he noted a pilot study on a handful of codes and standards that could be applied to a sodium fast reactor to sort out the extent of effort needed on a more technology-expansive basis, and how the codes and standards that are available could be used for a non-LWR. He completed his presentation by saying that the DOE provides its input through the industry working groups regarding staged regulatory review process. Upon members' question Mr. Kinsey explained how mHTGR review addressed the applicability of the GDC.</p>	
<p>Member Powers asked how the staff would do an independent verification related to a contention where an applicant had done calculations using super computers at the national laboratories and presented that as their validation. A discussion followed. Given the dual DOE/national laboratory role in support of and collaboration with the industry, a need to work out the conflict of interest issues was noted by member March-Leuba. Member Corradini ventured into the DOE handling of advanced reactor research and development, versus demonstration and deployment. A discussion followed.</p>	260-266
<p>Mr. David Blee, U.S. Nuclear Infrastructure Council (NIC), briefly summarized the NRC outreach with the industry developers and DOE involvement. He noted the licensing modernization and other support legislative activities in the U.S. Congress. Upon Chairman Bley's question he provided a short description on what the NIC is and does. He noted Terrestrial Energy's plan to submit a license application in 2019 and that NRC's schedule may not support that. Mr. Blee's statement that NRC should bear the responsibility for submittal of a quality application drew a discussion from members.</p>	266-280 Slides 2-3
<p>Mr. Blee noted some of their member developers are filing applications for a pre-licensing vendor design review to the Canadian regulatory agency because of their phased review approach, and a fixed review cost and schedule. This particular comment resulted in a long discussion. Upon members' comments he noted NIC was developing a license-ability statement.</p> <p>Mr. Blee presented NIC comments on NRC vision and strategy, and that NIC plans to present findings from their Advanced Reactor Technology Owners Group regarding a prioritized roadmap. Also NIC did not like NRC identifying which particular technologies are more likely to come ready for the Agency's regulatory review. NIC sees this as NRC picking winners and losers, and opined that it should be left to the market forces. He noted some congressional activities to expedite regulatory preparation that his organization supports. He stated NRC's vision and strategy was headed in the right direction, however timeliness was not optimum to support developers' needs.</p>	280-301 Slides 4-10
<p>Mr. Michael Tschiltz, NEI, presented the nuclear industry's perspective on NRC's non-LWR near term IAPs and comments submitted to the staff earlier in the week. He presented the NEI/industry structure for advanced non-LWR</p>	303-312 Slides 2-4

<p>activities including working groups and task forces for dealing with advanced reactor issues. The NEI advanced reactor technology task force is considering three major designs, high temperature gas, sodium, and molten salt reactors.</p> <p>Mr. Tschiltz presented their near term activities: identifying technology-inclusive policy issues and/or gaps in the existing regulatory framework; developing technology/design-specific licensing project plans that identify information needed to support staff findings; and aligning timelines/resource with industry needs.</p>	
<p>Mr. Tschiltz presented comments on Strategy 3, regarding a more efficient and effective licensing process. Regarding advanced reactor security, he noted the NRC's publication in the Federal Register and the NEI's white paper provide a viable path forward. He noted that NRC needed to include fuel cycle and qualification issues in the near term IAPs. A discussion on fuel enrichment capabilities and issues followed. He noted an industry group was starting to work on the level of detail needed for an acceptance review. Member Ray asked if this group was looking at a specific experience on missing details during design certification, and subsequently found to be problematic for the plant to operate. The question on the level of details started a spirited discussion, and the level of detail as a function of the risk irrespective of the size of the plant was mentioned. NEI is starting work on this subject. Quality of application was another such issue.</p>	<p>312-333 Slides 5-7</p>
<p>Mr. Amir Afzali, Southern Nuclear, presented the modernization of regulatory framework for advanced reactor licensing, claimed to be a holistic approach. He presented "observations" in that the IAPs, although extensive, are not clear on how the deliverables would result in a timely improvement in effectiveness and efficiency of the licensing process. He stated a modernized regulatory framework is paramount to reducing regulatory uncertainties, a condition for investment of billions of dollars in new reactor development. A technology-inclusive, systematic, risk-informed and performance-based framework, which enables or incentivizes innovation across a broad spectrum of advanced reactors, was deemed necessary. Upon Chairman Bley's question, Mr. Afzali noted the implementation time frame of the IAPs was too long, especially Strategy 2, and licensing basis events selection would be paramount.</p>	<p>334-344 Slides 2-3</p>
<p>Regulatory framework: Mr. Afzali noted the lack of a process for LBE selection, and advocated a process that uses PRA information and engineering judgment. They plan to submit this technology inclusive risk-informed performance-based process for NRC review, expecting NRC to issue an ISG or some form of regulatory guidance to endorse the approach. This process may be used for the LBE selection, SSC classification and defense-in-depth consideration.</p> <p>Mr. Afzali noted on-going work on a process for adequate safety determination, as the current process is thought to be too subjective. Regarding the advanced reactor design criteria, Mr. Afzali stated their project fits into NRC's approach.</p>	<p>343-349</p>

<p>Members questioned the design details that would be needed at the onset to use the above stated approach, and quantitative or qualitative mechanisms that would reduce the subjectivity of reviews. Mr. Afzali noted there was no definition of adequate defense-in-depth. NGNP experience was mentioned. A long discussion followed, licensing non-LWRs with higher margins to account for uncertainty was mentioned.</p>	<p>349-360</p>
<p>SRP Chapter 15.0, and definition of risk: Mr. Afzali discussed the ad hoc vs. systematic risk-informed performance-based approach, the latter being the preferred one. He completed his presentation by saying that timeliness is crucial in modernizing the regulatory framework.</p>	<p>360-365 Slide 4-5</p>
<p>Peter Hastings, Nuclear Innovation Alliance (NIA), noted that NIA is a non-profit organization dedicated to leading advanced nuclear energy innovation, and presented its involvements and activities. He discussed an NIA report published in April 2016 called "Enabling Nuclear Innovation: Strategies for Advanced Reactor Licensing.". He indicated support towards NRC's vision and strategy work, and recommended priority development of Strategy 3 for review guidance. Emphasis was placed in Strategy 5 in terms of identifying and resolving policy issues. He elaborated on Strategy 2 that more effective use of modeling and simulation could accelerate fuel qualification. Member Powers pointed out that modeling and simulation will not catch a new phenomenon that could emerge at a fuel burnup higher than the existing database. Mr. Hastings noted the use of prototype and demonstration options, within a balance. Computational power available to the NRC staff for confirmatory analysis was noted to be sub-par to what is available to developers. Member Rempe asked if a lack of development in the advanced reactor fuel area should delay some activities under Strategy 2. A discussion followed regarding the staff's vs. applicants' responsibilities with respect to the analytical basis. Use of independent peer review before applications are submitted to NRC was noted.</p>	<p>365-379 Slides 2-5</p>
<p>Discussion on staged licensing, a desired process for some developers: NIA has been working with the industry to develop guidance, with the scope of the standard design approval process still in flux. He completed his presentation with discussion on licensing program plan.</p>	<p>379-389 Slides 6-7</p>
<p>Chairman Bley asked for public comments, none was offered. Then he asked ACRS members for input to the letter he would be preparing.</p>	<p>390-391</p>
<p>Individual members' Comments (not ACRS positions): Member Corradini noted that Strategies 3 and 5 have to be done early in the initial five years, and how they knit together should be worked out. A project plan from the applicant was noted as important.</p>	<p>391-403</p>

<p>Member Powers did not think the design basis accident concept was essential for the regulatory process. He was dismayed that the communication strategy did not include a reach out to the technical learned society.</p> <p>Member Skillman stated that expunged features from GDC-26 needed to be retained.</p> <p>Member Ray pointed out the need for a high degree of accuracy of the information that the applicants submit and steps the applicants can take to assure that, a comment supported by other members.</p> <p>Member Rempe agreed with prior comments on the prioritization of Strategies 3 and 5, staff review for some tasks in Strategy 2 that could be delayed, and emphasized quality of submittals. She noted the lead-cooled reactor should be included in staff's plan.</p> <p>Member Kirchner pointed out the applicant's responsibility for fuel qualification, that Strategies 3 and 5 may be more important than Strategy 2, and reflected on the need for a mature design to use PRA in regulatory decision-making.</p> <p>Member March-Leuba pointed out that in the near-term staff could collect available experimental data relevant to the likely designs and concentrate on benchmarking efforts instead of attempting to develop new codes.</p>	
<p>Chairman Bley noted the importance of Strategy 3, and that the focus on codes in Strategy 2 may be misplaced. The licensing basis events selection plays a key role, and will need design details, operational information, and a good quality PRA for the risk informed approach to licensing.</p> <p>Chairman Bley adjourned the meeting at 5:56 p.m.</p>	403-405

ACTION ITEMS	
Action Item	Reference Pages in Transcript
Action item 1: Members asked for a copy of the NEI white paper on integration of safety and security.	162
Action item 2: The staff is drafting a guidance document for prototype reactors that will be available in April.	229
Action item 3: Provide NIA paper on staged licensing to members.	380

Documents provided to Subcommittee Members:

1. U.S. Nuclear Regulatory Commission, Draft Regulatory Guide DG-1330, "Guidance for Developing Principal Design Criteria for Non-Light-Water Reactors," February 2017 (ML16301A307).
2. Summary of October 11, 2016 Public Meeting Regarding Non-Light-Water Reactor Design Criteria (ML16314B333)
3. INL/EXT-14-31179, Revision 1, Guidance for Developing Principal Design Criteria for Advanced (Non-Light Water) Reactors, December 2014 (ML14353A246 and ML14353A248)
4. ACRS letter "Next Generation Nuclear Plant (NGNP) Key Licensing Issues," May 15, 2013 (ML13135A290)
5. U.S. Nuclear Regulatory Commission, "Next Generation Nuclear Plant Assessment of Key Licensing Issues," July 17, 2014 (ML14174A626).
6. DOE, Tanju Sofu, Argonne National Laboratory, "Sodium-cooled Fast reactor (SFR) Technology Overview," IAEA Education and Training Seminar on Fast Reactor Science and Technology, ITESM Campus, Santa Fe, Mexico City, June 29–July 3, 2015.
7. DOE slides "Sodium-cooled Fast Reactor (SFR) Technology and Safety Overview," February 18, 2015.

Official Transcript of Proceedings
NUCLEAR REGULATORY COMMISSION

Title: Advisory Committee on Reactor Safeguards
 Future Plant Designs Subcommittee

Docket Number: (n/a)

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Date: Wednesday, March 8, 2017

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DISCLAIMER

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

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

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

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

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FUTURE PLANT DESIGNS SUBCOMMITTEE

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WEDNESDAY

MARCH 8, 2017

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ROCKVILLE, MARYLAND

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The Subcommittee met at the Nuclear Regulatory Commission, Two White Flint North, Room T2B1, 11545 Rockville Pike, at 8:30 a.m., Dennis C. Bley, Chairman, presiding.

COMMITTEE MEMBERS:

DENNIS C. BLEY, Subcommittee Chairman

RONALD G. BALLINGER, Member

CHARLES H. BROWN, JR. Member

MARGARET CHU, Member

MICHAEL L. CORRADINI, Member

WALTER L. KIRCHNER, Member

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PETER C. RICCARDELLA, Member

GORDON R. SKILLMAN, Member

JOHN W. STETKAR, Member

MATTHEW W. SUNSERI, Member

DESIGNATED FEDERAL OFFICIAL:

MIKE SNODDERLY

ALSO PRESENT:

AMIR AFZALI, Southern Nuclear

STEVE BAJOREK, RES

DAVID BLEE, USNIC

AMY CUBBAGE, NRO

PETER HASTINGS, NIA

JIM KINSEY, INL

JAN MAZZA, NRO

WILLIAM RECKLEY, NRO

JOHN SEGALA, NRO

MICHAEL TSCHILTZ, NEI

*Present via telephone

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P R O C E E D I N G S

8:30 a.m.

CHAIRMAN BLEY: The meeting will now come to order.

This is a meeting of the Future Plant Design Subcommittee of the Advisory Committee on Reactor Safeguards.

I'm Dennis Bley, Chairman of this Subcommittee.

ACRS Members in attendance today are Ron Ballinger, Charlie Brown, Mike Corradini, Walt Kirchner, Jose March-Leuba, Dana Powers, Harold Ray, Joy Rempe, Dick Skillman, John Stetkar and Matt Sunseri.

Mike Snodderly is the Designated Federal Official for this meeting.

Today, we have members of the NRC staff and members from the nuclear industry to brief the Subcommittee on NRC's Non-LWR Vision and Strategy Implementation Accident Plans and supporting activities.

The NRC staff has been working with stakeholders for some time now in developing the regulatory framework for future licensing applications on advanced reactors.

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1 The ACRS was established by statute and
2 is governed by the Federal Advisory Committee Act,
3 FACA. That means that the committee can only speak
4 through its published letter reports.

5 We hold meetings to gather information
6 to support our deliberations.

7 Interested parties who wish to provide
8 comments can contact our office requesting time
9 after the meeting announcement is published in the
10 Federal Register.

11 That said, we set aside ten minutes for
12 spur of the moment comments from members of the
13 public attending or listening to our meetings.
14 Written comments are also welcome.

15 The ACRS Section of the NRC public
16 website provides our charter, bylaws, letter
17 reports and transcripts of all meetings, including
18 the slides that'll be presented here.

19 The rules for participation in today's
20 meeting were announced in the Federal Register on
21 March 2, 2017. The meeting was announced as
22 open/closed. This means that we can close the
23 meeting to discuss sensitive issues and presenters
24 can defer questions that should not be answered in
25 public session.

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1 No written statement or requests for
2 making an oral statement to the Subcommittee has
3 been received from the public.

4 Dr. Ed Lyman of the Union of Concerned
5 Scientists was planning to provide his
6 presentation, however, due to other commitments, he
7 had to cancel that presentation today.

8 A transcript of the meeting is being
9 kept and will be made available, as stated in the
10 Federal Register Notice. Therefore, we request
11 that participants in this meeting use the
12 microphones located throughout the meeting room
13 when addressing the Subcommittee.

14 Participants should first identify
15 themselves and then speak with sufficient clarity
16 and volume that they can be readily heard.

17 A bridge line established for the
18 public to listen to the meeting, the bridge number
19 and password were published in the agenda posted on
20 the NRC public website.

21 To minimize disturbance, the public
22 line will be kept in the listen in only mode. The
23 public will have an opportunity to make a statement
24 at the end of the meeting.

25 We have a separate bridge line for

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1 members of the Department of Energy and the
2 National Laboratory staffs to listen in and, if
3 necessary, participate in our discussion. This
4 line will be kept open, and while it's open, I ask
5 everyone on that line to silence your phones.
6 We're getting some clicks and pops now.

7 I'm requesting -- that's what it says
8 next -- either silence your phone, mute it or press
9 star six to do that.

10 Also, to avoid disturbance, I request
11 that attendees put their electronic devices in the
12 off or noise free mode.

13 By the way, we had a meeting on
14 Advanced Reactor Design Criteria last month and
15 tomorrow, we will have a full committee meeting on
16 today's topic and that one.

17 During that meeting, one issue was
18 raised that I hope staff will touch on today. And,
19 that was it's a little hard to evaluate the design
20 criteria in the absence of a set of licensing basis
21 accidents that comes under your Strategy 3 and that
22 connection between the two is something we'd like
23 to hear about today.

24 At this time, I'm going to invite John
25 Segala to introduce the presenters and start your

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1 briefing.

2 John?

3 MR. SEGALA: Thank you.

4 Good morning, I'm John Segala. I'm the
5 Chief of the Advanced Reactor and Policy Branch in
6 the Office of New Reactors.

7 I have here with me today Amy Cabbage
8 and Bill Reckley on the two ends. They are Senior
9 Project Managers in my branch.

10 And, then, I also have Steve Bajorek
11 who's the Senior Technical Advisor for Thermal
12 Hydraulics in the Office of Research.

13 We are pleased to be here today to
14 discuss NRC's readiness activities for reviewing
15 and regulating advanced reactors.

16 As you know, over the past several
17 years there has been a significant increase in
18 industries interests in developing and licensing
19 advanced reactors.

20 The Department of Energy released its
21 vision and strategy document with the goal of
22 having two or more non-light water reactors ready
23 for construction in the early 2030 time frame.

24 Similarly, the Nuclear Energy Institute
25 issued its strategic plan for advanced non-light

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1 water reactors where they anticipate demonstrations
2 of one or more non-light water reactors in the 2025
3 time frame and commercial availability of two or
4 more non-light water reactors in the 2030-2035 time
5 frame.

6 In December 2016, the think tank, Third
7 Way, updated its report identifying 58 companies
8 developing advanced reactor designs and other
9 nuclear technologies.

10 In response to the -- oh yes --
11 congressional legislation has been put forth in
12 both the House and the -- House of Representatives
13 and the Senate for research and development and
14 licensing of advanced reactors. Although none of
15 these bills have passed both Houses, congressional
16 interest remains very high.

17 In January, two bills passed the House
18 and today, there's a -- the Senate is holding a
19 hearing on S. 512 which is the Nuclear Energy
20 Innovation and Modernization Act.

21 MEMBER CORRADINI: So, can I just
22 clarify? I assume all three of the things that
23 you've just mentioned are probably not sync, but is
24 there a continuing conversation with the DOE side
25 so you understand how things are changing?

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1 MR. SEGALA: Yes.

2 MEMBER CORRADINI: Or what they'll be
3 told to change and what you might be told to
4 change?

5 MR. SEGALA: In terms of the bills?

6 MEMBER CORRADINI: Yes.

7 MR. SEGALA: I'm not -- I mean, we have
8 ongoing discussions with DOE on a regular basis.
9 I'm not sure we specifically discussed the bills,
10 but --

11 MEMBER CORRADINI: Okay. No, no, I
12 didn't expect that.

13 MR. SEGALA: -- as we move forward --

14 MEMBER CORRADINI: Just your --

15 MR. SEGALA: Okay.

16 So, in response to the growing interest
17 in advanced reactors, the NRC developed its final
18 vision and strategy document in December of 2016.
19 And, this had a strategic goal of assuring NRC's
20 readiness to effectively and efficiently review and
21 regulate non-light water reactors.

22 To help achieve this goal, the NRC
23 developed its Draft Near-Term, Mid-Term and Long-
24 Term Implementation Action Plans.

25 The Near-Term Implementation Action

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1 Plans includes six strategies. So, for the
2 presentations today, Amy Cabbage will start off
3 with providing an overview of our vision and
4 strategy document and our associated implementation
5 action plans.

6 Steve Bajorek will then discuss the
7 Near-Term Implementation Action Plan Strategy 2
8 which involves acquiring and developing sufficient
9 computer codes and analysis tools to perform
10 advanced reactor reviews.

11 Bill Reckley will then discuss Near-
12 Term Implementation Action Plan Strategy 3 which
13 involves developing guidance for flexible
14 regulatory review processes within the bounds the
15 existing regulations, including conceptual design
16 reviews and stage review processes.

17 And, then, Amy Cabbage will finish up
18 with discussing the Near-Term Implementation Action
19 Plan Strategy 5 which involves identifying and
20 resolving technology inclusive policy issues.

21 So, since the implementation action
22 plans will be used by NRC over the next several
23 years to identify and prioritize our execution
24 activities, we value and look forward to any
25 feedback or insights that the ACRS has today.

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1 With that, I plan to turn it over to
2 Amy Cabbage unless anybody has any high level
3 questions.

4 MEMBER CORRADINI: I have a question.
5 So, there was a study done by the DOE called the
6 Option Study for Test Reactors and Demonstration
7 Reactors. Has staff looked at that?

8 Because, that seems to be at the core
9 of a lot of the decision making from a time table
10 and a what if strategy or scenarios. Have you guys
11 looked at that?

12 MS. CUBBAGE: Yes, we're aware of it
13 and we're monitoring those developments. But,
14 until, you know, there's more concrete plans of
15 what -- when, you know --

16 MEMBER CORRADINI: Okay.

17 MS. CUBBAGE: -- we're, you know,
18 looking --

19 MEMBER CORRADINI: Okay.

20 MS. CUBBAGE: -- for that to be able to
21 reactor.

22 MEMBER CORRADINI: So, that's fine.
23 But, let me just get to the nub of it. In that
24 option study, they have a time table which says
25 that, at best, if I had a mature technology, I

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1 can't get to a construction, would you quoted as
2 year 2030 for 13 years, let's say, 13 years, a good
3 number.

4 So, I work backwards from that, that
5 means there's expectations of pre-application
6 discussions now. So, my question is, since that is
7 a referenced in the in the SIAP report, that's a
8 referenced document in the vision and strategy
9 document. That's a referenced document in this.

10 They are the only ones that did an
11 analysis on how this all might fit together, even
12 if it was a mature technology. And, it strikes me
13 that something's got to be synced with what the
14 expectation is.

15 They also estimated that if it was an
16 immature technology, we won't say what that is, but
17 I think we can take a guess, we're talking 20
18 years.

19 So, I understand the need for
20 flexibility here, but I'm trying to figure out,
21 coming into this, how does one think about this
22 relative to what, at least, the DOE thought was
23 happening?

24 Because I don't think it's going to be
25 faster.

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1 MS. CUBBAGE: Right. So, I think,
2 conceptually, we understand that. And, that's one
3 of the reasons we're trying to focus on technology
4 inclusive issues early on and not really focusing
5 too much on any particular technology at this
6 point.

7 Although, we do have some folks that
8 want to start pre-application near-term and we've
9 already started pre-application with one designer.
10 So, you know, we're working with them.

11 MEMBER CORRADINI: Well, the only
12 reason I bring it up at this point is not that you
13 need to respond now, but to keep it in the back of
14 your mind because the impression I got from that
15 study was, the schedule and costs, if mature, is
16 technology independent and the schedule costs is
17 technology independent that's immature.

18 And, they're just long time frames with
19 a schedule that involves licensing. And, I just
20 want to make sure staff sees that and figures it
21 into your planning. Otherwise, I have this feeling
22 of disconnect.

23 MS. CUBBAGE: It's certainly
24 information that we would factor in into our
25 planning.

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1 MEMBER CORRADINI: Okay.

2 CHAIRMAN BLEY: Just a matter of
3 definition when you say technology inclusive, that
4 means things apply regardless of the technology?

5 MS. CUBBAGE: Regardless of the
6 technology or within a category of technology, they
7 would be broadly applicable to say all gas reactors
8 or all types of sodium reactors.

9 CHAIRMAN BLEY: Okay, thanks.

10 MS. CUBBAGE: Okay, so as John
11 mentioned, to guide our readiness efforts, we've
12 prepared a vision and strategy document. It was
13 published last year for informal comment and we
14 stated in that document our strategic goal of
15 assuring readiness to effectively and efficiently
16 review non-LWRs by 2025 to be prepared to issue
17 licenses in the 2030 time frame to support the DOE
18 deployment goals.

19 We identified three objectives in this
20 document, enhancing technical readiness, optimizing
21 regulatory readiness and optimizing communications.

22 There was a recurring theme in the
23 stakeholder feedback we got that the time lines
24 were too long which is contrary to what Dr.
25 Corradini just said. So, we're kind of balancing,

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1 we're getting feedback and inputs from different
2 avenues that are saying go faster or we're about
3 right or go slower. So, we're balancing those
4 needs.

5 MEMBER CORRADINI: If I might, since
6 you're right, for sure, but reality is
7 still reality. So, I think staff has got to be
8 cognizant of what some of the advocates are saying,
9 but, from a realistic standpoint.

10 That's why I point to this document
11 because it's been vetted by the DOE, by the CF, by
12 NEAC and, in all cases, those two conclusions I
13 mentioned about mature and immature and timing,
14 seem to stand up as a realistic.

15 So, I'm not looking at -- to
16 optimistic, I'm looking to realistic.

17 MS. CUBBAGE: Okay, that's good
18 feedback.

19 So, what we did with the document to
20 address the feedback is that we acknowledged that,
21 you know, if we have a specific pre-applicant that
22 comes in, we're going to work with them on their
23 needs on whatever policy or regulatory decisions
24 are needed to support their business plans.

25 And, we published the revised vision

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1 strategy in December.

2 MEMBER KIRCHNER: Amy, may I interrupt?

3 MS. CUBBAGE: Yes.

4 MEMBER KIRCHNER: And, just ask, for
5 the record, what do you have in front of you in
6 terms of firm, not applications, but designs that
7 you are putting in your queue or anticipate that
8 you're going to be reviewing in the nearer term?

9 MS. CUBBAGE: So, we've begun -- I have
10 a slide on this later, but I can give you a
11 preview.

12 MEMBER KIRCHNER: No, we can wait.

13 MS. CUBBAGE: Okay, all right.

14 MEMBER REMPE: Actually, talking about
15 reality, there's all these bills that have been
16 proposed. And, although our mission is safety,
17 just for the record, did you ever get any of this -
18 - some of those bills talk about having things that
19 are off the fee base spending for NRC. Has NRC
20 gotten any of the fee base directly from Congress
21 that were appropriated? Or where is that if any --

22 MS. CUBBAGE: Okay.

23 MEMBER REMPE: -- is forecast to be
24 charged --

25 MS. CUBBAGE: Right.

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1 MEMBER REMPE: -- short-term?

2 MS. CUBBAGE: So, for FY17, the budget
3 does include all fee based funds. But, given that
4 we're in a Continuing Resolution, we haven't
5 physically received any authorization for off fee
6 base spending. So, we're using our existing on fee
7 base resources at the moment to support this
8 activity and a budget request in future years will
9 also include off the fee base money in conjunction
10 with our congressional oversight.

11 MEMBER REMPE: Thank you.

12 MEMBER SKILLMAN: Amy, let me ask this
13 question.

14 MS. CUBBAGE: Sure.

15 MEMBER SKILLMAN: Most of the
16 technologies that come to maturity, there's either
17 a burning platform or someone who says I'll do it.
18 I'll just do it.

19 Is there either a burning platform --
20 you've mentioned the time spans 13 years, 20 years,
21 that type of thing. That sounds like an awfully
22 long time, if there is an applicant that says I'm
23 ready to do this. I'm really ready to do it no
24 matter what the future brings.

25 Is there someone who is in that

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1 position?

2 MS. CUBBAGE: There are applicants who
3 want to come early with applications.

4 MEMBER SKILLMAN: Must their entry
5 await all of the other administrative issues that
6 you will be talking about?

7 MS. CUBBAGE: No, we could receive an
8 application. We could review it. It may take
9 longer and it may not be as efficient as if we had
10 put in place, you know, all of the infrastructure
11 that we need.

12 But, you know, I was the project
13 manager for the PBMR review in 2001. We were ready
14 to receive an application in 2002 for the PBMR and
15 then that project was cancelled.

16 Bill was involved with NGNP. We were
17 ready to review the NGNP project had that not been
18 suspended by DOE.

19 So, there is no impediment to someone
20 coming and submitting an application.

21 MEMBER SKILLMAN: Right now?

22 Okay, one final question. Is there one
23 specific requirement, design requirement that would
24 trump all of the others from the perspective of no
25 matter what the design is, whether it's a gas

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1 reactor, a sodium reactor, a salt reactor, a lead-
2 gold reactor, if it fits in that requirement no
3 matter what, it's good to go?

4 For instance, a very strong
5 containment, just a strong box.

6 MS. CUBBAGE: So, I think of it in a
7 different term. I think of it as the ultimate dose
8 to the public and that could be justified by either
9 the inherent characteristics of that design or the
10 existence of a containment or the inherent
11 characteristics of that fuel barrier.

12 So, there are many different layers
13 that could be weighted. So, I wouldn't necessarily
14 say we're in a place to say everything could be --
15 has to be solved by a containment. But, certainly,
16 if someone were to voluntarily want to use
17 containment as their barrier to show that the dose
18 to the public was acceptable, that would be an
19 option.

20 MEMBER SKILLMAN: Well, I'm just
21 wondering if there is an opportunity, instead of
22 getting into a quantitative discussion about
23 probability of failure of the containment or
24 probability of failure of the fuel or probability
25 of failure of this, that and the other, one simply

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1 said qualitatively, we don't care.

2 MS. CUBBAGE: Right.

3 MEMBER SKILLMAN: Here's the box. If
4 you make the box this strong --

5 MS. CUBBAGE: So, from a --

6 MEMBER SKILLMAN: -- no matter where
7 you put this machine --

8 MS. CUBBAGE: Yes.

9 MEMBER SKILLMAN: -- the public's
10 protected.

11 MS. CUBBAGE: From a defense-in-depth
12 perspective, I think we'd be reluctant to put all
13 of our eggs in the containment basket. Because, if
14 you have a scenario that truly leads you to a
15 severe accident, it could challenge the
16 containment.

17 So, I think --

18 MEMBER SKILLMAN: But, okay, hold on.
19 But, wouldn't you make it then a stronger
20 containment?

21 MS. CUBBAGE: I think your colleague to
22 your right could always figure out a way to fail
23 that containment.

24 MEMBER SKILLMAN: Oh, I'm sure he
25 could.

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1 (Laughter.)

2 MEMBER SKILLMAN: I mean, he's going to
3 disburse gas and blow it up and put so much C4 in
4 there --

5 MS. CUBBAGE: Right, right, right.

6 MEMBER SKILLMAN: -- it's gone.

7 But, realistically, though, what I'm
8 really saying is, if there were to be a drive to
9 get going now, is there, if you will, an
10 overarching requirement that could be establish
11 that says, no matter what, if you do this, we can
12 move ahead now, even with the risks that we're
13 concerned about?

14 MS. CUBBAGE: Well, I'll answer your
15 question in two ways.

16 One would be that the business model
17 for some of these applicants, particularly for a
18 small reactor to have such a containment structure,
19 would be potentially cost prohibitive because
20 that's an area where they're trying to simplify the
21 design and minimize costs.

22 And, then, on the other hand, I would
23 say the prototype provisions that we can get into
24 in a little more specifics, but, if you have a
25 design that has uncertainties and the first of the

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1 kind could be licensed as a prototype which would
2 mean it would come in as a regular either
3 construction permit or combined license. But,
4 there could be additional safety features such as a
5 leak-tight containment or a robust containment or
6 remote siting or additional EP that could balance
7 the uncertainties in the design.

8 So, those are kind of two ways I would
9 answer that question. But, at this point, it
10 wouldn't be for us to dictate to any applicant that
11 they should propose to put all of their eggs in the
12 containment basket.

13 If someone were to propose that, we
14 could certainly look at it.

15 MEMBER SKILLMAN: Thank you. Thanks.

16 MS. CUBBAGE: Okay. So, moving on,
17 from that structure of the vision strategy, we have
18 implementation action plans. We have divided them
19 into the near-term, what we're going to work on the
20 zero to five years, mid-term and long-term, getting
21 out into the out years.

22 You'll see a lot more specifics in the
23 zero to five. By definition, it's a little more
24 difficult to plan what we're going to be doing in
25 five to ten years until we see what we've achieved

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1 in the first five years and also what applicants
2 have come to fruition, et cetera.

3 CHAIRMAN BLEY: At the risk of putting
4 the cart before the horse here --

5 MS. CUBBAGE: Yes?

6 CHAIRMAN BLEY: -- we're now looking at
7 the Near-Term Implementation Action Plan Report?

8 MS. CUBBAGE: Yes.

9 CHAIRMAN BLEY: Okay.

10 MS. CUBBAGE: And, you should have the
11 mid and long as well.

12 CHAIRMAN BLEY: We have copies of
13 those. What's your -- and you want a letter on the
14 near-term?

15 MS. CUBBAGE: Yes.

16 CHAIRMAN BLEY: Tomorrow.

17 Is that about to be issued final or
18 what's your thoughts?

19 MS. CUBBAGE: So, what we're going to
20 do with the near-term and mid and long as a group
21 is, we're going to take your feedback, we're going
22 to take feedback from stakeholders. We've got a
23 letter just this week from NEI, or was it Friday,
24 well, anyway, in the last few days a letter came in
25 from NEI.

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1 We're going to take a look all of that
2 and then we're going to bundle it up and send it to
3 the Commission later this spring.

4 CHAIRMAN BLEY: Okay.

5 MS. CUBBAGE: So, the mid and long are
6 pretty high level. I'm going to get into those in
7 a little bit. So, I don't think you should focus
8 too much attention on that. I think the near-term
9 is really where the meat bulk of the information is
10 at this time.

11 CHAIRMAN BLEY: Okay, thanks.

12 MS. CUBBAGE: So, just to explain what
13 the IAPs are, we needed to have a way to set forth
14 what we're going to work on to get to reach our
15 goals and to help us plan our resources and develop
16 a budget and develop a workforce.

17 So, that's what the IAPs do. The non-
18 public versions have detailed resource estimates
19 for the first five years. Those are estimates.
20 When we get into execution for each year, we
21 develop detailed budget models and we figure out
22 exactly what we're going to be working on in each
23 year.

24 So, I would view the IAPs as more of a
25 guideline of the things we're going to be working

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1 on and about when we'd be working on them. But,
2 then, we inform our actual work based on the budget
3 we have in hand, the people we have in hand with
4 the right skills and then we prioritize our work
5 accordingly.

6 MEMBER REMPE: I've got a high level
7 question. I was looking at the documentation. The
8 picture you showed on slide four included the lead-
9 cooled fast reactor. But, the documents don't have
10 as much detail on the lead fast-cooled reactors.

11 MS. CUBBAGE: Right.

12 MEMBER REMPE: Is there a reason for
13 that?

14 MS. CUBBAGE: So, the near-term
15 applicants that are approaching us are not in the
16 lead-cooled arena. However, we did get some
17 feedback from the labs and from DOE that we should
18 factor that in.

19 So, I think we're going to probably
20 more broadly characterize liquid metal reactors in
21 the revision rather than being as specific just to
22 encompass that.

23 MEMBER REMPE: Thank you.

24 MS. CUBBAGE: But, we're just getting
25 that feedback and haven't had a chance to react to

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1 it in the documents yet.

2 CHAIRMAN BLEY: As you do that, are you
3 expecting things to change or is that just you
4 think everything fits under that umbrella --

5 MS. CUBBAGE: I think that would
6 already --

7 CHAIRMAN BLEY: -- from what you
8 already did?

9 MS. CUBBAGE: -- be an umbrella, but
10 I'm going to look to Steve when he gets into his
11 presentation.

12 CHAIRMAN BLEY: And, I broaden that to
13 include the design criteria.

14 MS. CUBBAGE: Well, we have the other
15 on the design criteria. So, I don't know whether
16 this would fit in the other or the sodium fast or
17 how that would play out.

18 CHAIRMAN BLEY: So, you haven't worked
19 that out yet?

20 MS. CUBBAGE: We haven't worked that
21 out yet, or at least I haven't. Jan, do you know?
22 Okay.

23 Okay, so, moving down to the near-term
24 IAPs, we put them out for public comment. We've
25 had three public meetings. We're getting some

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1 written feedback and we plan to issue them later
2 this spring.

3 They were developed independent of
4 funding availability. We wanted to get a full
5 picture of everything that would be needed to get
6 ready and then our actual resource funding levels
7 will impact the pace of execution.

8 There are six strategies, as you've
9 seen, in the near-term IAPs. We're going to focus
10 on a few of them today. I'll just give a brief
11 overview of all of them.

12 The first one, developing sufficient
13 knowledge, skills and capacity to form non-LWR
14 reviews. That's things like training. We're
15 contracted right now with Oak Ridge on a molten
16 salt reactor training class. We're going to be
17 offering that to staff this summer.

18 We're doing things like workforce
19 competency modeling, knowledge management. There's
20 decades of information out there on these designs.
21 We have a lot of it, it's in different places
22 within the agencies. We're going to try to get
23 that all into one place and organize so the staff
24 can access it better and use it as a resource and,
25 ultimately, hiring, if needed, et cetera.

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1 MEMBER SKILLMAN: Amy, for that
2 Strategy 1, you picked the molten salt reactor. To
3 what extent will the work that is done for that
4 design be applicable to the other designs?

5 MS. CUBBAGE: So, we picked the molten
6 salt training at this time because that's the area
7 where we have the least knowledge. We have good
8 familiarity with the gas-cooled reactor designs
9 going back to PBMR, NGNP, et cetera.

10 That technology's more mature. There
11 have been training courses already developed. We
12 have those recorded. We have access to those.

13 So, we felt that there was a need to
14 develop training on molten salt was a priority.
15 So, that's just why that was a near-term one.

16 MEMBER SKILLMAN: Thank you. Okay,
17 thanks.

18 MS. CUBBAGE: And, also, the Canadians
19 were working on a molten salt design and they
20 wanted to partner on development of training. So,
21 that kind of led us in that direction.

22 MEMBER SKILLMAN: Thank you.

23 MS. CUBBAGE: Okay, Strategy 2, Steve's
24 going to get into a lot more detail on that, so I
25 won't focus on that, but, other than to say that,

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1 you know, we've been focusing on the title as
2 computer codes and tools. But, it also is broader
3 than that.

4 There's some materials research aspects
5 in that area.

6 Strategy 3, Bill is going to get into
7 that a lot more.

8 You've also been hearing about things
9 like the ARDCs in the recent meeting. That's part
10 of Strategy 3.

11 Strategy 4 is industry consensus codes
12 and standards needed to support non-LWRs. We are
13 in a role of we participate in standards
14 committees. We ultimately endorse by Reg Guide or
15 rule if there's a standard that develops to that
16 point and is going to be broadly applicable.

17 But, at this point, we're looking to
18 industry, DOE, NEI, the individual working groups,
19 molten salt, gas reactor, et cetera, to identify
20 what codes and standards are needed and to get
21 started on that development. It's a long lead
22 area.

23 And, then, we will monitor that and we
24 will participate in code committees as appropriate.

25 One specific area we're spending on

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1 some significant time on right now is the ASME
2 Section III, Division 5 standard for high
3 temperature materials.

4 We have people that are on that code
5 committee and so we're actively involved with that.

6 MEMBER CORRADINI: So, if I might?

7 MS. CUBBAGE: Please.

8 MEMBER CORRADINI: I'm sorry, but I'm
9 still back with Strategy 1.

10 MS. CUBBAGE: Okay.

11 MEMBER CORRADINI: You're very
12 efficient.

13 MS. CUBBAGE: Go ahead.

14 MEMBER CORRADINI: So, you asked --
15 Dick asked the question, I guess he's thinking as
16 I, about why MSR. And, your answer was it's
17 different enough that there's some need.

18 Does the staff already have appropriate
19 skill sets for the other two or is the staff
20 training other new or younger staff about sodium
21 fast and gas?

22 MS. CUBBAGE: I would say at this
23 moment, we do not have a full complement of people
24 that are trained, but we have existing training
25 available on gas reactors.

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1 MEMBER CORRADINI: So, subject matter
2 experts or the actual training guides? That's what
3 I was trying to ask.

4 MS. CUBBAGE: We have some staff that
5 are --

6 MEMBER CORRADINI: Okay.

7 MS. CUBBAGE: -- familiar.

8 MEMBER CORRADINI: Okay.

9 MS. CUBBAGE: And, then we also have
10 training courses that have already been developed.

11 MEMBER CORRADINI: Okay.

12 MS. CUBBAGE: So, we don't need to go
13 off and develop training course. They are ready on
14 the shelf.

15 MEMBER CORRADINI: Okay. And, maybe
16 it's somewhere, and I should have asked this
17 earlier, but I didn't see where -- are all of these
18 being done in parallel at the same -- is the
19 expectation that all of these would be done in
20 parallel at the same rate or does something take
21 precedent over something else?

22 For example, to me, Strategy 3 seems to
23 loom over everything else relative, and 5, relative
24 to policy issues and what our Chairman mentioned in
25 terms of licensing basis events.

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1 And, before I start training and
2 planning and writing computer programs --

3 MS. CUBBAGE: Right.

4 MEMBER CORRADINI: -- I might want to
5 see, you know. So, is there a prioritization on
6 how these fit?

7 MS. CUBBAGE: There's a definite
8 prioritization within the individual strategies --

9 MEMBER CORRADINI: Now, that I saw.

10 MS. CUBBAGE: -- of what to work on.
11 We are working on some things across the board,
12 every strategy. But, I totally appreciate what
13 you're saying and that we're heavily weighting
14 Strategies 3 and 5 early on. But, you know,
15 Strategy 4, we, you know, we need to participate in
16 ASME if the code committee now, now is the time to
17 participate.

18 As Steve's going to get into on the
19 computer codes, the first year here, we're more
20 exploring what's out there.

21 MEMBER CORRADINI: Okay.

22 MS. CUBBAGE: You know?

23 MEMBER REMPE: So, I think we got you
24 off topic. Though, on that same line, when I was
25 looking at the non-public Volume 2, I lost track,

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1 but it sure seemed like, and again, I know our main
2 bailiwick is safety, but Member Powers often tells
3 us that if we waste a lot of money on some things,
4 safety could be adversely affected. But, it sure
5 looked like Strategy 2 was the most expensive
6 strategy.

7 MS. CUBBAGE: Right.

8 MEMBER REMPE: And, it was starting
9 early on. And, is that correct? I mean, maybe
10 even an order of magnitude more than some of these
11 other strategies, is that --

12 MS. CUBBAGE: There's definitely a --
13 Strategy 2 is expensive work.

14 MEMBER REMPE: You bet.

15 MS. CUBBAGE: Yes. So, it's the nature
16 of the work, not necessarily that we're giving it
17 higher priority.

18 So, we can get a lot accomplished in
19 Strategy 3 and 5 within the house, project
20 management, resources.

21 Strategy 2, if you get into developing
22 new codes, I mean, that's expensive work. So,
23 that's --

24 MEMBER REMPE: And, I'm mindful that we
25 spent -- the NRC spent resources to modify MELCOR

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1 for a gas reactor that -- models that may not be
2 used for quite a while here. You know, depending
3 on what comes in first.

4 And, so, I just, I mean, I was looking
5 at this, I'm going, man, it's a lot of money when
6 we aren't sure what, if anything's, coming in.

7 MS. CUBBAGE: Yes, so do you want to
8 wait until you get to your presentation? But, he's
9 going to get into it, you know, but we're going to
10 --

11 MR. BAJOREK: Since the question was
12 asked, yes, Strategy 2 is one of the areas where
13 you tend to be less generic.

14 I mean, a molten salt is so much
15 different than a sodium fast which is so much
16 different than a gas-cooled reactor. The codes,
17 the analysis, the needs for each of those are
18 almost individual where most of the other
19 strategies can look at things in a more generic
20 basis.

21 And, because of that, that drives up
22 the costs in Strategy 2.

23 MEMBER REMPE: Yes, everything's times
24 three.

25 MR. BAJOREK: We would hope that,

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1 eventually, as the number of applicants define
2 themselves better and we know which design type has
3 the priority, we'll be able to refine that better.

4 But, right now, when we're being asked
5 to look at all, I think somebody said there's 52
6 types of designs out there, it's very difficult for
7 us to hone in on one or the other. And, as a
8 result, our costs are a bit higher.

9 MEMBER REMPE: We'll talk about this
10 more, but when I was looking at it, I was
11 wondering, jeepers, can't you just use their codes
12 until they really come in with something and then
13 let them pay to do your independent code
14 development? But, that's just, when I was looking
15 at this, I was going, that's a lot of money for
16 something that --

17 MR. BAJOREK: We have a -- we'll be
18 getting to that.

19 MS. CUBBAGE: Yes, we'll get into that.
20 I mean, we want to leverage existing codes to the
21 maximum extent possible.

22 CHAIRMAN BLEY: I'd also caution, I
23 mean, it's easy to see where all the detail has
24 been laid out in Strategy 2 and all of the
25 different technical areas.

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1 Strategy 3 is going to take a lot of
2 work to get that right. And, more -- it isn't as
3 easy to see the depth of how much work is there to
4 get that right. I mean, it could be a lot harder
5 than we think.

6 MEMBER CORRADINI: I'm waiting -- I
7 expect that Dennis has this, but, I guess my point
8 is, I'm kind of with Dennis is that, although on
9 paper, 3 looks easier, when we went through NGNP,
10 this is where we hit a roadblock as to what is a
11 licensing basis event? Which ones fit into a
12 design basis? Which fit outside of the design
13 basis? What is the likelihood of frequency? What
14 is the measure of dose? And, those sort of things.

15 And, then, Strategy 5 relative to --
16 from a policy standpoint, what is a containment
17 functional performance criteria? What are the
18 source terms that one has to --

19 I mean, to me, they look easy, but
20 they're hard. Whereas, in 2, I might get along
21 with, excuse my English, hand calculations of
22 things that are 25 years old until I really see I
23 need something.

24 MS. CUBBAGE: Right, right. And, I
25 didn't mean to imply that any of the strategies are

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1 easy. But, just that, you know, you end up with a
2 lot of contract costs if we end up having to
3 develop codes and that's why the --

4 And, then, Steve said, you know, you
5 kind of got to do it for each technology, so it
6 ends up at least tripling. But, he could take more
7 questions on that later.

8 Strategy 4, another thing I wanted to
9 mention is there's a non-LWR PRA standard that
10 we're looking at. And, there are also ANS
11 standards.

12 Strategy 5, policy issues, I'm going to
13 get into later.

14 And, then, lastly, Strategy 6 has our
15 communication strategy.

16 Okay, so this slide has some examples
17 of the ongoing work. Some of these I've already
18 mentioned.

19 We are making significant progress in a
20 lot of these areas. We're going to get into more
21 detail on several of these later. If there are any
22 that catch your eye, I can take questions on them.

23 I think I've mentioned many of these
24 things already.

25 MEMBER KIRCHNER: There is one, Amy,

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1 that I'd like to ask. It's probably a combination
2 of number three and five.

3 And, that is, how high are you going to
4 set the bar coming in? There's been a lot of talk
5 of reviewing conceptual designs. At what quality
6 level, I'm assuming Appendix B, would be behind the
7 designs that you're reviewing?

8 So, we heard a lot about at our last
9 Subcommittee meeting about design criteria. There
10 wasn't much mentioned of quality in the design.
11 So, what is your thinking now in terms of, quote,
12 unquote, a flexible review process and a quality of
13 what you're going to review?

14 MS. CUBBAGE: So, Appendix B would
15 apply to designs that ultimately are going to be
16 licensed. I don't know if Bill, if you want to say
17 any more about that with relative to the conceptual
18 design?

19 MR. RECKLEY: What we'll see or what we
20 expect to see is a gradual approach. So, when
21 you're doing the pre-application work, they won't -
22 - they may not even have an Appendix B program at
23 that point. But, they still may have questions in
24 terms of what their regulatory approach for that
25 design may be.

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1 So, at that point, we'll be giving
2 preliminary feedback. As they move closer to
3 actually making an application then things like
4 Appendix B would kick in.

5 But, what we'll talk about later is one
6 of the things that is different this time, at least
7 from my perspective, is an emphasis on us engaging
8 early in the process and kind of parallel to the
9 business model and the funding stream such that
10 things are moving along together.

11 They may have, for example, a
12 particular designer may have a question that, I'll
13 just pick an example, would this kind of an
14 approach to reactivity control work? Because we're
15 still in the conceptual design phase but that might
16 be critical to deciding ultimately how much the
17 machine is going to cost.

18 And, so, they want an early indication
19 as to whether this approach would pass regulatory
20 muster and we are trying to, under this flexible
21 and staged approach, set up so that we can answer
22 that question even though the applicant may be, at
23 that point, one of these firms with a dozen people.

24 And, as they get those answers
25 questioned, they're able to progress on the design

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1 and, ultimately, they'll come in later with an
2 actual application.

3 So, when we talk about staged or -- and
4 a conceptual design, that's one aspect that's a
5 little different that we're not dealing with the
6 big companies this time and we're going to be doing
7 things in parallel with their funding stream.

8 MEMBER CORRADINI: So, can I say, back
9 to -- this is the one that I didn't understand.
10 So, you call it conceptual design approval or
11 conceptual design review, is that -- what --

12 There are figures out there that
13 ascribes to the process. I'm trying to understand
14 what you just described, what is it?

15 MR. RECKLEY: I would call it an
16 assessment. We're trying to get away from a word
17 of approval because that's used later, for example,
18 under standard design approval as a formal
19 regulatory decision.

20 What we would be giving in that
21 particular instance is feedback that may be just
22 the staff saying, hey, just based on what you said,
23 we think it'll be okay.

24 The applicant may submit something like
25 a topical report, which, again, that'll give a more

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1 formal answer. It could include a CRS. You have
2 the option of weighing in on the topical.

3 MEMBER CORRADINI: Thank you.

4 MR. RECKLEY: If they're doing a
5 topical, that would -- that may very well bring in
6 then Appendix B.

7 So, all of those things we can handle,
8 but each interaction would determine how we
9 approach it and how much it'll cost the designer
10 for that regulatory feedback.

11 (Simultaneous speaking.)

12 MEMBER KIRCHNER: I had a follow up.
13 Then, Steve, where I'm going with this,
14 rhetorically, there are 58 people out there doing
15 different designs or whatever.

16 As you think through your flexible
17 review process, what bar would there be of entry?
18 I mean, are you just going to review all 58 or and
19 disburse your resources accordingly? Or in reality
20 you're not going to get 58 submittals.

21 MR. RECKLEY: Well, and a lot of those
22 58 are just -- I shouldn't say just -- but they're
23 --

24 MR. KIRCHNER: I shouldn't say just,
25 but they're, of course --

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1 MR. RECKLEY: Right, and the small
2 companies, some of them are university programs
3 that I'm sure they would ever come to us through
4 that design.

5 Go back to the -- go back to reality,
6 we charge \$250 an hour, so that becomes an actual
7 real discriminator.

8 MS. REMPE: But, we often --

9 CHAIRMAN BLEY: I had a couple of
10 questions. Oh, I'm sorry, go ahead, Joy.

11 MEMBER REMPE: We often hear about the
12 Canadians and their vendor design review, right?
13 And, if we look at the view graphs they presented
14 at some meeting back in Oak Ridge, I think last
15 fall, they focus on the vendor's integrated
16 management system processes used to develop a high
17 quality design configuration.

18 And, the outcome of their review
19 reflects the quality of this vendor design process.

20 And, are you -- have you talked to
21 them? It sounds to me like they have bar for the
22 quality of the design that's being developed.

23 And, the reason why I'm talking about
24 this is, have you seen an article that was in
25 Technology Review about the Transatomic design and

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1 some major --

2 MR. RECKLEY: Yes.

3 MEMBER REMPE: -- errors in their
4 calculations. And, so, that's why I'm --

5 MR. RECKLEY: Yes, yes and yes. We've
6 talked to the Canadians. We're well aware of that
7 article.

8 MS. CUBBAGE: Yes, so keep in mind,
9 what we're talking about is a flexible approach
10 where if you want feedback based on the information
11 you give us, this is what you get. If you want an
12 approval, then there's clear requirements.

13 You know, so, it's a graded approach,
14 the feedback you want, the information you provide
15 us. You also have to keep in mind, the Canadian
16 approach doesn't have a Part 52-like approach. So,
17 they don't get an approval -- they don't get a
18 design certification.

19 So, if they want a level of certainty
20 before they go into a licensing application, their
21 product is a different type of product than what
22 Bill's talking about here.

23 MEMBER KIRCHNER: Amy, then you bring
24 up an interesting consideration then. I can see
25 how an applicant would want an NRC certification

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1 for all kinds of good business reasons.

2 But the 52 process, if you really look
3 at it, was for evolutionary reactors, not for out
4 of the box, one of a kind first off prototypes.

5 And, I don't want to compare the
6 Canadian approach, but, basically, it's 10 CFR 50
7 after you go through this first hoop.

8 So, what is your thinking here? I
9 mean, for a one of a kind design that's not even
10 then built, 52 is a big reach. I mean, they could
11 go for it.

12 MS. CUBBAGE: They could do 50 or 52.
13 But, I think what Bill was trying to say is that,
14 you know, you could come in with topical reports,
15 you could -- you know, it depends what they come in
16 with and then the quality would have to match.

17 MEMBER KIRCHNER: But, would it help
18 you and also help the industry to have some
19 expectation for that conceptual design review or
20 whatever you're thinking is, or are you thinking
21 you'll just take topical reports?

22 MR. RECKLEY: Well, I'm going to talk
23 about it later this morning.

24 MEMBER KIRCHNER: Okay, all right.
25 I'll wait.

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1 MS. CUBBAGE: But, I think my overall
2 philosophy is that we have a range of vendors with
3 a range of financing, with a range of business
4 plans, with a range of feedback they need at
5 different stages. So, the flexibility, I think, is
6 helpful to this community. But, you know, if
7 there's an overriding desire for one-size-all
8 approach, we can do that, too.

9 MR. RECKLEY: And, one of the things
10 I'll mention now and then we'll get into more
11 detail later is, we're asking each of the designers
12 to develop and work with us on a licensing project
13 plan that is for them.

14 So, we're not sitting here looking at
15 multiple designers and not knowing what's coming in
16 the door from whom. We will have licensing project
17 plans for the designers and those will say, that
18 designer's planning to come in with a topical
19 report. That one just wants meetings to get
20 feedback. This other one may want something else.
21 So, we'll know what's coming in and we can plan
22 accordingly.

23 MEMBER CORRADINI: Where was that?
24 That sounds very reasonable and rational. Where is
25 that in the IAP? Did I miss that?

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1 MR. RECKLEY: I'll get to it. It's
2 under Strategy 3, Item --

3 MEMBER CORRADINI: Okay, fine.

4 MR. RECKLEY: -- in one of the
5 contributing activities.

6 MS. CUBBAGE: In the draft licensing
7 roadmap.

8 MEMBER CORRADINI: Okay.

9 CHAIRMAN BLEY: Two things I want to do
10 at this point, Dr. Margaret Chu joined the
11 Committee a little while ago. I want to have that
12 on the record that she's here.

13 One thing that's confused me a bit, and
14 Bill's statement might take care of, but throughout
15 the document, you talk about conceptual design and
16 different stages. I'm pretty familiar with what
17 DOE does with their conceptual design, preliminary
18 design and so on. I've seen what the Army does.
19 I've seen other organizations.

20 You don't really define what you mean
21 by those terms anywhere. So, it seems to me you
22 ought to.

23 MS. CUBBAGE: Well, there's preliminary
24 design information that would be the level to
25 support a construction permit. And, then, final

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1 design information level to support a combined
2 license or a design certification or an OL.

3 And, then, conceptual design
4 information, it could run the gamut.

5 CHAIRMAN BLEY: So, you think of three
6 levels of design?

7 MR. RECKLEY: Actually, when you look
8 at the roadmap, what we're proposing to use is the
9 DOE's critical decision model.

10 CHAIRMAN BLEY: Okay. But, then, I
11 hope you use their definitions or your own but so
12 that it's clear.

13 MR. RECKLEY: Right.

14 CHAIRMAN BLEY: Because that makes
15 sense, but I didn't read that as I read through it.

16 MS. CUBBAGE: Well, I just wanted to be
17 clear that the preliminary word as a regulatory
18 implication relative to a construction permit.

19 CHAIRMAN BLEY: Okay, but does it say
20 that in the document somewhere?

21 MR. RECKLEY: We try to align them.
22 They don't work perfectly because we have words in
23 our regulations and the DOE orders are using
24 similar words for slightly different purposes.

25 But, in general, they align pretty

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1 well. I mean, you're basically talking --

2 CHAIRMAN BLEY: As long as you're
3 individually with each one laying out a plan, that
4 makes sense. But, if I come in and read this and
5 decide I know what this stuff means, I might get
6 really surprised.

7 MR. RECKLEY: Right.

8 CHAIRMAN BLEY: That's all I'm saying.

9 MS. CUBBAGE: Okay. Mid-term, I forget
10 where I am.

11 Okay, mid-term, generally, I know
12 you've just recently received it, but if you've had
13 a chance to look at it, the strategies in the mid-
14 term follow similar to the strategies in the near-
15 term. They're a continuation in some cases of
16 work.

17 They're an evolution in some cases, for
18 example, the policy issues start to shift towards
19 technology specific in the mid-term rather than the
20 near-term which is technology inclusive.

21 We're shifting in some areas to
22 developing guidance to starting to put it out in
23 Reg Guides, into rulemakings if we need to.

24 The main shift in the mid-term is where
25 you see Strategy 3 where we're looking at branching

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1 beyond the existing regulatory framework and
2 developing a new one if needed. So, we'd be
3 starting that effort in the near-term and then,
4 that follows into the --

5 MEMBER POWERS: Amy, let me ask you a
6 question --

7 MS. CUBBAGE: -- in the mid-term. I'm
8 sorry.

9 MEMBER POWERS: The framework that, you
10 know, a lot of gets presented to us for these
11 advance design persists and anguishing over the
12 design basis accidents.

13 And, in my exploration of that, I have
14 come to my own personal conclusion that the design
15 basis concept was really introduced to make life
16 easy for designers. But it really, that in Agency
17 that professes to limit the risk to the public
18 health and safety that design basis accidents don't
19 really help at all, that most of the risk is
20 associated with accidents that go beyond the design
21 basis.

22 Is it, in thinking about a new
23 regulatory strategy for these new designs, is
24 consideration being given to the idea that the
25 Agency should abandon the idea of design basis

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1 accidents and focus, instead, on the limitations of
2 the risk?

3 MS. CUBBAGE: Let me think about that.

4 MR. RECKLEY: I mean, we have thought
5 about that kind of an approach when we've been
6 working with stakeholders, even back to NGNP and
7 earlier. That was not the approach that the
8 stakeholders chose.

9 And so --

10 MEMBER POWERS: I couldn't -- I have no
11 control over stakeholders, well, any more than you
12 do.

13 MR. RECKLEY: But, as we develop the
14 approach, we're not working in isolation, we're
15 working with the designers through NEI, DOE in the
16 case of NGNP to construct this.

17 The logic in keeping a lot of that old
18 structure was because the programs like Appendix B
19 and working with the vendors and safety
20 classification of equipment broader, was all set
21 out so you could build on that infrastructure.
22 That was part of the logic, right or wrong.

23 MEMBER POWERS: You're talking about
24 the past.

25 MR. RECKLEY: Right.

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1 MEMBER POWERS: And, I'm explicitly
2 addressing the future.

3 MR. RECKLEY: Right.

4 MEMBER POWERS: It seems to me that
5 that is a variety of baggage that is not helping
6 the progression of the regulatory structure to
7 attack designs that deviate markedly from what
8 you've licensed for the last 40 years.

9 MR. RECKLEY: And, I'll agree with you
10 to some degree. It's baggage and, to some degree,
11 it helps because it's existing infrastructure. So,
12 there is good and bad in doing that.

13 We'll look at the designers to
14 basically ask us if we would entertain something.
15 But, we don't see ourselves, at this point, in the
16 plans developing something for ourselves.

17 MEMBER POWERS: I don't object at all
18 to the designers using a design basis accident.
19 They can use anything they want to. At nowhere
20 that I can find in the Atomic Energy Act does it
21 say thou shalt have a design basis accident.
22 Instead, it says, thou shalt provide adequate
23 protection of the public health and safety.

24 And, we know now that design basis
25 accidents don't always help in finding what the

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1 threat to the public health and safety is. I think
2 assuredly TMI demonstrated that for us pretty
3 clearly.

4 And, we have an alternative mechanism
5 now and an alternative policy that seems to lay out
6 a pathway to assess these things. Let the designer
7 do a design basis accident and then assess the risk
8 to his design as his plan of health and safety.

9 MR. RECKLEY: And, most of the
10 approaches that we're seeing in the NGNP and the
11 most recent does actually look at a combination of
12 those. They continue to use design basis accidents
13 for certain purposes, but they do go broader and
14 use PRAs to look and incorporate into the licensing
15 basis not only the design basis accident, but a
16 broader set of licensing basis events. And, we'll
17 talk about that a little later in the morning.

18 MEMBER CORRADINI: So, I guess Dennis
19 reminded me what you just said, I forgot. But, to
20 get to Dana's point, well maybe staff did, but we
21 never saw the end game of closing a loop on that
22 activity.

23 Because it seems to me the HTG, the
24 NGNP, whatever it is, activity was a path forward
25 that looked like a successful path forward. But,

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1 would that not be an appropriate starting point for
2 all of this in the mid-term so that --

3 Because it is a different approach,
4 more of a composite approach.

5 MR. RECKLEY: Right.

6 MEMBER CORRADINI: And, would -- and
7 considers things, what one might say, beyond design
8 basis.

9 MR. RECKLEY: And, then, I think what
10 you'll see both from me later in the morning and
11 then also from the industry discussions is that is
12 actually what's happening is we're picking up where
13 NGNP left off.

14 MS. CUBBAGE: And, to be clear, we're
15 doing that in the near-term and it would be
16 implemented in the near-term under the existing
17 regulations. Then, this activity in the mid and
18 long is looking at, do you need a new part in the
19 regulations, which remains to be seen.

20 MEMBER CORRADINI: Okay, okay. But,
21 the only reason I bring this one up, since Dennis
22 reminded, is the ACRS letter of some year, I can't
23 remember, asked the question that seems the loop
24 needs to be closed and here's specifically how to
25 close the loop. And, it seems that's where I might

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1 pick up just to be efficient.

2 MS. CUBBAGE: Yes, yes.

3 MEMBER CORRADINI: Okay.

4 MS. CUBBAGE: The other thing I wanted
5 to point out on the mid-terms is that that's where
6 we're starting to work on fuel cycle issues. But,
7 we've been getting stakeholder feedback from NEI
8 and NIC and others that they want us to look at
9 fuel cycle issues sooner rather than later. So,
10 we're engaging with them.

11 At this point, we don't see any
12 particular impediments in the regulatory structure
13 to licensing enrichment facilities, fuel
14 fabrication facilities or transportation containers
15 to greater than five percent enrichment.

16 Some of the vendors are looking at
17 getting up right at the threshold of just below 20
18 percent. And, so, we're going to look at that to
19 make sure that there's no regulatory infrastructure
20 that needs to be put in place to support that long
21 lead effort.

22 And, then, for the long-term, the only
23 item that remains at that point is conducting
24 rulemaking to put in place a new part in the
25 regulations for a framework, if needed.

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1 Okay, so, Strategy 6 is our
2 communications and outreach. I just wanted to
3 highlight a few examples.

4 We're going to have our third DOE/NRC
5 sponsored advanced reactor workshop next month,
6 April 25th, 26th at the Marriott across the street.

7 We're holding stakeholder meetings
8 about every six weeks. Our next meeting's March
9 22nd.

10 We're working on a series of topics at
11 those meetings including licensing basis event
12 selection.

13 We have an MOU with DOE on the GAIN
14 initiative, gateway for accelerated innovation in
15 nuclear. That's primarily a DOE program, but under
16 that MOU, if there are regulatory questions, we
17 would provide information to DOE that then they
18 could share with potential applicants.

19 And, then, internationally, we're
20 actively involved with international groups. I
21 chair the group on the safety of advanced reactors
22 or GSAR, that's under the auspices of NEA.

23 And, I am going to be attending the
24 GIF policy group meeting in Paris next month, so
25 we're plugged in on what's going on there.

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1 And, we had a question earlier about
2 pre-application activities.

3 What I can share with you is that we
4 have started pre-application interactions with
5 Oklo. We've had two meetings. We're going to be
6 doing more interactions with them this fiscal year.

7 Terrestrial Energy has a publically
8 available response to our RIS, Regulatory Issue
9 Summary.

10 CHAIRMAN BLEY: Amy?

11 MS. CUBBAGE: Yes?

12 CHAIRMAN BLEY: Oklo doesn't click with
13 me. Who is that?

14 MS. CUBBAGE: Oklo is a small sodium
15 fast reactor in the single digit megawatts.
16 They're a small company and they're working with us
17 on their design.

18 CHAIRMAN BLEY: Okay.

19 MS. CUBBAGE: They don't have a lot of
20 information on the Internet, but they're working on
21 that design.

22 Terrestrial Energy, they submitted a
23 RIS response to us. A RIS is a Regulatory Issue
24 Summary where we go out and we ask anybody who's
25 interesting in engaging with the NRC or plans to

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1 submit an application to tell us and then we can
2 plan and budget for their application.

3 Terrestrial did come in with a RIS
4 response saying they want to submit either a design
5 cert or a CP in 2019 for their 400 megawatt
6 integral molten salt reactor. So, we'll be
7 starting pre-applications with them soon to get
8 ready for that.

9 MEMBER POWERS: Amy, let me ask you a
10 question about these communication efforts where
11 you're trying to figure out what to do with
12 something you've never done before.

13 MS. CUBBAGE: Right.

14 MEMBER POWERS: And, you have commented
15 a couple of times, we send these things out and
16 anybody that wants to make a comment is free to
17 make a comment.

18 Yet, all of your meetings and
19 communications seem to be within a fairly closed
20 community, applicants, DOE, things like that.

21 Why is it that the NRC studiously
22 avoids presenting this kind of material at a broad
23 forum such as the American Nuclear Society, the
24 Health Physics Society, the ASME, consistently
25 refuses to do that, why is that?

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1 MS. CUBBAGE: I wouldn't know that it
2 was -- we refuse but we --

3 MEMBER POWERS: We don't --

4 MS. CUBBAGE: -- do. So, we're going
5 out to a lot of conferences. We're presenting this
6 type of information to conferences.

7 We had, for example, we had a number of
8 the standards committees in for a standards forum
9 back in September and I presented information on
10 what we're doing and we were encouraging the
11 standards groups to get engaged.

12 We have people who are on working
13 groups of the various standards committees.

14 Are you more focused on the standards
15 committees or just more globally?

16 MEMBER POWERS: With all due deference
17 to many of my colleagues who have a faith and
18 standards that I don't share, I think standards are
19 about the most boring place and the repository of
20 people with straightjacketed thinking, by
21 definition.

22 I think you need to be out soliciting
23 to people who think about things that you haven't
24 thought about.

25 MS. CUBBAGE: That's why we're here.

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1 MEMBER POWERS: And, I think you don't.
2 I think you religiously avoid going to people who
3 might raise a question.

4 MR. BAJOREK: Amy, part of the problem,
5 too, with going to the conferences is you're going
6 to have to present some of the design information.
7 And, much of this, we have to hold proprietary.
8 And, I don't even think the list you gave there is
9 really the complete responses because --

10 MS. CUBBAGE: It's not because that's -
11 -

12 MR. BAJOREK: -- because we've had to -
13 -

14 MEMBER POWERS: I am sure, Steve, that
15 you can find an excuse not to go where anything
16 that I might raise.

17 MEMBER CORRADINI: Dr. Powers is being
18 controversial, but I do think his point is that you
19 want to -- if you're doing communication plan,
20 communicating with the usual suspects is not
21 communication. That's what I think he just said.

22 MS. CUBBAGE: Right. So --

23 MEMBER CORRADINI: So, you've got to --

24 MS. CUBBAGE: The sort of documents we
25 put out, you know, if they're going out more

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1 formal, we do the Federal Register. I don't know
2 who reads the Federal Register, but that's what we
3 do.

4 MEMBER CORRADINI: I mean, just -- but
5 I --

6 MS. CUBBAGE: And, then, we have a gov
7 delivery system where I've sent out all these
8 documents to about 1,500 different stakeholders.

9 MEMBER POWERS: You can't even get me
10 to look at those things. How are you going to
11 motivate somebody who is marginally associated with
12 this but may have good ideas on physics.

13 One of your problems, and it'll come up
14 in spades when Steve talks, is that people are
15 designing computer codes with an incomplete
16 knowledge of the physics that's present in these
17 things.

18 And, so, when you -- when he has to go
19 through and say, gee, I need to look and see if
20 this code is adequate for the regulatory process.
21 He has to ask, is it on firm technical foundation.

22 Well, Steve is a brilliant guy and I
23 hang on everything he says. But, I bet you Steve
24 is perfectly willing to admit that he doesn't know
25 everything. He may know 99 percent of it, but that

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1 1 percent might be crucial and the way to find that
2 out is to put more eyeballs on the problem.

3 And, the learned societies provide you
4 millions of dollars of free consulting.

5 MEMBER KIRCHNER: If I may follow on to
6 Dr. Powers, it does beg a question, I mean, in the
7 final analysis, you license reactors in the court
8 of public opinion. That's not accurate, but
9 something like that.

10 So, I think Dana's point is a very good
11 one, having looked at a lot of black box reactor
12 designs on paper that everything's proprietary so
13 there's really no insight into what physics are
14 being used, et cetera, et cetera.

15 And, that's gone on for a long time
16 with a lot of these, let me call them, paper
17 reactor designs. But now you have some serious
18 contenders.

19 At what point and how much of the
20 design is then available for public review and, as
21 Dana points out, that broader opinion from the
22 societies, whether it's ASME or ANS and others, is
23 that a very useful way to have the designs also
24 reviewed in a more public matter.

25 So, if you had, for example, a

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1 conceptual design that you reviewed, at what point
2 is that available for the concerned public to also
3 participate in the review and to what detail will
4 they have access to the design?

5 MS. CUBBAGE: So, proprietary
6 information, in general, would be withheld from the
7 public, but there are mechanism where interested
8 stakeholders can get access and have nondisclosure
9 agreements and then that gets put in place for
10 things like security or when someone has a
11 particular basis to question an aspect of the
12 design, they can be granted access.

13 MEMBER KIRCHNER: But, then --

14 MS. CUBBAGE: But, I would expect that
15 would be at the licensing stage.

16 MEMBER KIRCHNER: Would that include,
17 say, the broader, I'll use the term which is
18 pejorative, but I don't think it that way,
19 intervener community.

20 MS. CUBBAGE: Yes, yes. Yes, and there
21 are members of the intervener community who have
22 gotten access to information to support their look
23 at a design.

24 MR. RECKLEY: But, that's in a general
25 sense. The further you progress, and then

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1 definitely when you enter into the area of getting
2 formal regulatory reviews, then the requirement is
3 that enough information is made available to the
4 public for them to participate.

5 MS. CUBBAGE: Right, right.

6 MR. RECKLEY: In the very early stages,
7 I think you can imagine that there would be less
8 and the companies may actually be more sensitive
9 and claim proprietary business interest.

10 MS. CUBBAGE: Right.

11 MR. SEGALA: I mean, just looking at
12 NuScale, the amount of information over the years
13 that's been publically available until now when
14 they've issued us their application and it's the
15 whole FSAR is publically available, the level of
16 information to the public has increased over time.

17 MEMBER REMPE: So, before you leave
18 this slide, as I recall, and maybe I'm mis-
19 remembering, one pre-application is a freebie from
20 the NRC and then they need to pay, is that true?

21 MS. CUBBAGE: We have one kickoff
22 meeting that's for planning and then thereafter
23 everything is billed.

24 MEMBER REMPE: Okay, so probably both
25 of the meetings, like for example, Oklo, they had

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1 to pay because they'd already done their kickoff
2 meeting earlier or they only paid for the --

3 MS. CUBBAGE: November was their
4 kickoff meeting.

5 MEMBER REMPE: And, then the second one
6 they paid? And, then something like NuScale, they
7 had hundreds of meetings all before they ever got
8 to their application. So, they're just looking at
9 the tip of the iceberg here, basically, right?

10 MS. CUBBAGE: Tip of the iceberg,
11 absolutely.

12 We've developed a core review team
13 approach such that we have a small group of people
14 across disciplines that are going to all of these
15 meetings. We're trying to do this to maintain an
16 efficient use of our resources. We don't need a
17 hundred people coming to every meeting because
18 they're interested.

19 Also, supports us having more
20 consistent, you know, from meeting to meeting. It
21 doesn't -- you don't have to, oh, well, what is
22 Oklo? Well, these people have been in every
23 meeting so they already have that base foundation.

24 They pull in additional people, if
25 needed, in specific technical areas, but we're

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1 trying to keep to that core team approach.

2 And, I think I can turn it over to
3 Steve.

4 MR. BAJOREK: Okay, thank you very
5 much.

6 Good morning, everyone. My name is
7 Steve Bajorek from the Office of Research.

8 And, what I'd like to do is to focus on
9 what we're calling Strategy 2. It's labeled
10 computer codes, computer codes and tools, but
11 really goes far beyond that. It's the idea is that
12 Strategy 2 should lay the foundation, not only for
13 our independent confirmatory analysis, but
14 developing the database, the analytical capability
15 to help the Agency in a very wide variety of areas.

16 In addition to looking at the codes
17 over the near-term, one of the things that we're
18 paying particular attention to are, what are going
19 to be the experimental needs over the next several
20 years?

21 Now, in many cases, the tests, the
22 development of the test facilities and the data for
23 things won't occur until the mid-term. It takes
24 time for those things to be rooted out and to
25 identify exactly what that is.

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1 It also gets to be a very expensive
2 part of a program. Our vision is that the
3 applicant will be providing much of that
4 information. There will be areas, however, in
5 which the staff will have to participate, use some
6 of those facilities, develop data in order to
7 develop some of our regulatory decisions.

8 In particular, where we're going to
9 need to develop a rule, regulatory guidance, things
10 which are really beyond what the applicant needs to
11 do to develop his design, but are supportive of
12 these Strategies 3 and 5. Those are things which
13 are still yet to be determined.

14 So, Strategy 2 goes well beyond just
15 selecting a set of tools.

16 MEMBER POWERS: Steve, let's talk about
17 the first point on your previous slide.

18 When we look at an SER on something, we
19 find there are two categories of review that we
20 encounter.

21 One is an examination of what the
22 licensee has said and say, yea, verily the -- by
23 the time it comes to us, yea, verily, what the
24 licensee has said is true and valid.

25 The other category which is less

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1 calming is the licensee has submitted an
2 assessment. The staff said thank you very much,
3 set that aside and did their own assessment.

4 And, so, and then, compare the two and
5 say, yea, verily again, by the time it comes to
6 yea, verily, the staff -- the applicant has either
7 been confirmed or shown to be conservative in its
8 assessment.

9 Did those -- the selection between
10 those two types has become more a matter of
11 precedent than anything else. In looking at this,
12 on your first bullet there, are you reexamining
13 that or are you saying no, we will continue to do
14 in the true independent confirmation on the
15 analyses as opposed to we're doing what the
16 licensee did much as we've done before.

17 Or we'll go back and reassess and find
18 a new criteria to decide between those,
19 understanding full well, it is unlikely that you
20 will go through and do an independent FSAR in its
21 entirety, that there's always going to be something
22 in one of the two categories.

23 MR. SEGALA: Let me add something here.
24 I'll talk -- you can talk more specific, but, in
25 general, with the NuScale application that's in

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1 house right now, there's been a lot of looking at
2 it as a follow up to KHMP.

3 What independent analyses should we be
4 doing and when should we be doing them?

5 So, we've developed an internal, it's
6 like a best practices brochure to try to focus the
7 staff on just because the SRP says for a particular
8 section, go off and do an independent analysis, do
9 you really need it in this case? Look at things
10 like margin and whatnot.

11 So, there is an activity undergoing
12 with NuScale where we're trying to rethink where do
13 we really need to be doing confirmatory analysis?

14 MR. BAJOREK: Now, first, it's a really
15 good question because nowhere is it very clear for
16 the staff to what extent you must do those
17 confirmatory calculations.

18 We have the stuff in the standard
19 review plan, but there's sort of a limit.

20 As we look at conventional reactors
21 which are going through some changes, an upgrade or
22 whatnot, we really don't need to do all the
23 confirmatory analysis. And, I think we're starting
24 to see that even more with NuScale right now, where
25 there is a subset of accident scenarios which are

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1 important.

2 And, I like to think of those as being
3 important because if the applicant is wrong, the
4 accident becomes worse than what you thought it
5 was. The fission products get out containment or
6 start spreading beyond that. So, you need to focus
7 on things like that.

8 Do you need to go back and do
9 everything? No, probably not. We're going to have
10 to think carefully on that.

11 As we get to these new designs, we
12 think that there is going to be the need for some
13 confirmatory analysis. But, we're going to have
14 took to Strategy 2 to start telling us what the
15 risk of that accident is, what the likelihood is of
16 that accident getting worse if somebody is
17 incorrect on their calculations.

18 You know, I would hope that, you know,
19 we focus only on those things which are the most
20 safety significant or those things which are
21 extremely difficult because we have that ignorance
22 of some of the new phenomena.

23 MEMBER POWERS: I'm very appreciative
24 of everything you've said. And, that's -- I mean,
25 you're thinking about it and that's all that --

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1 that's what you've said. We're thinking about it,
2 we don't have a rigid standard for deciding which
3 category things go into and that's probably the
4 best you can do. But, you're thinking about it.

5 But, I certainly have encountered with
6 some new designs pressure to adopt licensees
7 computer codes that I find woefully poorly founded
8 technical.

9 And, people saying -- and people not
10 recognizing that not only is the code well founded,
11 but the experimental database to support it is
12 unanalyzable.

13 MR. BAJOREK: Well, that's true. I
14 think there's really three reasons why you want to
15 look at confirmatory analyses.

16 One, they have the opportunity actually
17 to speed up the review. If you can show safety
18 independent of what the applicant is showing, that
19 should move that part of the review towards
20 completion.

21 But, the other two reasons are, I
22 think, is what you're hitting on, some of these
23 codes are developed on antiquated bases.

24 If we look at the TRAC in the RELAP,
25 these were codes developed back in the '70s and

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1 '80s and, in some cases, go back. They have
2 correlations going back into the early '60s. And,
3 we have seen cases where an applicant comes in,
4 gets one answer. We get something dramatically
5 different.

6 In one case that Dr. March-Leuba may
7 remember, one applicant said, we're down to TSAT
8 where we said, gee, we're almost at the regulatory
9 limit. What's wrong here?

10 Well, when we looked at it, we found a
11 code that had been used again and again for years,
12 had been used outside of its data base.

13 And, one correlation in there, which
14 was applicable for its original intent was used in
15 the wrong set of thermal hydraulic conditions and
16 gave you drastically different answers.

17 And, that lends itself to the third
18 thing, and I'll go back and reference Novak Zuber
19 who was a consultant to this committee for a number
20 of years who, when he demanded on having
21 documentation as part of the CSAU methodology, it
22 wasn't that he wanted more things to read, but it
23 was the idea that you need to force people to
24 understand what's inside the black box.

25 Because if you don't understand what's

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1 in the black box, you're more likely to start using
2 it for situations where you shouldn't.

3 And, we've seen too many cases where
4 people are -- have picked up these older codes and
5 misapplied them. So, I think that's the other
6 reason why you need to have some level of the
7 confirmatory calculations.

8 We try to keep our codes, the TRACE,
9 the FRAPCON, FRAPTRAN, the MELCOR as state of the
10 art as we can with the resources available.

11 Don't necessarily do that, if you've
12 got an off the shelf code that has been approved
13 and used it for years. So, it's something we're
14 going to have to be careful about, especially with
15 new applicants that don't have a long-term history
16 of using some of these tools.

17 MEMBER RAY: Let me make a comment
18 here. Appendix B's been mentioned a number of
19 times. Appendix B, Criterion 3 has the requirement
20 for independent confirmation.

21 When you encounter a situation like
22 that, I guess the point of my comment is, the
23 Agency shouldn't be in the position of performing
24 independent verification in lieu of the applicant.
25 It should be in addition to the applicant.

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1 When a situation develops like you just
2 touched on, it seems to me like there's a
3 fundamental problem that has to then say, all
4 right, time out. We've got to go back and address
5 this fundamental problem.

6 Because you brought us something and
7 applied for our approval, you're required to have
8 independently confirmed what you brought us and you
9 didn't. So, you didn't satisfy Criterion 3, in
10 other words.

11 MS. CUBBAGE: I can't speak to the
12 specifics of Steve's example, but when we find that
13 an applicant has made an error, we will typically
14 send a QA team down to do an inspection and then,
15 they'll, as part of their inspection, they'll do an
16 extent of condition and they'll keep going out and
17 out and out to make sure that there isn't a problem
18 throughout that organization.

19 MEMBER RAY: Yes, well, that's I guess
20 the point. I guess it was just Steve's discussion
21 of confirmation. I just want to make the point
22 that the applicant is the first one required to do
23 this.

24 MS. CUBBAGE: Definitely, always.

25 MEMBER RAY: Completely confirm.

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1 MR. BAJOREK: Yes, the applicant --
2 that is the analysis of record and that's the one
3 that it has to stand on. Ours is essentially there
4 to help with the review and then help with our
5 questions.

6 The Strategy 2, the next slide shows
7 all the functional areas that we focused on
8 starting back last July and August.

9 We asked each of the large functional
10 areas, and then it's broken down primarily as you
11 would do it for light water reactors. What do you
12 see as being the major issues and the major work
13 that needs to be done for molten salts, sodium fast
14 and gas-cooled reactors?

15 CHAIRMAN BLEY: Can I sneak in a
16 nontechnical point here? When I review those, we
17 didn't call them functional areas or something and
18 go through your document, they're not quite
19 parallel, they're kind of different. And, I wonder
20 if that's on purpose or just because different
21 people were doing them and are you happy with that
22 or do you need to revise this report?

23 MR. BAJOREK: Yes, it was designed by a
24 committee. We --

25 CHAIRMAN BLEY: Yes, I mean there are

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1 things in some areas that ought to be in all but
2 don't show up there.

3 MR. BAJOREK: Yes, and --

4 CHAIRMAN BLEY: So, when are you going
5 to fix that or do you need to?

6 MR. BAJOREK: I think we'll fix it as
7 we go on.

8 CHAIRMAN BLEY: Before it goes up to
9 the Commission?

10 MS. CUBBAGE: So, we can take a look at
11 that. Ultimately, what we're living by is our
12 execution, you know, so --

13 CHAIRMAN BLEY: Yes.

14 MS. CUBBAGE: -- we need to weigh how
15 much time we spend revising this document and keep
16 revising it versus what are we actually working on
17 and focusing on the detailed work.

18 So, we'll take that into account when,
19 you know, if we're going to do a rev, we might as
20 well take a look if there's inconsistencies, we'll
21 clean those up.

22 MR. BAJOREK: There could be and I --

23 CHAIRMAN BLEY: I think it's fairly
24 important. It's like looking for gaps or like
25 things seem to show up some places and not others

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1 and I expect you want to do them across the board.

2 MS. CUBBAGE: And, there was a pretty
3 tight time line to get the document out, so I'm not
4 surprised that you found some of those issues.

5 MR. BAJOREK: Yes, I think as we go
6 forward, we'll see a lot more synergy between some
7 of these areas. Probabilistic risk assessment is
8 kind of more of a Strategy 3 type of activity.
9 But, we'd be looking for that and Strategy 3 to
10 help define what's the design basis versus beyond
11 design basis? You know, give us some guidance
12 there.

13 As we look at the types of systems
14 we're looking at, we see things a lot more tightly
15 coupled than we did in the light water reactor
16 world.

17 Light water reactors, if you're looking
18 at a large break LOCA, you get a large break to the
19 system, the reactor shuts down because you avoid
20 everything else. I mean, you don't need a nice
21 tight coupling with neutronics and your kinetics
22 codes.

23 As we're starting to look at sodium
24 fast reactors and the molten salts and I think
25 possibly, the gas-cooled reactors, we see a much,

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1 much tighter coupling between the kinetics, thermal
2 fluids and the fuel performance.

3 And, we're going to start looking at
4 this in terms of a set of codes as opposed to a
5 code to do this and a code to do that.

6 MEMBER CORRADINI: So, maybe you said
7 it and I missed it, so you've already done the gap
8 analysis? I'm looking for a gap analysis to say
9 what --

10 So, let me just get to my question
11 which is like, okay, I already have a case on the
12 books relative to MHTGR and I already have a case
13 on the books relative to PRISM and I did those, at
14 least I got close to the end game on those with the
15 tools I already have.

16 What are the gaps? I look for a
17 potential design in those two areas. How do I fill
18 those gaps? After that, I don't need to do anymore
19 at this point.

20 MR. BAJOREK: We're getting to that and
21 I think I have a slide coming up that'll --

22 MEMBER CORRADINI: Okay, because --

23 MR. BAJOREK: -- address that.

24 MEMBER CORRADINI: Because it kind of
25 goes to Dick's question about, if somebody walks in

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1 the door now, can you do it and, if you can't do
2 it, what are the one or two or three things you
3 need to do to be able to do it?

4 MR. BAJOREK: Okay.

5 CHAIRMAN BLEY: And, does this primary
6 and secondary focus change as you move into the
7 mid-term?

8 MR. BAJOREK: We'll start to see the
9 secondary focus activities play a greater role.

10 Largely, when we looked at what we
11 wanted to do in fiscal year '17 and '18, we said,
12 let's focus on those things which have greater lead
13 times. You know, if we need an analysis capability
14 to look at a prototype reactor, there's some things
15 we need to start on versus do we really need to
16 look at control room habitability at this point?

17 Well, until we get the design
18 information in and really see what the issues are
19 with that design in the 2020s, there's no sense
20 really starting on some of that work.

21 CHAIRMAN BLEY: I wonder a little, if
22 our focus is on codes, this makes sense to me. I
23 don't like that the focus is on codes, I think it
24 ought to be on the things that underlie -- sit
25 behind them. And, then, I get nervous about

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1 putting I&C and human factors and security off to
2 the kind of the back end of the thinking. Those
3 aren't going to be driven by codes, those are going
4 to be driven by other aspects.

5 But, getting them right is pretty
6 important and getting your ideas of how you're
7 going to chase them is pretty important.

8 MR. BAJOREK: Well, this is also from a
9 research perspective. From the research and the
10 security, not really our area.

11 Now, security I think is being
12 addressed as part of the Strategy 3 and, you know,
13 security by design is something that I think we're
14 still going to -- we encourage the applicants to --

15 CHAIRMAN BLEY: This isn't a research
16 group.

17 MS. CUBBAGE: Strategy 2 is focused on
18 Office of Research activities to support the
19 staff's readiness Strategies 1, 3, 5, you know, the
20 other strategies are more --

21 CHAIRMAN BLEY: Well, where do human
22 factors and security live --

23 MS. CUBBAGE: Okay, well --

24 CHAIRMAN BLEY: -- if they don't live
25 in Strategy 2?

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1 MS. CUBBAGE: Let me just say a few
2 things about human factors. One primarily we don't
3 have much information today to do a lot of thinking
4 about what does human factors look like for a non-
5 LWR versus a NuScale?

6 So, we're focusing in the top on the
7 areas where we need to develop independent
8 capability and where things are drastically
9 different from an LWR. Materials, you get
10 different materials. You've got high temperatures,
11 you've got different accident phenomena, different
12 fuels. You know, those things are important.

13 Things like human factors, I don't know
14 what I would do with that today relative to what is
15 a control room for a --

16 CHAIRMAN BLEY: Well, NuScale gives you
17 some pretty good hints if you've been following
18 what they're doing.

19 MS. CUBBAGE: Right. But, what do we
20 need to do today to get ready for non-LWR control
21 room?

22 CHAIRMAN BLEY: I think there's a fair
23 amount.

24 MS. CUBBAGE: Today. I mean, we've got
25 --

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1 MR. RECKLEY: Well, but more
2 specifically what new tools? And, the task --

3 CHAIRMAN BLEY: Well, see, now that's
4 my problem. If the focus is on computer tools, I
5 agree with you. But, to me, this Strategy 2 is
6 about knowledge and filling in gaps in knowledge
7 through experiment or a new analysis or
8 developments.

9 MS. CUBBAGE: There's a lot --

10 CHAIRMAN BLEY: And, there --

11 MS. CUBBAGE: There's a lot of overlap
12 in all of these things. Strategy 1 is getting
13 people in training. Strategy --

14 CHAIRMAN BLEY: It smells like you're
15 focus is on the tools here.

16 MS. CUBBAGE: Strategy 3 -- yes, that
17 is correct.

18 MR. BAJOREK: For fiscal year '17 and
19 '18, yes, we think that's going to be in the tools.
20 Those other areas, it's not -- we're not saying
21 we're not doing anything there. We are going to do
22 some work on instrumentation and controls this
23 year, probably more in the area of molten salt
24 reactors where we're not so clear on the
25 environment and whether the instrumentation that

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1 you need is going to be appropriate for that.

2 So, it hasn't completely fallen off the
3 table, they're just getting less emphasis until we
4 get better educated on the designs themselves.

5 CHAIRMAN BLEY: Well, you know, if you
6 look back over history, these things have always
7 been pushed to the tail end and when the accidents
8 come in, these things are always heavily involved
9 in them. So, it's worth giving it.

10 MR. RECKLEY: Right and I'll just
11 counter that, from DOE's perspective, they have a
12 whole program on instrumentation for advanced
13 reactors and high temperatures in specific. So, as
14 they're developing, it's a matter of working out
15 the timing of the NRC's activities related to the
16 designers and DOE and some of these other
17 activities.

18 MS. CUBBAGE: Yes, we can't be getting
19 out ahead on all of these things.

20 MEMBER SKILLMAN: So, Steve, I'd like
21 to ask this question. You hit a hot button for me
22 and, perhaps for some others around the table when
23 you mentioned that with the salt reactor and lead
24 reactor, there's a different neutron spectra and,
25 hence, a different reactivity scenario.

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1 When we discussed the advanced reactor
2 design criteria a couple weeks ago, criteria
3 existing GDC 10 and 17 were kind of shuffled off by
4 DOE from the perspective, all you need to shut down
5 and control on reactivity and the fine words that
6 many of us grew up with regarding control the
7 reactivity or eliminate it.

8 The words that you just used ignited
9 the importance, to me, of those words being in
10 design criteria for a non-light water reactor
11 because there are neutron spectra is different and,
12 perhaps, with faster higher energy, much may need
13 to be much faster than we saw in the light water
14 family.

15 My question is, to what extent are the
16 new criteria informed by research?

17 Let me say it differently, did you get
18 your digs in when the new design criteria were
19 being proposed so that those who adventure into
20 molten salt, lead and other designs, really see a
21 reactivity control requirement, can comment with
22 the design spectra of those cores?

23 MR. BAJOREK: To that, I'd say no. We
24 really have not worked closely with the ARDCs and
25 defined what those are.

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1 MEMBER SKILLMAN: Fair enough.

2 MR. BAJOREK: So, we're identifying
3 issues and problems and the people who are working
4 on kinetics, they point out it's a much, much
5 different world dealing with the fast spectrum than
6 it is -- than what we're used to. And, there are
7 some things that we're going to have to be
8 concerned about.

9 But, I don't know if we've really
10 gotten to the point of working back and forth with
11 the ARDCs on that yet.

12 MEMBER SKILLMAN: Okay, thank you.

13 MS. MAZZA: This is Jan Mazza, Project
14 Manager for the ARDCs. I just want to say, we did
15 have research on our team to the extent that they
16 had -- were able to -- could either input, you
17 know, was dependent on their team member.

18 MEMBER SKILLMAN: Okay.

19 MEMBER CORRADINI: Before you launch
20 in, so, did I miss the slide or is it still coming
21 about the gap analysis?

22 MR. BAJOREK: I think it's --

23 MEMBER CORRADINI: I'm still hot over
24 about the gap analysis to understand what should I
25 do first, second, third? What can I wait five or

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1 ten years or never do?

2 MR. BAJOREK: If you can wait two
3 slides, I think we're -- I think that will do that,
4 so it might be five or ten years.

5 MEMBER POWERS: He is very poor at
6 waiting. He is very poor at waiting.

7 (Laughter.)

8 MR. BAJOREK: I'm not going to try to
9 go and list all of the technical challenges because
10 that's one of the things that we are trying to
11 identify here in the near-term. But, it's almost
12 obvious through some of the cases.

13 First, it's -- we have to develop some
14 staff familiarity. We have to look to Strategy 1.

15 We actually looked to some of the very
16 excellent workshops that have been put on by EPRI
17 and GAIN to help us get up to speed on what are
18 some of the things that we need to be concerned
19 about for each of these designs?

20 We look at fuels as being that first
21 barrier. Of course, we think we understand UO2
22 fairly well. As we start moving into TRISO, to
23 fuel salts, other types of fuels, what are the
24 concerns, the -- how we simulate the processes?
25 And, those start to become very complex and a bit

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1 of a mystery to us.

2 Neutronics, as we just pointed out,
3 they are -- they very quickly point out the need to
4 move towards a large number of energy groups in
5 order to do their analysis.

6 And, for those designs that are more
7 highly enriched than five percent, there's a lack
8 of basic data and benchmark information that they
9 see out there.

10 Severe accident phenomena, we're trying
11 to get our hands around that. We think we're in
12 good shape with the gas-cooled reactors. But, how
13 is the fission products transported in sodium fast
14 reactors? Molten salts? What happens when a
15 molten salt solidifies and you know you have
16 radiolysis occurring, giving off UF6 or some other
17 type of a product that we need to be concerned with
18 about.

19 One area that's actually fairly generic
20 is that --

21 MEMBER POWERS: You're probably
22 delighted if it's giving UF6 and to the cerium
23 chloride.

24 MR. BAJOREK: One of the areas that is
25 more generic at this point is that of materials.

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1 Almost all of these designs are looking at outlet
2 vessel temperatures 600, 700, 800 degrees C. We
3 have a lot of work planned in order to try to look
4 at and obtain data for the conditions under which
5 these new systems would operate.

6 Looking at the corrosive environment
7 that may occur for some for some of the --

8 MEMBER POWERS: Have you looked at the
9 obligation of the applicant?

10 MR. BAJOREK: I'm sorry, say again?

11 MEMBER POWERS: Isn't that the
12 obligation of the applicant?

13 MR. BAJOREK: Yes.

14 MEMBER POWERS: Did the materials be
15 totally the focus of the applicant?

16 MR. BAJOREK: But, you know, going back
17 and trying to find out what's out there now
18 participating on codes and standards committees
19 that you like, is something that they're going to
20 do in order to try to better understand what should
21 be the concerns for some of these new materials
22 that are being proposed?

23 MS. CUBBAGE: Right. And, we need to
24 be able to challenge the applicants. So, we need
25 to have a level of knowledge as well.

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1 MEMBER BALLINGER: I think we need to
2 be careful when you say new materials. These are
3 materials that exist, have been used in other
4 applications but would be used in this application.

5 So, nobody's developing brand new
6 materials, to my knowledge, with maybe the
7 exception of fuel cladding.

8 MEMBER POWERS: Well the TRISO fuels --

9 MEMBER BALLINGER: Well, okay. When I
10 think about materials, I think of anything but the
11 fuel.

12 MEMBER POWERS: Anything but the fuel?

13 MEMBER BALLINGER: Yes, anything but
14 the fuel.

15 MR. BAJOREK: No, and when I'm talking
16 about materials here, I mean exactly that. It's
17 the new types of Inconels, the new types of steels
18 that they would use.

19 Yes, they currently exist but have they
20 been irradiated for 40 years in a corrosive
21 environment at 800 degrees C and --

22 MEMBER POWERS: It seems to me, I mean,
23 I appreciate what you're saying, but it seems to
24 me, the only question that you ask is, okay,
25 where's your data for 40 years of irradiation at

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1 the appropriate temperature with the appropriate
2 flow velocities with episodic shutdowns for
3 refueling? And, that's usually -- those
4 combinations of things, especially I mean --

5 MR. BAJOREK: Well, which remains to be
6 --

7 MEMBER POWERS: -- to do accelerated
8 aging on these fuels without episodic shutdowns,
9 that's where things -- materials go to hell on you
10 is when you bring them up and down all the time.

11 And, to ask those questions is what you
12 need and when the licensee says, well, I don't have
13 that and I don't need it and then you say BS, go
14 get me the experimental data.

15 That's the challenge for what -- I
16 mean, your biggest challenge is the pressure to get
17 this things through when there is an inadequate
18 technical foundation for the work. That doesn't
19 appear on anybody's list, but that is what the
20 problem you're going to face on these things.

21 MEMBER BALLINGER: An even more
22 important question is, how much data do I need?
23 Because when light water reactors were developed,
24 we certainly didn't have 40 years of irradiation
25 data.

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1 MR. BAJOREK: Right, and actually, you
2 do see some diversity in designs. I've seen one
3 when they say, well, we're going to replace the
4 vessel every ten years. It seems like that's a
5 very difficult thing to do and keep your capacity
6 factor up.

7 But, they're talking about those types
8 of replacements. So, we'll see.

9 MEMBER RAY: I think Dana's saying the
10 same thing I was saying a different way and the
11 same thing that Amy affirmed which is, what -- our
12 capabilities should be for the purpose, not of
13 confirming the analysis of the applicant, but of
14 enabling us to challenge their analysis.

15 And, to send them back if that
16 challenge shows that it's not adequate, their
17 analysis.

18 So, sometimes we get in, it seems like
19 to me, we get into the mind set of, well, we've got
20 to be able to replicate what they've done. And,
21 that, you know, isn't necessary or practical
22 because they should not -- we should not be
23 engaging with them if they can't show that they've
24 complied with the requirements for themselves
25 having inadequate basis of what they're proposing.

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1 MR. BAJOREK: Yes, and I don't think we
2 intended here to say that the NRC is doing parallel
3 physical research but that this is challenge and we
4 have to be aware.

5 One thing we do want to avoid however,
6 is to have applicants or DOE have a program that's
7 being going on for -- I take TRISO fuel as an
8 example for 10 or 15 years and then, for us to come
9 in in year 15 and say, well, you haven't proven
10 your point, go back and do another 15 years' worth
11 of data.

12 So, there has to be some engagement in
13 real time in order to avoid that kind of an
14 unnecessary impact.

15 MEMBER RAY: Yes, absolutely, Bill.
16 And, I mean, I understand that. But, I also just
17 think we want to make the point I just did, I won't
18 repeat it.

19 MR. BAJOREK: Okay.

20 MEMBER RAY: But, you guys have an
21 obligation as an applicant to show us that there's
22 -- what you're presenting is validated. It's not
23 our job to validate it.

24 MS. CUBBAGE: And, one thing I'd like
25 to add in the materials area and I have basically

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1 zero qualifications in materials, so I'll put that
2 out there. But, some of the molten salt reactors,
3 the materials are currently the impediment to them
4 being able to move forward.

5 They may need to be developing new
6 materials because the materials that they are using
7 now would not be able to withstand the close
8 environment for the long life that they want. They
9 want these to be designed for 60 years and they're
10 looking at, okay, this material might be good for
11 five years.

12 So, I don't know if it's qualifying
13 existing materials, developing new materials, but
14 my understanding is that materials issues are a
15 significant issue for molten salt reactors.

16 MEMBER BALLINGER: Yes, I think you're
17 uninformed.

18 MS. CUBBAGE: I would agree with that,
19 and if there's anybody in the audience that has
20 more information on that, I'd be happy to --

21 MEMBER MARCH-LEUBA: Going back to the
22 previous topic, I think there the responsibility of
23 the staff is to get ready to challenge those
24 results and the applicants will.

25 And the question is how do you do that

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1 and what this staff should do and I think is doing
2 is trying to develop internal expertise to have
3 some insights, to have some engineering knowledge,
4 to have some physics knowledge.

5 And, the question is, do you do that by
6 giving the young engineers a couple of books and
7 saying go read them? Or do you have to be hands
8 on, run the code, see they result, run some
9 experiments?

10 And, I would say that the second part
11 is better than just reading a couple of books.
12 Because there is absolutely no expertise inside the
13 house on molten salt. Nobody has -- nobody can
14 even tell you what the properties are.

15 MEMBER REMPE: But, along those lines,
16 again, I appreciate eventually you need words
17 important to be able to independently confirm or
18 disagree with some of the results. But, rather
19 than just having a textbook to look at, maybe it'd
20 be good to look at their ill-founded, based on the
21 erroneous physics codes and use their codes rather
22 than starting out in trying to improve the existing
23 in house tools just to try and do something less
24 expensive to gain some insights.

25 Because, basically, you're just trying

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1 to gain the expertise to know where to challenge
2 them.

3 MEMBER POWERS: The problem I see with
4 that strategy is that, when you run a code, you
5 develop a relationship to that code that is akin to
6 marriage. And, you start believing the results.

7 MR. BAJOREK: It depends on how you
8 believe in their --

9 MEMBER REMPE: It depends on how you --
10 (Simultaneous speaking.)

11 MEMBER REMPE: -- you just start
12 attaching to your codes, I think. And, you may be
13 right in some ways, but for the existing on --

14 MEMBER POWERS: I mean, I make no bones
15 about that. I know this from personal experience
16 that I write a computer code, I tend to believe the
17 results.

18 And, even in the face of contrary
19 evidence, I say, well, they must have screwed up
20 the experiment because it's not the result my code
21 got. And, it's true of my own codes.

22 And, if I recently was privy to a
23 computer severe accident analysis that was totally
24 orthogonal to what you would manifestly guess would
25 happen. And, yet, people were perfectly willing to

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1 believe -- to present it to me and this is what the
2 code said. How can it possibly be wrong? Because
3 it left out the melting point of the material
4 involved.

5 You know, trying to arrive intuition
6 from a code that is very new and not well
7 established phenomenologically is just a move to
8 persuading yourself and not doing what Amy said the
9 objective is to this challenge thing.

10 It's much better to do what Ron says is
11 look at the vast array of experience with the
12 materials or whatever in other applications. It's
13 much more useful, too.

14 MEMBER MARCH-LEUBA: Yes, but I think
15 that the staff needs to keep very focused on the
16 goal which is to the develop internal expertise to
17 be able to challenge the applicant. And, that's
18 what you're doing.

19 And, in my opinion, if I was the king
20 of the world, what I would do is, I would take
21 whatever code is available and start benchmarking
22 it against everything that's available.

23 Forget about writing new software,
24 forget the new software wise for Steve. Give us
25 available and benchmark it and see where it fails.

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1 MEMBER REMPE: Because, when there's
2 not adequate data to support things, trying to get
3 -- attach -- develop your own code and getting
4 attached to it could lead you along the same path.

5 MEMBER MARCH-LEUBA: Yes. And, you
6 tend to emphasize whether somebody else's code.

7 MEMBER REMPE: Yes.

8 CHAIRMAN BLEY: Let's go to the next
9 one.

10 MR. BAJOREK: There are a lot of
11 challenges, also some benefits as we start to look
12 at the path forward. As I think -- as we've
13 mentioned before, the staff had done a lot of work
14 for PBMR and NGNP.

15 We think we know what the issues are
16 and what the path forward is for the gas-cooled
17 reactor. So, we're --

18 MEMBER POWERS: You more than I do
19 then.

20 (Laughter.)

21 MR. BAJOREK: This is relative to the
22 other two.

23 MEMBER POWERS: And, that's true of so
24 many things in your case, Steve, that you know more
25 than I do.

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1 (Laughter.)

2 MR. BAJOREK: In comparison to the
3 other reactors, we think we're in much better shape
4 when it comes to selecting the tools and where we
5 think the issues are.

6 For the most part, we're really looking
7 at single phase phenomena now apart from sodium
8 boiling, molten salt solidification which are
9 conditions you probably just want to avoid as part
10 of the design as opposed to the fun we have with
11 two phased flow, critical heat flux, non-
12 equilibrium that we deal with in light water
13 reactors.

14 MEMBER POWERS: You know, I just found
15 that a remarkable line in your view graph because
16 the -- when I think about it, I think about molten
17 salts, they said what is the problem with molten
18 salts?

19 Well, if you carry off little particles
20 of corrosion products and then we get an abrasion
21 component to the attack, that's not -- so it's no
22 longer is the safety issue single phase flow, it
23 is, in fact, two phase flow where you have a solid
24 component in there.

25 When I asked the CFD people about this,

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1 they said, well, we really don't do that very well
2 or particles tend to be points. We don't have a
3 good way to account for abrasion.

4 When I think of your gas-cooled
5 reactor, I say, you know, what is the safety issue?
6 Well, gee, it's the gas carries off fission
7 products that are typically in the form of
8 aerosols. I ask the CFD people and it's, oh, we're
9 really good at that.

10 We have this point model that doesn't
11 account for diffusion. Oh, gosh, that's not a
12 small issue there. It doesn't account for the
13 phoretic phenomena. That, too, is not a small
14 issue there for the aerosol fission.

15 So, the comment surprised me that it's
16 single phase, though. Because I think the safety
17 issues all arise because it's not single phased
18 flow.

19 MEMBER KIRCHNER: If I might jump in
20 here. Yes, I was looking at that, too. And, then,
21 I was thinking, you know, just about every reactor
22 concept that's probably going to come forward has
23 been designed and many have been built before in
24 some small prototype fashion.

25 And, over these 50 years of nuclear

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1 power, we've evolved away from liquid fueled
2 reactors for a lot of reasons, one being the
3 uncertainty is, you know don't know where the fuel
4 is with quite the precision of a fixed geometry.

5 So, actually, I was struck by this as
6 well. It's to be determined whether you have
7 significant safety margins. And, again, in the
8 spirit of being able to challenge the applicants,
9 it strikes me that the -- and I think your next
10 slide, it actually hints at it.

11 You've got tight coupling of fuel and
12 neutronics and thermal performance. And, it seems
13 to me reliable assessment.

14 I note that the GDC, the advanced GDC
15 strikes reliable control of reactivity which
16 we'll address, I guess, tomorrow.

17 But, that is probably the crux of some
18 of these designs, probably the most important
19 safety issue that you're going to have to be able
20 to analyze and challenge. Because that's probably
21 one of the largest contributors to, quote, unquote,
22 risk in those designs.

23 MEMBER BROWN: Okay, I can't resist it
24 now any more.

25 I looked through the rest of the

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1 slides. I have a hard time understanding why we
2 focus a little bit what we're saying, okay, here,
3 we're going to tap the technical benefits in terms
4 of why it makes it easier for us to do things as
5 opposed to a slide that shows the risks involved
6 with the utilization of these other types of
7 reactors.

8 The disadvantages of them, the time in
9 which they've been built in the past and been not
10 built again and, instead, I mean that's, to me,
11 ought to be, along Dana's point, we ought to be
12 assessing the risks involved of these particular
13 plans.

14 What are the things we want the
15 applicants to demonstrate to us how they ameliorate
16 those risks so that we don't have to deal with
17 public safety?

18 We understand the light water reactors,
19 they've been around for 60, 67, no, since what,
20 1954, roughly when SIW or S52, whatever it was,
21 when the S1W, the naval nuclear reactor went
22 critical.

23 So, we've got a huge wealth of data on
24 that and we continue to proliferate those over the
25 last 67 years or so.

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1 But, to focus on benefits of analysis
2 or single phased -- I like that, it's a good idea.
3 They don't have high pressures and things like
4 that.

5 But, their disadvantages, you know, of
6 your materials that you have to deal with, the
7 corrosion, the how you transfer, you know, the heat
8 into another viable medium which allows you to
9 generate electricity, that whole how you deal with
10 that and we're not focusing on that.

11 MS. CUBBAGE: Well, I'd like to say
12 that this slide was poorly titled. This is
13 reflecting --

14 MEMBER BROWN: That's an
15 understatement.

16 MS. CUBBAGE: -- this was -- yes. So,
17 this was just reflecting -- Steve was trying to say
18 in the code world, he's saying there's things about
19 this that make it hard and there's things about it
20 that aren't as challenging and that is not trying
21 to advertise --

22 MEMBER BROWN: No, it's not that you're
23 --

24 (Simultaneous speaking.)

25 MR. BAJOREK: -- significant margin,

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1 it's still a tough sell.

2 MEMBER BROWN: Yes, I understand.

3 MR. BAJOREK: Okay, there's a lot that
4 has to go into that. Do we have the data to do
5 that? No. From the limited information that
6 people presented, there might be a lot of margin
7 there.

8 If that is true, if that can be shown,
9 experimentally and conclusively with your analysis,
10 you allow yourself some larger uncertainties than
11 you do with a light water reactor which is already
12 been ratcheted right up to the regulatory limit.

13 MEMBER BROWN: My difficulty is that
14 you're being asked by some of these to provide a
15 set of regulatory assessments of whether it is a
16 viable go forward type process for them when, in
17 fact, you have little, if any, information,
18 background information to make those judgments.

19 I would -- I just think that's a
20 slippery slope to even do that. Instead, to me,
21 you'd be going back and telling, here are the
22 downsides. Here are the risks to the public. How
23 does your design prevent and ensure those don't
24 occur for the next 40 years?

25 That's the question that ought to be

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1 asked. You shouldn't be confirming anything in my
2 own mind. You should be getting them to tell you
3 why it's okay.

4 That's what was -- and that's what was
5 done 60-something years ago when we started this
6 process. And, we didn't build the first reactors
7 to last for 40 years. The first one was only
8 designed for about 18 months of operation.

9 We knew we couldn't build submarines
10 that only had to be refueled every 18 months. I
11 mean, I learned that lesson heavily in 1965 when I
12 went to work for the program.

13 MS. CUBBAGE: I'll give a counterpoint,
14 the Commission has an advanced reactor policy
15 statement which encourages inherent simple, passive
16 designs.

17 These designs are professing to have
18 inherency characteristics, many of which have yet
19 to be proven, but that's -- this is --

20 MEMBER BROWN: But, they're relative to
21 light water reactors.

22 MS. CUBBAGE: Yes.

23 MEMBER BROWN: That's -- every one of
24 these is relative to a light water reactor. When
25 really, they're not addressing -- you haven't

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1 looked at where are -- how are they addressing the
2 risks to the public from these particular design
3 approaches?

4 And, I haven't seen a thrust in your --
5 I mean, I read through your IAPs and everything
6 else, and I don't have any big problem. You all
7 were doing a pretty thorough job of trying to
8 assess things. But, it's not relative to the risk.

9 So, I'm -- I guess maybe I've said my
10 peace and maybe I will allow you to continue. But,
11 that's my difficulty with the whole thing.

12 MS. CUBBAGE: Risk is going to underpin
13 everything we do and safety, that's --

14 MEMBER BROWN: But, it's not being
15 addressed. I mean, you haven't gone -- instead of
16 challenging these folks to come in and tell you,
17 how do I avoid all the downsides? And, you don't
18 have any information or experimental data to show
19 me why this is going to last for the time you --
20 why -- how can you give an assessment that looks
21 like a viable path?

22 I have a hard time of walking down that
23 road. If I was the Agency, I wouldn't want to do
24 that.

25 MEMBER CORRADINI: I don't mean to take

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1 your side, Charlie, but --

2 MEMBER BROWN: I know you, you're going
3 to. But, I'm going to -- it doesn't matter.

4 MEMBER CORRADINI: I think what they're
5 saying is, as people -- as what I thought they were
6 saying is, as potential applicants come up with
7 designs or concepts, they want to be flexible to
8 ask what I'll call penetrating questions up front
9 that they'll -- the applicant, potential applicant,
10 will come scratching his head and say, okay, be
11 back to you in a month, a year, three years.

12 MS. CUBBAGE: Never, maybe.

13 MEMBER CORRADINI: Or not.

14 MS. CUBBAGE: No, I'm saying if we
15 identify a fatal flaw, I mean, that's part of the
16 process, too.

17 MEMBER CORRADINI: It's happened
18 before.

19 MS. CUBBAGE: Yes.

20 MR. BAJOREK: Okay, think back a little
21 to my first slide, one of the things that we're
22 going to come out of the next thing is going to be
23 identification of those experimental needs. That's
24 the thing that's going to drive. Do you have the
25 data to show that margin?

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1 That step in coming up. We don't know
2 it yet. We only have the information that we've
3 been presented to this point. We take it at face
4 value.

5 Now, in initial efforts, going to wake
6 Dr. Corradini up, so this is the slide.

7 MS. CUBBAGE: Oh, this is the slide you
8 were waiting for. That's why he was --

9 MR. BAJOREK: So, what are we doing to
10 get started and really identify where the true
11 issues are?

12 Our first -- our focus in virtually all
13 of those areas is identification on the phenomena,
14 the scenarios and the issues that are going to
15 drive the code selection and the needs for the
16 experimental data.

17 CHAIRMAN BLEY: I like hearing that. I
18 don't like the focus on codes so much, but okay, I
19 like hearing that. But, when I read the document,
20 here was the place where I saw, for some of them,
21 my criticality, well, you read it, and this is what
22 is what it says.

23 For others, it reads as if, we already
24 know this stuff and we're going to the following
25 things. And, that's where I saw the inconsistency.

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1 And, it especially bothered me because
2 the focus on identifying technical gaps where we
3 need to really understand things better didn't seem
4 to be consistently applied across the functional
5 areas.

6 MR. BAJOREK: That's --

7 MS. CUBBAGE: That delta B function,
8 we've already done the certs on the gas reactors.
9 We already got an --

10 MR. BAJOREK: Gas-cooled reactors, yes,
11 we've done some of that work. But, we've already
12 started two projects going to be for molten salt,
13 going to be sodium fast reactors.

14 I call them more of the pre-PIRT type
15 of evaluation. But, we're going to go back and
16 review the existing information from things like
17 EBR2, from Fermi, Clinch River, the PRISM for the
18 sodium fast, look at the MSRE and the aircraft
19 reactor for molten salt reactor to identify what
20 were the things that were of most concern in those
21 designs?

22 What type scenarios? We're not going
23 to be able to get to the licensing basis versus
24 nonlicensing basis at this point. But, we already
25 kind of know from those things that cause

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1 stagnation in the flow, loss of flow.

2 Those tended to be more problematic to
3 those types of designs. Flow blockages in some of
4 the assemblies. Yes, we've seen that come up as a
5 recurring theme.

6 So, we're going to start looking at
7 those. And, the idea is to come out of these pre-
8 PIRT exercises with a list of phenomena and issues
9 that you're going to need to account for in these
10 codes and in your analytical tools.

11 MEMBER CORRADINI: So, I'm with Dennis.
12 I think the first bullet is -- makes me feel good.
13 So, now, let me ask the question, if tomorrow,
14 which one was it up there, Terrestrial, no let's
15 not pick that, let's Oklo since it's a sodium
16 reactor.

17 Company X comes in and says we actually
18 want to start pursuing a certification or a Part 50
19 construction activity or somewhere in this pathway
20 on a sodium reactor or somebody comes in like X
21 Energy for a gas reactor.

22 And, you said to Dick, you're right,
23 what I'm looking for is, okay, if you're ready
24 without this code, that code, this code, what would
25 you do in terms of a process to address it in the

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1 next five years?

2 Because you won't have the information
3 of some of these. And, that's where I'm -- that's
4 where the gap analysis, to me, fits -- would fit
5 in. Because, then, you can address issues like I
6 know Dr. Powers has been sending me little missives
7 on source term.

8 Because source term affects EPZ, it
9 affects containment performance, functional
10 requirements, and so on.

11 So, it seems to me that's where in the
12 writing that we got, I was missing that sort of, if
13 they come in in the next few years, how do I do it
14 practically?

15 MR. BAJOREK: Initially, and when you
16 do the part, you really do it in -- there's two
17 issues. What are the phenomena? And, how well do
18 you know them?

19 We would look for this in on a generic
20 basis that we -- these are the phenomena, how well
21 do we understand them? And, invariably, you're
22 going to -- what I -- start your gap analysis. Are
23 those things where? Yes, this is important for
24 these designs, we don't know anything about it.

25 MEMBER CORRADINI: Okay.

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1 MR. BAJOREK: And, that basically
2 starts it, okay, you need to go down an
3 experimental path.

4 MEMBER CORRADINI: But, the only reason
5 I'm suggesting this as an activity, which you can
6 choose to ignore is, it addresses Charlie's point,
7 which is, in the next N years, N being less than
8 five, you're not going to be necessarily have all
9 additional data.

10 You're going to have the data you've
11 got, you've got the analysis tools you've got and
12 you've got the potential risk from older designs
13 and their performance. And, now, you've got to
14 deal with it.

15 So, it seems me you're going to also
16 have to have a pilot on how you would address a
17 potential applicant when one of these many stages
18 that Bill was saying that's the sodium, that's gas,
19 and that's an other. And, that's how I might
20 organize my thoughts in the first five years so
21 that I practically know how I would attack it.

22 And, then, you can say that when they
23 come in, you say, well, you know, this looks like a
24 deficiency in materials, geez, you better go back
25 and do X.

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1 Or, we always saw when Oak Ridge ran
2 their whatever it is under the chemical engineering
3 codes and standards, it still dissolved the hell
4 out of the materials, so you've got to go do Y.

5 That's what I guess I'm --

6 (Simultaneous speaking.)

7 MEMBER RAY: Well, let me weigh in here
8 for a second.

9 You talked about Part 52 versus Part
10 50. There used to be a time when there was thing
11 called a provisional operating license.

12 Charlie talked about 40 years. I can't
13 envision, conceivably, issuing a license for 40
14 years on some of these designs where you're never
15 going to have the material properties except as you
16 monitor it on an ongoing basis.

17 So, surely, and this now becomes a
18 question, surely, we anticipate the possibility
19 that there is going to need to be, whether we call
20 it a provision license, which we don't have a
21 provision for any more, but or not, there's going
22 to be -- have to be, for the initial suite of
23 plants of any design some monitoring that deals
24 with the long-term potential effects that we can't
25 have the data for because it's just not going to be

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1 available. Is that not correct?

2 MR. RECKLEY: That is absolutely
3 correct that you have to look at, when you're doing
4 the licensing process, not only the design, but the
5 operational aspects that'll be put in place,
6 including the monitoring.

7 And, that ranges from the use of an
8 actual prototype provision which is somewhat
9 similar to a provisional, but --

10 MEMBER RAY: That's right.

11 MR. RECKLEY: -- in that first reactor
12 is actually being used to gather data that would be
13 used for subsequent reactors is basically the way
14 that prototype provision.

15 But, even if it's not a prototype,
16 there'll be operational constraints just like there
17 are for light water reactors that include
18 monitoring and then making adjustments if the
19 behavior is different than what you expect.

20 MEMBER RAY: Yes, but, Bill, I mean,
21 realistically, the monitoring of light water
22 reactors has gone down and down and down over the
23 years, it's going to be at a pretty high level, it
24 seems to me, for many of these new concepts in
25 terms of frequency and extent of monitoring that's

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1 required.

2 And, people need to understand if
3 they're going out and financing something on the
4 basis that they're going to operate it for 40 years
5 and they have a guarantee of being able to do so,
6 it's got to be clear that that's only if all of the
7 monitoring supports doing that.

8 And, they may shutdown in five years or
9 whatever.

10 MR. RECKLEY: That's a possibility if
11 it doesn't behave the way it's expected.

12 MEMBER RAY: Well, it needs to be
13 explicit. It seems to me everybody needs to
14 understand that there's not going to be any
15 guarantees.

16 MEMBER MARCH-LEUBA: Well, from the
17 relative point of view, how is this different from
18 changing a silt-based cladding hydrides from by a
19 new alloy? That doesn't have 40 years' experience.

20 You put it in and you hope it works and
21 you monitor it.

22 MEMBER RAY: Well, my point is that
23 it's not different, it's simply that it needs to be
24 explicit and I really am responding to Charlie's
25 point and I thought that Mike was repeating it

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1 somewhat, which was you've got to go get data that
2 doesn't exist presently because it's needed in
3 order to show that this thing will be able to
4 operate for 40 years.

5 Well, maybe the only data that's going
6 to show that is the data that is created by the
7 operation of the plant in the first place.

8 So, you simply have to say, all right,
9 we're going to have to shut down or, you know,
10 monitor this parameter frequently until we can
11 establish what -- how it's behaving.

12 MEMBER CORRADINI: I elicited Bill's
13 phenomena prototype, I'm happy.

14 MS. CUBBAGE: And, I'd like to just
15 follow up. All good ideas and I think the issue
16 comes down to, do we have enough information such
17 there won't be a safety issue that wouldn't -- that
18 would manifest and the monitoring wouldn't pick it
19 up?

20 You know, in that case, you need more
21 information.

22 MEMBER CORRADINI: Well, of course.

23 MEMBER RAY: Yes, but if --

24 MS. CUBBAGE: But, if you have enough
25 information to say, we expect the behavior to be X

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1 and then you're going to monitor it and make sure
2 it behaves, and if it doesn't, you have course
3 corrections. Then that's more like a normal
4 operating reactor. We could put appropriate
5 monitoring in place.

6 But, if it's more like we don't have
7 enough data to justify this safety, then, you get
8 into more of, you either need to do more testing to
9 get a license or you could be in that gray area of
10 maybe it's a prototype.

11 MEMBER RAY: Yes, we're all in
12 agreement, I think.

13 MS. CUBBAGE: Yes.

14 MEMBER RAY: It's just I think it needs
15 to be clear enough that this isn't just like plants
16 that have been operating for a long period of time
17 relative to assurance that we're not going to look
18 at this issue as the plant enters operation.

19 CHAIRMAN BLEY: I'm going to interrupt
20 the discussion at this point.

21 MEMBER BROWN: Can I, before you do,
22 can I just finish off this thought for two seconds?

23 But, Harold's exactly the point, that
24 is how, exactly how all the initial design
25 approaches that were taken with the naval nuclear

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1 program so they could move on.

2 They were put in place, the prototypes
3 were in place. There were ways to access
4 information, you know, material, stuff that was put
5 in those that were monitored then pulled out and
6 then looked at so that we could then extend that
7 life time and move on to the other reactors.

8 And, that ought to be a part of your
9 thinking. That's all Harold's thinking or saying,
10 is that that ought to be -- if you're going to do
11 these different designs, assign those risks, how do
12 you do it? How do you get -- now build up that
13 database so you can do it, that's all I wanted to
14 amplify. That's how it was done in the past, it
15 worked.

16 MS. CUBBAGE: Yes, and we don't control
17 the business. You know, we don't control the
18 applicants, they have business models. We're not
19 the Navy and we can't dictate that you're going to
20 build an RTR, you're going to do this, you're going
21 to do this.

22 CHAIRMAN BLEY: And, you don't have to
23 approve it for 40 years.

24 MS. CUBBAGE: You don't have to approve
25 it. You're absolutely right, but my point is,

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1 Design X may want to come first with an research
2 test reactor. Design Y might want to come first
3 with a prototype. You know, Design Z may want to
4 come in first with a full scale commercial reactor
5 and they'll have to demonstrate that they have the
6 data to support that.

7 CHAIRMAN BLEY: And, you don't have to
8 approve it for a 100 percent power.

9 MS. CUBBAGE: Exactly.

10 CHAIRMAN BLEY: But, at this point, I'm
11 going to stop the discussion. I'm going to --

12 (Laughter.)

13 CHAIRMAN BLEY: -- going to announce
14 that Dr. Peter Riccardella has joined us on the
15 committee.

16 And, we are going to -- I was going to
17 wait until you were done, but we're going to take a
18 break now and we'll come back at 10 minutes until
19 11:00.

20 We are in recess.

21 (Whereupon, the above-entitled matter
22 went off the record at 10:35 a.m. and resumed at
23 10:52 a.m.)

24 CHAIRMAN BLEY: We are back in session.
25 Give it back to you Steve. Not that you have many

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1 left.

2 MS. CUBBAGE: But before --

3 CHAIRMAN BLEY: Oh, okay.

4 MS. CUBBAGE: Before Steve starts and
5 where did Mike go? Mike needs to sit down.

6 MEMBER POWERS: No. It's not that he
7 sits down. He's -- be quiet.

8 MS. CUBBAGE: He needs to be quiet.

9 MEMBER POWERS: And that's much harder
10 to achieve.

11 MS. CUBBAGE: So I just wanted to close
12 the loop on one thing. Mike was, you know, hitting
13 on the topic of gaps. And I just wanted to make it
14 clear that while Strategy 2 happens to be the most
15 voluminous in the document, that was just quite
16 frankly by nature of the fact that different people
17 pull different pieces together, it all got put
18 together at the end.

19 We didn't really have time to beef up
20 certain sections and compress other sections. We
21 felt that there was a lot of good information in
22 the Strategy 2 area. So it really wasn't worth
23 pulling it all out.

24 But, I say that because the --
25 identifying regulatory gaps is actually a Strategy

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1 3 topic. And it has just as much emphasis for us
2 as the other Strategies.

3 So it all has to work together. It's
4 all overlapping. And the gaps identified in
5 Strategy 3 plus the resolution of policy issues in
6 Strategy 5, that all feeds into what you need to do
7 in Strategy 2.

8 I kind of inherited this framework of
9 all the separate Strategies. If I had to do it
10 over again, it would be written differently.

11 MEMBER CORRADINI: But since you're now
12 -- since you're now in -- since you now own it.

13 MS. CUBBAGE: I own it. And I'm stuck
14 with all these different bins. And it -- and then
15 we try to figure out, well is that a Strategy 2
16 activity or a 4 activity? And does it really
17 matter?

18 It doesn't matter. We just need to be
19 working on the right things in a smart way.

20 MEMBER CORRADINI: Is the -- so, let me
21 just take that. Is the roadmap where I would look
22 to see how these are knit together? Where do I --

23 MS. CUBBAGE: No.

24 MEMBER CORRADINI: Or is it still to be
25 knitted?

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1 MS. CUBBAGE: The roadmap is a specific
2 Strategy 3 topic that Bill will get to.

3 MEMBER CORRADINI: Okay.

4 MS. CUBBAGE: And that's how people
5 would interact with us in licensing.

6 MEMBER CORRADINI: Okay.

7 MS. CUBBAGE: So that's licensing
8 strategies.

9 MEMBER CORRADINI: But I do think that
10 since you brought this up, which is a, I think, an
11 important point. The knitting together on how
12 these six things fit either temporally or
13 organizationally is important.

14 MS. CUBBAGE: And it resides in my
15 brain.

16 MS. CORRADINI: Okay.

17 MEMBER REMPE: So, it doesn't entirely
18 reside in your brain. If I read the document in
19 Strategy 2, it looks like an all of the above
20 strategy. Where there's detailed tasks for gas
21 reactors, sodium reactors, and molten salt reactors
22 with detailed model changes and things like that
23 that are identified for fiscal year '17 and on out
24 each year.

25 And it's a substantial -- and that was

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1 my comment earlier, this is a few bucks that you're
2 expending there. And knowing that there's a lot of
3 uncertainty, I mean, I like the words here on the
4 slide. They're very high level and generic.

5 When you get down to some of these
6 detailed tasks with bucks associated to it, I'm not
7 sure it's knitted together and working wisely like
8 your last comment.

9 And maybe there ought to be some
10 changes.

11 MS. CUBBAGE: I have internal working
12 documents that are execution strategies for '17 as
13 far as what we're actually working on. Steve has
14 developed one that's specific to code development
15 aspects.

16 And it is along the lines of the slides
17 where we're doing pre-PIRTs. And we're assessing
18 what's out there.

19 MEMBER REMPE: What's in Volume --

20 MS. CUBBAGE: And more exploratory.

21 MEMBER REMPE: So what's in Volume Two
22 that's not publically available, we should assume
23 it is going to be changed before it goes to the
24 Commissioners?

25 MS. CUBBAGE: It -- we're in this --

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1 MR. BAJOREK: It's certainly going to
2 get shuffled around. A lot of that went into that
3 Strategy 2, those IAPs, some have already been
4 pushed out to further years.

5 What we're really going to be able to
6 accomplish in fiscal year '17 and much of '18 went
7 through a more recent review. Developing models,
8 selecting individual models and correlations,
9 that's been really put off.

10 MEMBER REMPE: Yes. That was what
11 distressed me. And so I -- again, we were doing
12 something that's been changed. And so I guess I
13 will conclude --

14 MS. CUBBAGE: I wouldn't necessarily
15 say it's been changed. You've got to look at what
16 the purpose of that document was.

17 It was a snapshot that was written
18 frankly back in August, before we got into the
19 work. It was to generally inform budget requests.
20 It wasn't intended to be what -- a detailed
21 execution strategy by fiscal year.

22 It was, these are the types of things
23 we need to do. This is how we're going to come up
24 with a rough estimate of the resources because we
25 budget multiple years out.

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1 My problem is, is if I spend my whole
2 life keeping this document updated all the time, I
3 don't get to do other work. So, we need to
4 balance, was this a snapshot planning tool? Or is
5 this really going to be a detailed work plan?

6 And my druthers would be this is kind
7 of like, okay, that was a snapshot. And when it
8 gets into detailed budget formulation, then we get
9 into more specifics.

10 MEMBER REMPE: Thanks. This helps me
11 and comforts me.

12 MS. CUBBAGE: Okay.

13 MEMBER MARCH-LEUBA: In the same topic,
14 don't move. In my mind, what we're doing here on
15 item two is trading up from cost of setting up all
16 these tools. Versus delays when somebody actually
17 gets to submit something.

18 MS. CUBBAGE: Right. Exactly.

19 MEMBER MARCH-LEUBA: So, and the risk
20 we're running with -- or the public is running, is
21 that if you don't have these half-done costs when
22 the submittal comes and the pressure not to do it
23 because we don't have time.

24 MS. CUBBAGE: Right. You're absolutely
25 right. That is the dilemma we're in. Do we invest

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1 a lot of money to be ready for something that may
2 or may not come, or may, or may not come on the
3 schedule advertised? Or do we risk it showing up
4 and we're not ready?

5 And we have to balance that. And we're
6 keeping our eyes open, weighing all the information
7 that's out there. And trying to responsibly use
8 our resources as Steve has --

9 MEMBER MARCH-LEUBA: So, as a part of
10 all these gap analysis that we keep talking about,
11 --

12 MS. CUBBAGE: Yes.

13 MEMBER MARCH-LEUBA: You should be
14 prioritizing a sense of what takes longer, and what
15 is more likely to be used. Which is obviously what
16 you're going to do.

17 MS. CUBBAGE: Right. Right. The what
18 takes longer, 100 percent factors into the plans.
19 The what is more likely is a very difficult
20 balancing act.

21 We can't pick winners and losers. We
22 have to go --

23 MEMBER MARCH-LEUBA: The risk I see is,
24 DOE is going to come with, and now you have to do
25 this one.

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1 MS. CUBBAGE: Right.

2 MEMBER MARCH-LEUBA: And you're not
3 ready. And then you should then stomp your feet
4 down and say, we're not ready because we didn't
5 have the money. We are going to -- you come back
6 in five years.

7 MS. CUBBAGE: Right.

8 MEMBER MARCH-LEUBA: Or, you succumb to
9 political pressure and not do it.

10 MS. CUBBAGE: You basically surmised
11 our whole problem right there.

12 CHAIRMAN BLEY: Amy?

13 MS. CUBBAGE: Yes?

14 CHAIRMAN BLEY: Tomorrow we'll have
15 another meeting on this same thing.

16 MS. CUBBAGE: Yes.

17 CHAIRMAN BLEY: And then we'll be
18 talking about us fighting the letter.

19 MR. BAJOREK: Can I please ask --

20 CHAIRMAN BLEY: Do you want us to think
21 about that letter the way you just said? That this
22 was a snapshot in time and it isn't a plan for
23 going forward?

24 MS. CUBBAGE: It's a snapshot in time.
25 And it should be viewed as this is the general body

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1 of work we plan to do in the first five years.

2 CHAIRMAN BLEY: Except you've already
3 said you know a lot of it isn't going to be in the
4 first five years.

5 MS. CUBBAGE: Well, what we're doing is
6 we're not necessarily doing in '17 what it said we
7 would do in '17 because availability --

8 CHAIRMAN BLEY: But it hasn't moved to
9 midterm. You think these are still --

10 MS. CUBBAGE: It hasn't moved to
11 midterm.

12 CHAIRMAN BLEY: Short term.

13 MS. CUBBAGE: Right.

14 CHAIRMAN BLEY: Okay.

15 MR. BAJOREK: Yes. I think part of the
16 problem is you have the full IAPs in those two
17 large documents. And you don't have the December
18 sanitation that we went through where we decided
19 hey, we're changing some priorities.

20 We're taking some tasks that people
21 said yes, we've got to do those. And we said, no,
22 you don't. You don't need to do those right away.
23 And in some cases there were things for gas-cooled
24 reactors that we'd probably done.

25 You know, so we've cleaned up a lot of

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1 that. But I'm not so sure.

2 CHAIRMAN BLEY: And we don't anywhere,
3 as far as I know, have anything that plays out to
4 our priorities. You talk that if we don't get all
5 the money, things will get spread out.

6 But, which comes first seems not to be
7 identified and -- if the documents were reviewed in
8 any case.

9 MS. CUBBAGE: Right. So that's where
10 going all the way back to, you know, to this one.
11 So --

12 CHAIRMAN BLEY: I like that one. But
13 under Strategy 4 the third little green box, I
14 don't see that in this file.

15 MS. CUBBAGE: Under Strategy -- right.
16 Because that's new work. So, --

17 CHAIRMAN BLEY: And they're like the
18 others. I didn't check for the others.

19 MS. CUBBAGE: Right. So NEI sent us a
20 letter after the document was issued. They want to
21 engage on licensing basis of in selection PRA,
22 using the -- and that will need the non-LWR PRA
23 standard to support it and other activities.

24 So, you know, it's a very fluid area.
25 We're moving, we're reacting to what industry

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1 wants. We're meeting with stakeholders every six
2 weeks.

3 We're kind of continually adjusting,
4 all right, we'll work on this.

5 MEMBER CORRADINI: But I think, I mean,
6 to get to Dennis points, and as the Chair of the
7 Committee, he's worried about at least giving us a
8 first cut at what our response might be.

9 MS. CUBBAGE: Right.

10 MEMBER CORRADINI: If we want to make a
11 response. What I heard you say about Strategy 3
12 and 5, I'll just repeat to make sure I didn't hear
13 it incorrectly.

14 Which is, in some sense if one were to
15 knit together an action plan on how these all are
16 knitted together, 3 and 5 will drive the train.
17 Because within 3 is a gap analysis. Within 3 is
18 event -- at least a methodology to determine
19 events.

20 MS. CUBBAGE: Right.

21 MEMBER CORRADINI: There could be
22 design basis or beyond basis. Under 5 there are
23 policies that have to be discussed.

24 MS. CUBBAGE: Yes.

25 MEMBER CORRADINI: I think when we had

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1 the February meeting you at least mentioned one on
2 containment functional performance requirements.

3 MS. CUBBAGE: Right.

4 MEMBER CORRADINI: So to me, what I
5 heard you say was, that 3 and 5 tends to drive this
6 forward.

7 MS. CUBBAGE: It drives except Strategy
8 2 was such a long lead issue that Steve and his
9 colleagues are today looking at what's out there.

10 MEMBER CORRADINI: I understand.

11 MS. CUBBAGE: You know, getting up to
12 speed. So you kind of have to do all of this in
13 parallel.

14 MEMBER CORRADINI: But if -- but if --
15 and just one last thing. So, if you didn't get the
16 resources you needed, then there's got to be a
17 backup plan or two since it's so extensive, that
18 there is something already available that might
19 require current tools, applicants' tools and us
20 doing auditing. There's got to be other ways to
21 attack that problem in case you don't get the
22 resources you need.

23 MS. CUBBAGE: Quite frankly right now
24 I'm less worried about getting the resources then,
25 you know, maybe some areas where we have critical

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1 skill gaps.

2 MEMBER CORRADINI: Okay.

3 MS. CUBBAGE: And we're working on
4 those. But I think the issue is more, if we get
5 application sooner than anticipated. If --

6 MEMBER CORRADINI: Okay. Okay.

7 MS. CUBBAGE: That's the real rub.

8 MEMBER CORRADINI: Thank you.

9 MEMBER REMPE: Well, I'd like to go
10 back to Dennis' question and your response back.
11 Because you said oh, no. We're still going to do
12 all this stuff in the near term. It's just it may
13 not happen in fiscal year '17 or '18.

14 And I look at this plan, and there were
15 activities '17, '18, '19, '20, and '21 all
16 identified. And so is your vision -- again, it was
17 an all of the above approach.

18 Is your vision, we get an applicant for
19 one design. And then we do all of these tasks for
20 that one and you prioritize? Instead of the --
21 every gas reactor, sodium reactor, and whatever
22 reactor?

23 MS. CUBBAGE: We're keeping our eyes
24 wide open. Right now we have people that want to
25 come in in all three categories. So we are really

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1 --

2 MEMBER REMPE: So how do you compress
3 and get it all done in the near term if again, it's
4 been delayed is what I hear. But you still think
5 all of these activities are needed in the near
6 term?

7 MR. BAJOREK: Well, if the applicants
8 keep that diversity of design, yes. Yes. If they
9 sort themselves out in a couple of years and it
10 starts to gravitate towards one or the other, we'll
11 be able to reduce some of those costs --

12 MEMBER REMPE: Right. Right.

13 MR. BAJOREK: And resources.

14 MR. SEGALA: So the IAPs were developed
15 independent of the budget, independent of critical
16 skills, independent of applicant plans. And the
17 whole idea was to write down, what is all the
18 things we need to do to get ready.

19 MEMBER REMPE: It's an all of the
20 events strategy.

21 MR. SEGALA: All yes. And so, we're
22 going to constantly have to do course correction
23 depending on what the applicants want, how much
24 budget we have, what kind of critical skills we
25 have.

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1 And so we're constantly going through
2 looking at all those. Looking at work priorities
3 in the office and how to make adjustments.

4 And so we're having -- it's very fluid.
5 We're having very frequent communications with all
6 the offices. You know, can you support this
7 activity? When can you get it done? Do you have
8 the bodies? All that kind of stuff.

9 And then going through prioritization
10 and whatnot, so.

11 MS. CUBBAGE: And being responsible
12 stewards of our resources, we don't want to go
13 crazy in the first year. You know, we're kind of
14 seeing where things are going.

15 MEMBER REMPE: Another backup plan
16 would be to have the applicant that comes in pay
17 for some of these activities for Strategy 2.

18 MS. CUBBAGE: If they are a specific
19 applicant and we are working on stuff for their
20 specific design, absolutely. Under our current fee
21 structure, they would be billable.

22 MR. SEGALA: And the other thing I want
23 to add is, you know, when we developed the IAPs,
24 this listed everything that needs to get done. In
25 some cases, if you go back to that green sheet, as

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1 Amy indicted, NEI is coming in with a licensing
2 basis event selection. That's something that we
3 had planned to work on.

4 So, not everything in the IAPs is going
5 to be done by NRC. We're going to do some of it
6 in-house. Some of it industry may do. And we may
7 endorse it in a Reg Guide.

8 DOE may do pieces of it. I think
9 they'll come and talk about that. And that we can
10 leverage work that other organizations are doing.

11 So, it's kind of a complicated thing to
12 weave together.

13 MEMBER SKILLMAN: May I please ask
14 Steve a --

15 CHAIRMAN BLEY: Yes. Go ahead.

16 MEMBER SKILLMAN: Steve, on your second
17 bullet there --

18 MS. CUBBAGE: This one?

19 MEMBER SKILLMAN: That. Slide 18. The
20 second slash may involve NRC developed codes and so
21 on. What is the agency's appetite for well vetted
22 foreign codes?

23 Codes that may have come from South
24 Africa, from France, from Germany, from east bloc
25 countries, Russia, where there is true data, good

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1 stuff?

2 MR. BAJOREK: I don't think we would
3 necessarily discount them. But our priority right
4 now is to make use of things either we have, or the
5 U.S. codes where there has been a lot of
6 development.

7 MEMBER SKILLMAN: Is there any
8 prohibition on using foreign information?

9 MR. BAJOREK: I don't think there's no
10 prohibition. But, gaining access to them and
11 obtaining those codes might be a problem.

12 MEMBER SKILLMAN: But wouldn't the
13 burden be on the applicant to say here is the code
14 that we intend to use. And here is the basis for
15 its use. And here is our verification of the
16 adequacy of this code?

17 MS. CUBBAGE: Yes. And if it relied on
18 international data, then that would be -- I think --
19 -- I think he was asked -- you were talking about us
20 relying on for our --

21 MR. BAJOREK: Also the applicant.

22 MEMBER SKILLMAN: Your willingness to
23 use foreign codes --

24 MS. CUBBAGE: For our confirmatory or
25 for the applicant?

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1 MEMBER SKILLMAN: No. Your willingness
2 to accept the results of foreign codes if those
3 codes are vetted.

4 MS. CUBBAGE: They would have to meet
5 all the same requirements whether they're domestic
6 or international. It wouldn't matter.

7 MEMBER SKILLMAN: Okay.

8 MR. BAJOREK: It would be the same.
9 And we looked at that. We're not really aware of a
10 whole lot of codes that we would right off the bat
11 consider and find acceptable.

12 We've looked at a couple of the
13 Japanese codes. But basically they're the same
14 tools that Argonne had developed and used. And
15 Argonne thinks they have better tools for those
16 right now.

17 So, that's not something we would
18 certainly rule out. But the point of the bullet,
19 that second one under the second bullet is that
20 we're trying to think out of the box.

21 We're not going to say we're going to
22 have to absolutely develop our own code or take an
23 existing tool and modify it for some of these other
24 reactor designs. We're looking closely at work
25 that's gone on in CASL and NEAMS.

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1 Argonne has done a lot of work for
2 sodium reactor fuels. Also applicable is I
3 understand is the lead bismuth type of coolants as
4 well.

5 So, we're looking at those. And
6 actually to get to, what I think somebody's
7 question was, well what happens if you had to do it
8 right away? Okay, and you don't have enough time
9 to do that development as you would usually do.

10 Yes, we might go and actually pick up
11 some of these tools which are available. Okay?
12 Insisting that they do stay with the same quality
13 standards we would have.

14 They would still have to be assessed.
15 They would still have to be exercised. They would
16 still have to have the right numerics. They'd have
17 to have the right documentation.

18 But we're not objecting to doing that.
19 And as I think you'll see in another couple of
20 slides, we're gravitating to actually from picking
21 a couple of these tools up for our use if we can
22 gain access, and if the tool passes some of the
23 criteria that we're actually in the process of
24 laying out right now.

25 MEMBER SKILLMAN: Thank you. That's

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1 good. Thanks.

2 MR. BAJOREK: We talked about gaps.
3 And I think Dr. Corradini brought that up. And
4 maybe it's good to say hey, there's two types of
5 gaps.

6 There's the regulatory gaps. There's
7 the technical gaps. And that's really what I'm
8 looking at.

9 And I see that dropping out of the
10 first bullet and the third bullet. We're going to
11 do this pre-PIRT exercise, identify issue, look at
12 scenarios in a more generic sense.

13 We expect to follow that up. It might
14 be a couple of years hence. Once the applicant
15 comes in and says here's my design and we hear from
16 Strategy 3 is here's what the licensing basis
17 events or should be.

18 We would revisit that PIRT for that
19 specific design. Go through that part of the
20 exercise again. And then reexamine the code
21 applicability.

22 As we're looking at the codes right
23 now, we're looking at a series of -- or a set of
24 codes. Because we see a lot of tighter coupling
25 between neutronics, fuels, perhaps even chemistry

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1 and thermal fluids.

2 But we need to look at these as a set
3 with the idea of well, what serves the agency best
4 in the short term and in the long term? If we had
5 to pick up another tool, can we use that right
6 away?

7 If we're going to do something in the
8 long term, is this something that this set or this
9 suite of tools can be used by a relatively small
10 staff? We'd like to try to avoid the situation
11 where we have to have experts in A, B, C, or D
12 different types of code suites.

13 Because we don't expect to have an
14 increase in resources sufficient to cover that
15 situation. So if we can get to a code set that
16 helps more than one reactor type, that's a benefit
17 for us right now.

18 So anyway, our initial effort is to
19 start the PIRT process, use that then to identify
20 the experimental needs. And I can almost guarantee
21 you that the -- that overly optimistic slide I had
22 a couple -- up there that prompted a lot of
23 conversation, it probably won't be that optimistic
24 once we get to bullet number three.

25 Because that's the thing that's going

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1 to have to identify what you're going to have to
2 use to assess the code. Who's going to have to
3 develop that data?

4 We're going to look for the applicant
5 to provide the vast majority of that. We may
6 supplement that. We may do some of our own tests
7 if it means developing rules or regulatory
8 criteria. But that's generally where we would want
9 to limit that.

10 We would expect that list to be fairly
11 significant. Okay? And in demonstrating that
12 there's significant margin, that's the gap that's
13 going to likely exist here.

14 CHAIRMAN BLEY: Through your meetings
15 with the various stakeholders and discussions with
16 them, do they understand that? Or do they have a
17 picture that might be similar to yours as to what
18 it might mean to have to develop that data?

19 MR. BAJOREK: To varying degrees. I
20 think some of them realize they need to get to a
21 prototype, an experi -- an integral type test
22 facility that develops the data.

23 Others don't. Some have the approach
24 or they have the thinking that well, we can analyze
25 our way around everything. We have these wonderful

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1 tools from CASL and NEAMS and we're just going to
2 pick those up and use those.

3 Assessment and validation of those
4 tools is still an open question. Most of those
5 tools have looked at steady state type of
6 situations. They do a fantastic job of looking at
7 3D code -- core maps and temperature distribution.

8 But they really haven't gone to things
9 like LOCA or loss of flow or uncontrolled rod
10 withdrawal. Or any of the types of things you
11 might have in a transient situation. Which is near
12 and dear to us in safety.

13 But not necessarily the most important
14 thing to somebody who's designing a normally
15 operating core. There's a little bit of a
16 difference on there.

17 The other thing that I sort of detect
18 from some of the very new applicants is -- or
19 potential applicants is that they don't have the
20 idea of the concept of an evaluation model like the
21 more traditional fuel vendor is doing. Okay?

22 And that I assess my -- I have to
23 define my codes. It becomes my code and my
24 analysis. I'm responsible for the assessment. I'm
25 responsible for the background and QA of that

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1 document. And I need to license that with NRO or
2 NRR.

3 The idea of just simply picking up a
4 tool that's out there, even if it's something like
5 a RELAP or a COBRA, I think you'll find that that's
6 not something that they really want the staff
7 demands for licensing of a tool are stringent.

8 They may also want to recognize that in
9 general you don't pick up a tool that's publically
10 available because you're going to want to make your
11 own twists, put your own features on there. Make
12 it proprietary.

13 That's why you would have an SRELAP,
14 we'll see an NRELAP. We had a COBRATRAC and we
15 immediately put a W in front of it, okay? To keep
16 it proprietary, license that tool.

17 But then use it for your economic
18 advantage as you move forward. I'm not sure that
19 the pre-applicants appreciate the difficulty in
20 doing that.

21 MEMBER CORRADINI: So, let me get back
22 to the process. So, 1 and 3 you identified as what
23 you've called a technical reactor analysis.

24 That's going to be done using some
25 conceptual gas, sodium and other to identify what

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1 might be the technical gaps? Or are you going to
2 wait until a potential applicant comes in and you
3 start having the pre-application conferences with
4 them?

5 MR. BAJOREK: We're going to try to do
6 it generically for sodium fast reactors.

7 MEMBER CORRADINI: But there's already
8 a gap analysis. There's an extensive one that was
9 done by some laboratory that will remain nameless.

10 MR. BAJOREK: Somebody down near
11 Mexico. Someone around there.

12 MEMBER POWERS: It was brilliant and
13 comprehensive.

14 MR. BAJOREK: And that type of
15 information --

16 MEMBER CORRADINI: Is that like Ivanka
17 Trump clothing?

18 MR. BAJOREK: And that will actually --
19 that will speed us along. Okay? That will speed
20 us along in that part of the gap analysis.

21 I think where the more difficult area
22 is going to be for coolant salts, molten salt
23 reactors where the fuel is fixed. And perhaps the
24 most difficult are going to be when fuel salt,
25 molten salt reactors where the fissile material is

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1 moving around with the coolant.

2 That's where we likely are going to see
3 more of a -- more difficulty in this gap analysis.

4 MEMBER CORRADINI: So the thinking
5 process is for 1 and 3 with the technical gap
6 analysis, you'd rely on what was done by NRC back
7 ten years ago for the NGNP.

8 MR. BAJOREK: Yes.

9 MEMBER CORRADINI: And what maybe, I
10 don't know how long ago it was, but similarly for
11 the sodium one.

12 MR. BAJOREK: Yes. There's a lot of
13 information out there now. Part of the staff's
14 problem is getting that.

15 MEMBER CORRADINI: Okay.

16 MR. BAJOREK: Bring that into this
17 light water centric world that we've been living
18 in.

19 MEMBER CORRADINI: Okay. And then the
20 second part of my question would be, so let's say
21 you've done that. And then you're -- you have
22 those two for the sodium and the gas, and you're
23 going to do something for the NSR.

24 Then it seems to me from a process
25 standpoint, if a pre-application conference comes

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1 in with a particular company, are you going to ask
2 them what's high on their list versus what's on
3 your list? Because if you fund this, you'll know
4 that this worry -- this is a concern, that's a
5 concern, this concern, and look at what they're
6 looking at?

7 MR. BAJOREK: We would expect to do an
8 independent part. I mean, they should be doing
9 theirs. We'll likely do one very similar. And
10 then hopefully we agree.

11 MEMBER CORRADINI: Okay. Thank you.

12 MR. BAJOREK: Okay.

13 MS. CUBBAGE: And Dennis, you had
14 asked, do the Applicants know this regarding bullet
15 three? We're doing our best to get that word out.

16 At the upcoming workshop, Steve's going
17 to be making a presentation specifically on what
18 applicants are responsible for for validating
19 codes. And he attended the EPRI DOE GAIN modeling
20 and simulation workshop. Where I think the
21 advanced reactor community was well represented
22 there.

23 And he's explaining all this. So,
24 we're trying to get that word out. It's very
25 important.

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1 MEMBER CORRADINI: Yes. Thank you.

2 MR. BAJOREK: And then the final
3 bullet, our initial efforts' material's experts
4 getting involved in the codes and standards
5 activities as they apply to some of the materials
6 that they're looking towards for these new
7 reactors.

8 Just to show a little bit where our
9 thinking is in terms of the code suites that we're
10 thinking about. Here's one that we're looking at
11 for sodium fast reactors.

12 We might be able to -- well, actually I
13 labeled this one as option two. Because option one
14 is to go and use the Argonne tools. The SASI, SAM
15 as they're developing the tools that they have
16 developed for sodium fast reactors. That's one
17 option.

18 If we need to go to an alternative,
19 okay? We might be able to use TRACE. Some of our
20 international collaborators from our CAMP program
21 have been very interested in sodium fast reactors
22 for some time.

23 They've actually put sodium properties
24 and some of the sodium models into TRACE at this
25 point. And have tested some of that out.

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1 But where we're looking towards NEAMS
2 and CASL and outside of the NRC, maybe in the area
3 of the fuel performance code. We're looking
4 closely at using BISON. Especially when you start
5 to look at TRISO fuel. Or you're looking at fuel
6 designs which are not cylindrical in geometry.

7 The FRAPCON and FRAPTRAN codes are
8 strictly for those types of geometries. We have a
9 long term plan in order to go to a more finite
10 element. Not that it didn't would allow it to use
11 different types of geometries. But BISON can do
12 that right now.

13 And I think we've even seen some
14 calculations for one of the upcoming applicants
15 where they have used BISON to try to simulate some
16 of the -- their fuel.

17 So this is an area we may, if we have
18 to do it very quickly, we might be able to use this
19 tool. CTF is the later name now for COBRA.

20 As we look at conditions in
21 subchannels, we need to look at blockage events.
22 CTF is one we would look at. They have also put
23 sodium properties in this.

24 So, the idea is here, let's look at
25 some capabilities that are out there. We think we

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1 can link these together possibly with our existing
2 tools using the MOOSE frame work that has been used
3 with NEAMS and CASL.

4 It's a way of efficiently getting our
5 tools involved with some of the other ones. And
6 getting us to a capability in the near term,
7 hopefully without sinking a whole lot of resources
8 into that.

9 MEMBER CORRADINI: I have a -- maybe I
10 just -- maybe I don't know what CTF is. Is that
11 just COBRATF?

12 MR. BAJOREK: It used to be. Yes.
13 Yes, a COBRATF.

14 MEMBER CORRADINI: Okay. Fine. Just
15 renamed.

16 MR. BAJOREK: They've renamed it.
17 They've modernized the coding.

18 MEMBER CORRADINI: Okay.

19 MEMBER REMPE: So, I have a question
20 about BISON. In the LWR world they had something
21 called MARMOT that was like this micro-scaled thing
22 for which there was zippo data to validate those
23 models.

24 Now, I thought they were putting
25 perfume in for BISON for the pebble bed. And I'm

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1 not sure how much data there are. But is it going
2 to be like a limited set of models in BISON that
3 you would consider? Is that what you're going to
4 do?

5 MR. BAJOREK: Probably. Actually the
6 way they're headed with BISON right now is
7 approaching it more like we've done with FRAPCON.
8 They're using experimental information to develop
9 things for fission gas release and creep and swell
10 and all of those things which are fun for fuel
11 performance.

12 MARMOT I think was a very good academic
13 idea to try to predict those things academically.
14 But as I understand it, the NEAMS and CASL
15 developers are going more traditional in the idea
16 of using experimental data they've been getting out
17 of some of the test programs.

18 MEMBER REMPE: And only validating it
19 over the conditions for which there are data, and
20 et cetera, et cetera.

21 MR. BAJOREK: Yes. And that's --

22 MEMBER REMPE: First principals,
23 predictions and others.

24 MR. BAJOREK: And that's what's going
25 to be very important for us. Is as we look at the

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1 fuel, where has it been validated? And what are
2 those -- what is degradation mechanisms? And are
3 they reflected appropriately in BISON?

4 Just another example on what we're
5 thinking about for codes, the more difficult
6 problem is that of a salt fuel, a molten salt
7 reactor. This one we think is going to be more
8 interesting.

9 Our thinking right now might be to use
10 a CFD type of code to look at regions of the core
11 where you do not have a lot of structures in a code
12 like a TRACE where a RELAP really is not
13 applicable. We would be able to use TRACE to do
14 the loops and the heat exchangers and other parts
15 of the vessel in the system effectively well.

16 But maybe not necessarily rely on it
17 for the core. Which is going to have to be very
18 closely coupled with a reactor kinetics tool.

19 PROTEUS is one that has been developed
20 actually, I think, by Argonne. They have used it
21 for a fuel salt analysis. It's promising. So,
22 we'll consider that.

23 What gets kind of interesting here is
24 now you have system chemistry effects. All of
25 these molten salts are really a eutectic of two or

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1 three different salts. As you process the fuel,
2 you process the system. You start to get
3 actinides. The chemistry changes over times.

4 And our thoughts were, we're going to
5 need something in there to help us keep track of
6 what that chemical environment is. Because then
7 that's going to have to feed something that will
8 tell us the cross actions that are going on in the
9 reactor, kinetics tool.

10 What goes into those boxes, we'd like
11 to try to stay with tools that we've either
12 developed ourselves, or things that have been
13 developed by the National Labs.

14 System chemistry, when we talked about
15 that at the modeling and simulation workshop, I
16 think everyone sort of had the deer in the
17 headlights look as to what needs to be done there.

18 MEMBER MARCH-LEUBA: Why didn't you
19 consider using PARCS? I mean, I know you're
20 thinking fuel, solid fuel and everything. But
21 PARCS really takes a six-inch cube and you get what
22 a cross section is even in some conditions.

23 MR. BAJOREK: PARCS, is a -- PARCS is
24 likely going to be the one that we're going to use
25 for sodium fast reactors.

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1 MEMBER MARCH-LEUBA: How about for
2 liquid -- no, no, for liquid fuel?

3 MR. BAJOREK: Liquid fuel, it's --

4 MEMBER MARCH-LEUBA: PARCS only cares
5 what is a cross section in the six-inch cube given
6 the temperature of the fuel and the coolant.

7 MR. BAJOREK: And that's a question we
8 have for our kinetics experts right now. What name
9 should go in that box.

10 MEMBER MARCH-LEUBA: It will help on
11 the resource allocation and cost if you keep the
12 same goal.

13 MR. BAJOREK: Oh, yes. That's very
14 important. If we could stay with a tool and use it
15 for multiple types of systems that makes it easier.
16 Because we --

17 MEMBER MARCH-LEUBA: I don't see a
18 reason why PARCS wouldn't work on a molten salt
19 fuel. No, no. It's absolutely none there.
20 There's no reason why it wouldn't.

21 You have to trick -- the way you define
22 the fuel elements on the cross section would be
23 different, but.

24 MR. BAJOREK: I'm not objecting to it.
25 If PARCS is the tool based on accuracy, efficiency,

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1 cost and schedule, I'm putting my -- I'm reading my
2 instructions that we had for our fuel -- our group.

3 If it comes to the top, then that's
4 certainly --

5 MEMBER MARCH-LEUBA: Well, I got the
6 new one.

7 MR. BAJOREK: But we don't want to at
8 this point, rule out any of the other tools. We're
9 going to look at them.

10 MEMBER CORRADINI: I want to go onto
11 Strategy 3 which I was going to do. But I can't
12 help myself any more than say that it strikes me,
13 hand calculations maybe was assisted by some sort
14 of MATLAB or Mathematica or something. There might
15 be a way to do this other than this.

16 In other words, a lot of the systems
17 analysis was begun with a relatively
18 straightforward analysis so that you get a feeling
19 for how these things behave. Kind of back to Dr.
20 Power's point that if you get invested too much in
21 the tool, you start trusting the tool a bit too
22 much.

23 That's -- and this comes back to your
24 Strategy 1 relative to training. It seems to me
25 I'm not going to train people by telling them go

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1 put this input into the computer and get it spewed
2 back out at you.

3 Rather do some hand calculations that
4 give you some feeling as to how the system behaves
5 in an integral sense.

6 MEMBER MARCH-LEUBA: Well, molten salts
7 are such molasses that CFD -- CFD is done to follow
8 all the areas in every single. In that case
9 probably a hand calculation would give you a pretty
10 good --

11 MR. BAJOREK: I love that --

12 MEMBER MARCH-LEUBA: It doesn't need to
13 be a hand calculation. It can be done by the
14 computer.

15 MR. BAJOREK: I love hand calculations.
16 That's the way I scare the code developers.

17 MEMBER MARCH-LEUBA: You can throw lots
18 of money at CFD.

19 MR. BAJOREK: I agree. Okay. Just to
20 summarize Strategy 2. We've put our initial plan
21 together and we're starting into this now.

22 We're considering the various tools.
23 We're entering into a project where we'll look at
24 the PIRT, the phenomena, trying to identify what
25 are going to be the real tough nuts to crack in

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1 each one of these systems.

2 We do have some limits. Funding does
3 kind of limit, and probably more so the
4 availability of staff. The same people that would
5 be looking at fuels performance in the BISON code,
6 they're also being asked to help review the new
7 scale design.

8 They're looking at plant up rates.
9 They're also looking into accident tolerant fuel.
10 So, and in some cases we're pulled in several
11 different directions.

12 Familiarization with the designs is one
13 of those first steps. We need to learn more about
14 the operating conditions, the designs of each of
15 these various systems before we can really, really
16 make firm and permanent decisions on some of these.

17 So, as we come out of fiscal year '17,
18 my goal at least for the code development part of
19 this is to try to come up with a preliminary set.
20 It will be written in pencil. Okay?

21 And we think this is what our direction
22 is going to be. There will still be some questions
23 to answer at that point. But as the designs
24 mature, and as we mature, we'll make changes as
25 necessary. Okay?

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1 MS. CUBBAGE: So just a time check
2 before Bill gets started. We have about a half
3 hour before the scheduled break to get through
4 Strategy 3 and 5.

5 I know you have some people that aren't
6 going to make it this afternoon who were planning
7 to speak. Do you want us to split and go over the
8 lunch?

9 CHAIRMAN BLEY: I do. We -- you have
10 hardly any slides for 3 and 5 by comparison. Kind
11 of like the report.

12 MS. CUBBAGE: Yes.

13 CHAIRMAN BLEY: But we'll probably
14 delve deeply. We have to quit at noon for our own
15 --

16 MS. CUBBAGE: Yes.

17 CHAIRMAN BLEY: Separate meeting.

18 MS. CUBBAGE: Right.

19 CHAIRMAN BLEY: And we'll come back at
20 1:00 as -- I think it's scheduled to come back at
21 1:00.

22 MS. CUBBAGE: We'll get as far as we
23 can.

24 CHAIRMAN BLEY: And you'll go over --

25 MS. CUBBAGE: And we can come back

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1 after lunch.

2 CHAIRMAN BLEY: And we don't have to
3 quit at 4:30. I don't know if all of the people in
4 the afternoon will have enough material to fill up
5 their time. But they might.

6 But we can keep going past 4:30.

7 MS. CUBBAGE: All right.

8 CHAIRMAN BLEY: So, go as far as you
9 can, Bill. And we may slow you down.

10 MR. RECKLEY: Okay. So, looking at the
11 framework. It was the one Strategy that went
12 across near term, midterm, and long term in that in
13 the long term if we find it necessary or if we're
14 directed by the legislation, we might go into
15 rulemaking to actually do the technology increasing
16 the framework of Part 53 that we've started and
17 stopped at on a couple of different occasions.
18 Next slide.

19 So Strategy 3 was divided into seven
20 activities. The first three are closely related.
21 And really, have to be looked at kind of together.
22 Although we split them out as different activities.

23 One is how are we going to reach safety
24 and security in environmental findings? By and
25 large, we do have the criteria.

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1 In the end public health and safety and
2 the safety goal establish a high level framework
3 from which we start and back up to define possible
4 other criteria that we've used.

5 The next one in number two, we're going
6 to talk about it a little bit, is to determine the
7 construct of the licensing basis events. And we're
8 working, as Amy had mentioned, we're working with
9 stakeholders on that during the current set of
10 public meetings that we're having.

11 The third one we've talked about also a
12 number of times. Look -- as we go through this,
13 look for possible gaps in either regulations or
14 policies that we may need to resolve.

15 One item that was --

16 MEMBER CORRADINI: Can I --

17 MR. RECKLEY: Sure.

18 MEMBER CORRADINI: Now that maybe came
19 a will, on number two. So is that going to be a --
20 not procedure, an approach that would then cross
21 whether it be sodium, gas, and other? But then
22 applied individually?

23 Do you know what I'm trying to ask?

24 MR. RECKLEY: Yes. We will have to
25 decide working with stakeholders what we're going

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1 to look at when. The question right now, and it's
2 not clear to me in any case, as to whether the
3 approach that's being proposed is truly generic
4 across the whole spectrum of designs.

5 Not only technologies, but within each
6 technology you can have reactors that vary, as Amy
7 said, from single digit or ten megawatt sizes all
8 the way up too traditional, you know, hundreds of
9 megawatt plants.

10 And so to look across that to see if
11 there's one approach. In the end, the goal is to
12 have a generic construct for any of the non-light
13 water reactors.

14 MEMBER CORRADINI: So we're coming back
15 to 1860?

16 MR. RECKLEY: Yes. Well, to the goal
17 of 1860.

18 MEMBER CORRADINI: Okay. Thank you.
19 Because I like that goal.

20 MR. RECKLEY: Okay.

21 MEMBER CORRADINI: Okay. And so to the
22 extent that one could do that, that's why I was
23 asking about it process wise. Okay.

24 MR. RECKLEY: Right. But we may go
25 through some steps getting there that is not at

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1 first totally technology neutral or technology
2 inclusive.

3 MEMBER CORRADINI: and then maybe we're
4 in 4, and I stopped you, but 4 kind of answered the
5 question similar too over here from one of the
6 members about, I think it was Harold, relative to
7 whether 1 does it in a 50.52 or in a prototype,
8 right?

9 MR. RECKLEY: Yes. And also, a big
10 emphasis was, how do you interact early in the
11 conceptual design phases with the understanding
12 this time that some of the companies we're dealing
13 with are kind of doing things in parallel.

14 Funding, in terms of obtaining funding,
15 regulatory interactions, policy interactions, and a
16 kind of incrementally going through and try to do
17 that all at the same time. So early interactions
18 were important to them.

19 And so I'll talk about that in a little
20 bit more detail.

21 CHAIRMAN BLEY: Let me sneak another
22 question in. Because I don't know where it belongs
23 in all of this stuff.

24 We've heard that when NuScale, well
25 they have come in, that the NuScale application

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1 will -- has tried to closely integrate safety and
2 security. I haven't seen anything yet. That could
3 be true for others. I would hope it would be true
4 for others.

5 Are you considering how you'll deal
6 with that in what you're doing here? Or is it done
7 somewhere else? What's that?

8 MR. RECKLEY: No. It will be done
9 here. And that's why security is included in the
10 top pull. As a matter of fact, next week we'll
11 issue security design considerations.

12 CHAIRMAN BLEY: Oh, next week? Okay.

13 MR. RECKLEY: Yes. Which is a way to
14 bring into the advanced reactor design criteria,
15 security considerations.

16 And then the other part is, NEI has
17 submitted a white paper. And we're going to start
18 interacting with them in terms of trying to make
19 sure that security is considered by both sides as
20 early in the design process as we can.

21 Whether from the designer standpoint
22 that you don't design a plant with a whole bunch of
23 things in mind, safety and other factors, and then
24 when you're done, overlay security and have missed
25 some opportunities perhaps to have done it more

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1 efficiently.

2 And then from the NRC side, to make
3 sure that we're looking at security and also in
4 terms of the reactor sizes and other aspects.

5 CHAIRMAN BLEY: Okay. Thanks. I'm
6 really glad to hear that. Is the NEI document a
7 public one?

8 MR. RECKLEY: Yes.

9 CHAIRMAN BLEY: Okay.

10 MR. RECKLEY: We'll send it.

11 CHAIRMAN BLEY: Mike and Maitri, but
12 the NEI and next week when the staff's document
13 comes out, we want to see that too.

14 MS. CUBBAGE: Right. And this holds,
15 you know, the security design considerations are
16 really stemming from the Commission's advance
17 reactor policy statement was revised to include
18 security to be in early consideration.

19 MR. RECKLEY: Number five, we are
20 updating guidance on prototype testing. And also
21 looking at research in test reactors as it might
22 apply to non-light water reactor designs.

23 CHAIRMAN BLEY: In case you might get
24 one?

25 MR. RECKLEY: In case we might get one.

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1 And looking also at the recent experience on the
2 isotope production side. And just gaining that
3 experience and bringing it to how we might interact
4 with a vendor or the Department of Energy or
5 whoever it might be.

6 I had mentioned earlier that we are
7 working with individual designers for them to
8 develop licensing project plans. This was actually
9 something that the industry had brought up as a
10 good practice.

11 And we're just adopting this into our
12 guidance. The importance of them identifying where
13 they are in the process, what they need from us,
14 what kind of interactions we'll have, what kind of
15 outcome will come from those interactions.

16 And then lastly, number seven is simply
17 to support the longer term efforts. As during the
18 short term to keep in mind that we might do a
19 rulemaking later on. And the next slide.

20 So Dr. Bley had mentioned how you do
21 this. There's any number of models on design
22 processes and how they characterize early design
23 steps and all the way up through construction,
24 operation, and even decommissioning.

25 We brought forward that we would try to

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1 use as close as we can, it doesn't work perfectly,
2 but as early as we can, the DOE critical decision
3 process steps in terms of conceptual. Being where
4 decisions are still being made about the design.

5 And that's where I was going earlier.
6 That if a vendor comes in and says, hey, we're
7 looking at two different approaches to reactivity
8 control. Getting some feedback from the staff as
9 to if there's preferences or benefits. Or if one's
10 acceptable and one's not acceptable. Because that
11 can then feed back into the design process and the
12 business model.

13 As Amy mentioned earlier, there might
14 be a case where they come in and say, I want to use
15 a particular material. And we'd say, well this is
16 what would be required. The business model may
17 collapse at that point.

18 And what we've heard from them is in
19 this venture capital model, they would rather get
20 that decision early then to continue through the
21 process. And then have all the regulatory risks
22 come late in the process.

23 So, one way this is represented in the
24 literature is to kind of bring up some of that
25 regulatory risk to the beginning of the process.

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1 Not let it wait all the way to the end when all the
2 capital has already been sunk.

3 MEMBER MARCH-LEUBA: In that sense, I
4 had a note to give you a comment later. But let's
5 put it here.

6 I'm worried a little bit about the
7 finality of pre-decision, or pre-conceptual design
8 issues.

9 MR. RECKLEY: Right.

10 MEMBER MARCH-LEUBA: I mean, you --
11 some reactor contingencies we only need one shut
12 down system because we have some passive features.
13 And you say okay.

14 If later on you find out that you were
15 wrong, it's almost a backfit to make the changes.

16 MR. RECKLEY: Not a backfit per say.
17 But it would make it more difficult. And that's
18 why in the roadmap, we try to identify that the
19 applicant needs to identify what outcome they want.

20 They can come in and give us, you know,
21 the 50-cent argument. And we'll give them the 50-
22 cent answer that it looks okay from what you've
23 said.

24 And that's worth what you paid for it.
25 Which is, you've got my opinion as a staffer. It's

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1 not reference able in a future submittal.

2 MEMBER MARCH-LEUBA: But you can see
3 how that is going to work out, right?

4 MS. CUBBAGE: Right.

5 MEMBER MARCH-LEUBA: And you tell them
6 it's okay to have only one of these. And then ten
7 years later after it's built --

8 MR. RECKLEY: If they want us to write
9 it down such that they can reference it in a future
10 application, we have processes for that. And that
11 would be along the lines of a topical report.

12 They submit it. We write a safety
13 evaluation. ACRS has a shot to review it. Then
14 they get a more formal document that says yes, the
15 NRC did look at this. And gave either approval, or
16 conditional approval, again at the staff level.

17 The Commission didn't weigh in.
18 Backfit doesn't come into play.

19 MS. CUBBAGE: Right. And that approval
20 would probably have a multi-page list of, we assume
21 this, we assume this, we assume this, if this
22 changes, if this changes --

23 MEMBER CORRADINI: Is that like the 65
24 items on protection systems with the SMR I might be
25 aware of?

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1 MS. CUBBAGE: Maybe.

2 MEMBER CORRADINI: Okay.

3 MS. CUBBAGE: But I was thinking of the
4 ESBWR pre-application review where we approved
5 their models. We approved their test program, et
6 cetera. And there's a whole list of, well, if you
7 end up needing reflow, you know, all bets are off.

8 So there are whole lists of conditions.

9 MR. RECKLEY: And then I'll take it,
10 you know, that the ultimate step is that we send
11 something all the way from the staff, involving the
12 ACRS, and send it up to the Commission. And it
13 becomes a final agency position.

14 So we -- it really will depend. And
15 that's part of the licensing plan. And something
16 we'll just have to talk to designers as we go
17 through the process.

18 And then --

19 MEMBER CORRADINI: So, let me just --
20 maybe this is what you're implying. So the yellow
21 is the DOE vernacular.

22 MR. RECKLEY: Um-hum.

23 MEMBER CORRADINI: And the black is the
24 NRC vernacular trying to be overlaid.

25 MR. RECKLEY: This is all DOE.

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1 MEMBER CORRADINI: Oh, is it? Even the
2 black is? Because I was thinking that the
3 equivalent of CD-2 would be essentially a PSAR.

4 MR. RECKLEY: Yes. That's true. But
5 that's -- but this is not a graph. This is a view
6 we got.

7 MEMBER CORRADINI: Okay. Excuse me.
8 Excuse me.

9 MR. RECKLEY: But, what you said is
10 true.

11 MEMBER CORRADINI: Okay.

12 MR. RECKLEY: That would be roughly --
13 CD-2 would basically be where we do the pre-
14 application reviews I would say for the PRISM and
15 MHTGR in the 90's.

16 MS. CUBBAGE: And then you, if you're
17 in a Part 50 world, you've got to figure out
18 where you're at on the CP.

19 MEMBER CORRADINI: Yes. That was going
20 to be my next question. But that's fine. But at
21 least you -- and then when you earlier noted -- you
22 used the term not approval, but assessment of a
23 conceptual design. It's back in the CD-1ish?

24 MR. RECKLEY: Yes.

25 MEMBER CORRADINI: Okay. Okay. And --

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1 MS. CUBBAGE: And at the pre-conceptual
2 phase we may get somebody coming in with detail in
3 one area.

4 MEMBER CORRADINI: Which might be a
5 topical report that they would ask for an SER?

6 MS. CUBBAGE: Maybe.

7 MEMBER CORRADINI: Okay.

8 MR. RECKLEY: And the other thing I'll
9 mention is, there's another round of DOE guidance
10 that we can also work with applicants if they
11 choose to use it. And that's the whole technology
12 readiness levels.

13 Because some work is done and
14 characterized that way, and it aligns roughly to
15 this critical decision process. So, I think there
16 is nine. Or it depends. Whatever.

17 MEMBER SUNSERI: I'd like to look at
18 Jose's question from the other side of it. So, his
19 question was, you have an issue. You say it's
20 okay. But later on you find out maybe it's not so
21 okay. And you've got something to do.

22 What about, you know, the case where an
23 issue comes up and you say like well, there's no
24 way we'll ever accept that. And that's the wrong
25 decision. But you don't -- you won't know it's the

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1 wrong decision because the vendor pulls out and
2 they shut down and everything else.

3 But yet, with further research or
4 effort or whatever, it could have turned out that
5 that would have been an okay conclusion or what
6 have you. What safeguards are there from an overly
7 conservative decision killing a reactor design
8 prematurely? I guess is the way I'd state that
9 question.

10 MR. RECKLEY: I would tend to think
11 that the way that would play out is during the
12 interactions with a particular designer who's bring
13 forth that question, so they bring forth and say
14 okay, here's our proposal. And again, I'll go back
15 to reactivity control.

16 Here's our proposal for a reactivity
17 control system. And we look at it and say no. And
18 if that is really going to be critical and
19 ultimately challenge the success, I would hope most
20 of them would simply not take our first no as the
21 final answer.

22 And they would come back. And those
23 discussions would work. Now, I'll be, you know, if
24 we say no and they say well, all right, we give up,
25 and leave, then that question, there is a bit of a

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1 risk that that position if you will, kind of stays
2 on the book.

3 MEMBER MARCH-LEUBA: And I wouldn't
4 just say that the most likely scenario you say no,
5 because we don't have sufficient data to justify.

6 MS. CUBBAGE: Yes. And if you want to
7 go get the data, then yes.

8 MR. RECKLEY: Right. And that's the
9 other aspect that Amy mentioned. That most of the
10 approvals, the earlier you are in this process,
11 they're going to be -- to the degree we give
12 approvals, they're going to be conditional.

13 Yes, but contingent on your research
14 program proving that what you just told us was
15 true, or your analysis.

16 MEMBER MARCH-LEUBA: Alternatively no,
17 contingent on.

18 MR. RECKLEY: Right. Right.

19 MS. CUBBAGE: No because.

20 MEMBER REMPE: To bring up this thing
21 about the quality again, I know you've said well,
22 it's a graded approach. But at some point where
23 they don't have the necessary quality, can you not
24 get yourself into a situation, what if for example
25 in the Transatomic case that they've been drawn the

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1 other way.

2 And instead of not going critical for
3 very long or at all, they'd gone the other way.
4 And you've made a finding with respect to
5 reactivity control for example.

6 It just seems like at some point there
7 should be some expectations communicated to these
8 applicants of what the agency antic -- you know,
9 maybe it's a caveat on the part of your conditional
10 approval process saying we assumed you had adequate
11 QA. That you had independent review, et cetera, et
12 cetera in your submittals.

13 It just seems like it's a very fluid
14 thing. And when we think about even the more
15 mature vendors and some of the things that have
16 happened with certified designs, maybe there should
17 be more QA imposed on folks in developing the
18 design.

19 MS. CUBBAGE: If they're developing a
20 design, if they're developing what's going to be
21 submitted, they have to be under an Appendix B
22 program.

23 If they're doing testing that's going
24 to be relied on for the design, if they're doing
25 computer analysis that's going to be relied on for

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1 the design, it doesn't matter whether they're an
2 applicant yet or not. It has to be under Appendix
3 B.

4 But, in some of these early
5 interactions, they maybe at a very conceptual
6 level. And they're going to get very preliminary
7 feedback from the NRC.

8 I don't see any other way around that.

9 MEMBER REMPE: If one could impose a
10 little bit more earlier on. Even recognizing it's
11 not the final design. But it just seems like
12 everybody's spinning their wheels and their venture
13 capital, et cetera for -- and we could end up with
14 some preliminary feedback.

15 Which again, the Commissioners or ACRS
16 might push back and say no. But, it just seems
17 like if you had some expectations early on that
18 were communicated that you might have a more
19 productive process.

20 MS. CUBBAGE: We are going to have our
21 QA folks at our upcoming workshop. They're going
22 to be presenting on what the QA requirements are
23 and what we're trying to communicate that.

24 You know, we are certainly airing on
25 the side of it needs to be quality.

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1 MEMBER REMPE: Well again, the
2 Canadians again, which seems to be touted a lot by
3 some folks, have said, we get a better quality
4 application because we do spot checking on the
5 processes earlier on to ensure they have adequate
6 quality.

7 MR. RECKLEY: Yes. The -- I would
8 argue that the difference would be where you are on
9 this plot. And even if you're up at the
10 preliminary design process, I think what you're
11 saying would be the expectation that they've had
12 that in place.

13 But, the earlier you interact when
14 these companies are small, and they don't have an
15 Appendix B program yet, to say we won't talk to you
16 until you get your Appendix B program, I think we
17 would be told that that's not answering the mail.

18 MEMBER REMPE: I agree with you on
19 that. But is it imposed and understood in the
20 preliminary design process stage they need to have
21 certain aspects of the Appendix B process in place?

22 I mean, maybe they don't have the full
23 thing, but do they have some -- at some point do
24 you have some minimum requirements like well, it
25 was kind of in a hurry on there.

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1 MR. RECKLEY: I think we would just
2 depend on the review of the -- to catch that.

3 MEMBER CORRADINI: But I don't -- I
4 guess I'm kind of with them Joy, I think that's
5 requiring things that might be considered, I don't
6 want to use the word out of bounds, but okay. A
7 bit too much.

8 MEMBER REMPE: But say T&A makes some
9 conclusions that --

10 MEMBER CORRADINI: I mean, was -- was
11 SHINE require --

12 MS. CUBBAGE: We're not giving them a
13 license though, I mean.

14 MEMBER CORRADINI: Was SHINE required
15 to have an Appendix B QA to get the construction
16 permit?

17 MEMBER REMPE: Were they required to
18 have any?

19 MEMBER CORRADINI: It would have a
20 process. And the process was reviewed. But
21 whether or not all the pieces fit into the process
22 going into a construction permit, I'm not clear.

23 I'm just trying to figure out what a
24 CD-2 is. That's why I was asking what the black
25 and the yellow is.

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1 MR. RECKLEY: No, no. Yes.

2 MEMBER REMPE: But again, a process
3 with certain things that is reviewed. That again,
4 I'm not sure maybe it's already there and you're
5 doing that.

6 But I haven't seen that documented as
7 clearly as other places. And think about some
8 other examples where even where they were supposed
9 to have but they didn't.

10 MR. RECKLEY: Yes. Again, I think what
11 we would depend on is the -- that the preliminary
12 interactions at the pre-conceptual or even the
13 conceptual design phases, as you move through
14 assuming they do, to the next stages, then the
15 expectations, the level of detail, the quality
16 requirements, all of that start to come back or
17 don't start, they come into play at that point.

18 And even if there was an error made
19 earlier on, it would have been caught later in the
20 process. And that would have -- that will have
21 wasted resources. But that is a -- that's the
22 price. The next slide.

23 So this complicated slide just lays out
24 the fact that designers do have a lot of
25 flexibility on how they're going to interact with

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1 us. And as has been mentioned, they can do Part
2 50. They can do Part 52. They can do combinations
3 of Part 52 and Part 50.

4 The --

5 MEMBER CORRADINI: Where's the
6 prototype map?

7 MR. RECKLEY: Well, the --

8 MEMBER CORRADINI: The prototype map or
9 roadway?

10 MR. RECKLEY: the prototype roadway
11 could most likely come under the Part 50 trail.
12 And it would be conditions added on through the
13 PSAR and FSAR.

14 MEMBER CORRADINI: In terms of what?

15 MR. RECKLEY: And the operating
16 documents that go along with that. The technical
17 specification, the license conditions and such.

18 MEMBER CORRADINI: Okay.

19 MS. CUBBAGE: Right. And this graph
20 doesn't even cover the RTR route.

21 MR. RECKLEY: So basically it lays out
22 the major areas. Pre-application assessments,
23 standard design approval, which is a Part 52
24 process, which can then be referenced if an
25 applicant were to choose to use that in either a

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1 Part 50 or Part 52 application for design
2 certification under 52. Or a construction permit
3 operating license under Part 50.

4 Really in most of the discussions we're
5 having the focus is on pre-application assessments.
6 And our message is the importance of the big green
7 box on the right side, talking about supporting
8 activities.

9 These are the meetings, the submittals
10 of white papers, topical reports, the participation
11 in standard development organizations, and so
12 forth. So, that really lays out the -- much of the
13 ground work that a lot of people forget about.

14 That even for the operating fleet, how
15 much work was done through those vehicles before
16 you ever got a PSAR or a final safety analysis
17 report. It's the topical reports on systems, the
18 topical reports on codes and assessment techniques
19 and so forth.

20 So, this lays out again, all the
21 different possibilities that a designer has. And
22 how they might interact with us early. And how
23 they get various levels of feedback, be it informal
24 or formal through safety evaluations all the way up
25 to a Commission decision on a particular topic if

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1 it's critical to their decision model.

2 Next slide.

3 MEMBER KIRCHNER: Bill, would you in
4 this big box called pre-application assessments,
5 would you put some structure in that? In other
6 words, the danger that I see for the agency is that
7 you're going to have potentially a wide variety of
8 designs, but also, people on the different -- at a
9 different level.

10 MR. RECKLEY: Yes.

11 MEMBER KIRCHNER: Say you have a major,
12 you know, past vendor with the LWR fleet coming in,
13 they obviously bring to the table all their
14 experience to date. One therefore would expect a
15 higher level of completeness and such.

16 Where someone maybe just the outfit you
17 described. It's 12 people. They're not ready to
18 implement Appendix B at this point, et cetera.

19 But, wouldn't it benefit you and
20 benefit the applicants and take some of the
21 arbitrariness out of this if you had some
22 definition of what is going to be done for the
23 people that don't know your existing processes?

24 Do you see where I'm going with this?

25 MR. RECKLEY: I do. And you're exactly

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1 right.

2 MEMBER KIRCHNER: Let's assume they
3 don't really know what a topical report entails.
4 Okay. So they may go into this exercise as you
5 thinking that wow, they just gave us the green
6 light. I'll run back to my venture capitalist and
7 say the NRC's onboard with this concept and such.

8 So, what I'm -- I think it benefits
9 both sides that there's some -- there's some
10 guideline, some definition of what a conceptual
11 design is, et cetera, as they go through this
12 exercise and engage you.

13 So that there aren't, you know, -- so
14 it doesn't appear arbitrary or capricious to some
15 applicant when they really don't understand, you
16 know, all your processes.

17 MR. RECKLEY: Part of the interaction
18 will be --

19 MEMBER KIRCHNER: I know you're having
20 these stakeholder meetings and such. But --

21 MR. RECKLEY: But that's to make sure
22 they do.

23 MEMBER KIRCHNER: But at some point you
24 have to codify it don't you? And say this is how
25 we're going to run this game.

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1 MR. RECKLEY: Right. And the way we'll
2 plan to --

3 MEMBER KIRCHNER: Peaceful benefits
4 from the rules. And so does the NRC.

5 MR. RECKLEY: And the way -- the way we
6 plan to do that is to issue, I mean, it was issued
7 in draft and we're talking to stakeholders during
8 public meeting about this roadmap.

9 And we'll expand it as the discussions
10 go on. For example, under standard design
11 approval, one topic, or one advantage of the
12 standard design approval under Part 52 is the scope
13 of that rule is defined as being a major portion of
14 the plant that differs from the design
15 certification. Which is essentially the design.

16 So, the industry is working to come up
17 with a definition and guidance on what is a major
18 portion such that we can enhance the use of the
19 standard design approval process.

20 MEMBER KIRCHNER: Right.

21 MR. RECKLEY: So, that will be coming
22 up in the future. But what we're trying to do --
23 you're going to gavel?

24 CHAIRMAN BLEY: I'm going to gavel.
25 And we're going to stop here. I want you to come

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1 back to this slide.

2 MR. RECKLEY: Okay.

3 CHAIRMAN BLEY: Because I think a
4 number of us have things that branch off of this.

5 MR. RECKLEY: Okay.

6 CHAIRMAN BLEY: We'll come back at
7 1:00. At this point we'll recess until 1:00.

8 (Whereupon, the above-entitled matter
9 went off the record at 11:59 a.m. and resumed at
10 1:02 p.m.)

11 CHAIRMAN BLEY: The meeting will come
12 to order. We are back to you, Bill.

13 MR. RECKLEY: Okay.

14 CHAIRMAN BLEY: Oh, and I promised a
15 question if you --

16 MR. RECKLEY: Yes.

17 CHAIRMAN BLEY: -- left that slide up.
18 You're going to get to this, but I wanted to jump
19 ahead while this slide was up. A meeting or two or
20 three ago, when we were talking about this stuff, I
21 had asked if the enhanced safety focus review that
22 Lynn Mrowca and that group were working on was part
23 of this, and I thought the answer was no, but now I
24 see it two slides later. Can you link the two
25 together? Or you can do it later when you get to

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1 that slide.

2 MR. RECKLEY: I will get to that slide,
3 but while I -- while I have this up, are there
4 other questions? I mean, again, the emphasis --
5 picking up where I left off, the emphasis on this
6 slide is that it provides a lot of flexibility, and
7 that is a problem for some people because if you
8 are looking for a structured process, it can look
9 chaotic. On -- on the other hand, we are faced
10 with a real situation in which, if you go back a
11 slide or two, we are dealing with designers, just
12 the -- the DOE -- yeah, we are faced with designers
13 that might characterize them somewhere between CD-2
14 and 3, all the way down to CD-0, and the way we
15 interact with those various designers will have to
16 change to reflect the technology readiness levels,
17 or technology maturity, and what those designers
18 want to interact -- want to get from the NRC during
19 interactions.

20 It for example could be possible that a
21 design -- and this is all just hypothetical, but a
22 design like PRISM might want to say just to keep
23 things in motion, just to keep us interacting with
24 the NRC, we are going to submit something, right?
25 We -- we largely have not had submittals from --

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1 from DEH on PRISM for a few years now, so -- and
2 the same is true for all the advanced reactor
3 designs, so even though they are relatively mature,
4 and in theory could come in with even an
5 application for a formal approval, they might not
6 want to exercise that and come in for one of those
7 support documents.

8 And so not knowing what people want or
9 -- or are willing to spend of their money or of
10 DOE's money, or the cost share activity of -- of
11 combinations thereof, we just have -- have kind of
12 left it open for -- we will -- you know, we are
13 from Washington. We are here to help. We will --

14 CHAIRMAN BLEY: That seems an
15 appropriate point to ask my next question. Can you
16 leave that other slide up? Where in all the things
17 you are doing do you plan to help people who don't
18 know these processes understand what the difference
19 is between CD-0 up to CD-4, what is expected at
20 each point and the things Amy said earlier about
21 construction permit is -- was that CD-2, I think?
22 I can't bring everything up here, but that kind of
23 linkage: where are people going to find that?

24 MR. RECKLEY: We talk about this during
25 the public meetings, the six-week periodic

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1 meetings, at the workshops, the joint DOE/NRC
2 workshops. We will be talking about it at the RIC.
3 We talk about it in actual pre-application
4 discussions with the designers, individual
5 designers, and so basically, any opportunity we
6 have, or any questions that are raised by the
7 designers, we will interact with them and try to --
8 not only for us to receive information from them,
9 but for us to give information to the designers
10 about our processes and how we can interact with
11 them.

12 CHAIRMAN BLEY: Okay. Makes sense, but
13 I am not sure why it is not in a document like this
14 one.

15 MR. RECKLEY: Okay.

16 MS. CUBBAGE: Well, I was going to say
17 Bill has put out the draft regulatory roadmap,
18 which I have mentioned --

19 CHAIRMAN BLEY: Ah yes.

20 MS. CUBBAGE: -- a few times, so that
21 talks about --

22 CHAIRMAN BLEY: That makes these
23 linkages?

24 MS. CUBBAGE: Well, it talks about this
25 topic, and also, NEI is working on guidance for

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1 applicants in how they would interact with the NRC,
2 and so some of this will be addressed. Hopefully
3 you will hear some of that this afternoon from --

4 CHAIRMAN BLEY: That would be nice.

5 MS. CUBBAGE: -- other stakeholders --

6 CHAIRMAN BLEY: Okay.

7 MS. CUBBAGE: -- but if not, the
8 concept would be that they are putting together
9 some guidance on exactly what you're talking about,
10 and then we could potentially roll that in as an
11 appendix to our regulatory review roadmap to have
12 more of a comprehensive picture on how to engage
13 with the NRC at the various stages.

14 CHAIRMAN BLEY: Okay. Thanks.

15 MR. SEGALA: And I just want to add too
16 with the -- when Bill mentioned earlier a licensing
17 project plan that the applicant would submit to us,
18 and then we're having a series of discussions with
19 these pre-applicants on the licensing project plan.
20 We don't want to have pre-application activities
21 until we understand what they are trying to get out
22 of it, and they have an understanding of what kind
23 of findings we are going to make, so it is during
24 that process that we're going to have lots of
25 discussions and make it clear, well, this is -- you

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1 know, you're hoping to get a topical report SE,
2 this is what comes along with that, and this is the
3 kind of finding we can make to try to make it clear
4 to them before we start charging them money for the
5 review that they understand what they are getting.

6 So -- so you kind of have the general
7 guidance. You have the information we have been
8 communicating at all the stakeholder meetings, but
9 then you -- you have the -- the personal
10 interactions that we have, and it can be quite a
11 bit of interactions, with these new vendors,
12 teaching them how to -- to interact with us, how
13 to, you know, identify something as proprietary,
14 how to -- you know, all the interactions that they
15 have to do with us, we are, you know, holding their
16 hand through that process.

17 CHAIRMAN BLEY: Okay. Thank you.

18 MS. CUBBAGE: Some of these discussions
19 were in the first version of the vision and
20 strategy document, but since that time, we
21 published the regulatory review roadmap, we had
22 moved further along, and I thought it best to just
23 focus on that product rather than having the vision
24 and strategy be stagnant and get out of date, so
25 some of that was removed, yeah.

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1 MEMBER KIRCHNER: I would -- would you
2 back up one slide --

3 MS. CUBBAGE: Whoops --

4 MEMBER KIRCHNER: -- please?

5 MS. CUBBAGE: -- trying.

6 MEMBER KIRCHNER: So I come out of the
7 DOE lab system. I know this process very well. I
8 would not use this here. I think you will just
9 confuse people. There are specific requirements
10 with each block along the line that will be a lot
11 different than what a would-be applicant testing a
12 new concept with you will be prepared to present,
13 and this -- I don't know if they will go look at
14 DOE Order 413 or not and read all the details of
15 this process, and I -- I think it may be confusing
16 to them.

17 MR. RECKLEY: That is a -- it is a good
18 point. Again, we looked at a variety of models
19 that are available in textbooks and other
20 government agencies and so forth. I will mention,
21 the only thing we are pulling forward out of the
22 DOE order is basically this terminology. This --
23 they use the order in this process for funding
24 decisions and -- and so forth.

25 MEMBER KIRCHNER: That is right.

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1 MR. RECKLEY: I mean, that is the
2 critical decision, is whether -- whether to go
3 forward with a project and the various phases of
4 funding. That obviously is not really applicable
5 to this --

6 MEMBER KIRCHNER: Like --

7 MR. RECKLEY: -- this.

8 MEMBER KIRCHNER: -- CD-0 to kick it
9 off is a mission need statement.

10 MR. RECKLEY: Right.

11 MEMBER KIRCHNER: Your would-be
12 applicants are not going to come in with something
13 --

14 MR. RECKLEY: And we --

15 MEMBER KIRCHNER: -- that looks --

16 MR. RECKLEY: -- are not --

17 MEMBER KIRCHNER: -- anything like
18 that.

19 MR. RECKLEY: -- really -- that is
20 right, and we are not really, in the guidance that
21 we are preparing, using the CD terminology. We are
22 using primarily the pre-conceptual, conceptual,
23 preliminary, final, just -- just as a flow chart
24 process.

25 MEMBER KIRCHNER: So again, I --

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1 MR. RECKLEY: Okay.

2 MEMBER KIRCHNER: -- just would
3 encourage in this reg roadmap that these terms are
4 defined, and that people understand what they are
5 getting, because I have also spent the last 15
6 years following things on the Hill and watching the
7 interaction of the industry and the Congress, and
8 one could be led to believe that if it were not for
9 the NRC, all these concepts would just sail right
10 along, and I don't think that is accurate.

11 So if someone starts going through your
12 system and does not understand what you're giving
13 them precisely --

14 MR. RECKLEY: Right.

15 MEMBER KIRCHNER: -- then they may go
16 to their congressman, which is usually the first
17 phone call, not the NRC, but the Congress, and
18 complain that this is an arbitrary and capricious
19 system that the NRC is running. So I just think
20 for both sides, it begs for more clarity and
21 definition, and again, I think this is notionally
22 kind of what you want to do, but I wouldn't hold
23 that up as a roadmap because if they do read 413,
24 they are going to go, wow, this is -- this is not
25 what I was anticipating at all.

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1 CHAIRMAN BLEY: That is kind of where I
2 was coming from.

3 MR. RECKLEY: Okay.

4 MEMBER CORRADINI: But just to clarify,
5 so this is just as -- as you say, notional, but the
6 next slide, where we were, that literally is a
7 pictorial summary of the roadmap, and that is --

8 MR. RECKLEY: It is, and on the -- and
9 on the right side, it is hard to read. You can see
10 part of the difficulty is that that is roughly the
11 design stage, and you can see that we would be
12 interacting in the final design stages through
13 various possible regulatory processes, and the same
14 is true under the -- the pre-conceptual is a little
15 easier. We would only be doing pre-application
16 discussions during the conceptual design phase.

17 MEMBER CORRADINI: Okay.

18 MR. RECKLEY: So --

19 MEMBER CORRADINI: But I -- I guess --
20 okay. At least the way I thought about it when I
21 was reading this part of the IAP Volume 2 --

22 MR. RECKLEY: Right.

23 MEMBER CORRADINI: -- Strategy 3 point
24 et cetera, this cartoon, it was not as complicated
25 in the -- this cartoon is the roadmap.

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1 MR. RECKLEY: Right.

2 MEMBER CORRADINI: Okay.

3 MR. RECKLEY: It is.

4 MEMBER CORRADINI: And the previous
5 cartoon, which you don't have to go back to, is
6 mainly notional.

7 MR. RECKLEY: Yes.

8 MEMBER CORRADINI: Okay.

9 MEMBER RAY: Is this characterized as
10 an alternative to quote "stepwise," or is this a
11 way of implementing a stepwise regulatory process?

12 MR. RECKLEY: We would say the latter.
13 This is -- the difficulty is that if you have in
14 your head a logical stepwise starting from pre-
15 conceptual all the way through, you can do that
16 through this process and use these various tools.
17 The difficulty comes in that some applicants,
18 because they are far enough along, would not need
19 the -- there's different starting points for
20 different applicants.

21 MEMBER RAY: Well Walt mentioned a
22 dialogue that goes on in other places, and the
23 stepwise that I perceive being presented there is
24 first we approve this, then we approve that, but
25 you don't go back and reconsider --

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1 MR. RECKLEY: Right.

2 MEMBER RAY: -- step one. You did
3 that, and that is -- I take that to the bank, and
4 then step two, I get that done, and I take that to
5 the bank, and --

6 MR. RECKLEY: Right.

7 MEMBER RAY: -- on and on, and that of
8 course is I guess what I am concerned that we would
9 wind up doing, is basically issuing a DCD on a
10 stepwise basis. We would have 10 increments to the
11 DCD, and when you got the tenth one, you had the
12 whole thing, but when you got five, you had half of
13 it, and that is the thing that -- that is the image
14 that is concerning to some of us, I know, that --
15 that is being -- is in some people's mind, or at
16 least apparently is, and which would be very
17 concerning.

18 MR. RECKLEY: Yes. I am not -- I am
19 not convinced that that can be done because of the
20 interrelationships between --

21 MEMBER RAY: I am --

22 MR. RECKLEY: -- the parts.

23 MEMBER RAY: -- convinced it can't be
24 done, Bill, so let's just begin there.

25 MR. RECKLEY: Okay.

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1 MEMBER RAY: If that is -- if anybody
2 thinks that can be done, we ought to talk about it.

3 MR. RECKLEY: But -- but the way we are
4 using the term "stepwise" is that a designer can
5 walk through -- and again, they can -- they can
6 start from different maturities, but in any case,
7 they could step through and get some comfort in a
8 pre-application review, and we would issue a
9 document like we did for MHTGR and PRISM, and say
10 for a pre-application safety evaluation.

11 Then with that comfort, they could then
12 go maybe to the next step if they wanted to
13 exercise the standard design approval, which is a
14 formal application and a formal document with a
15 safety evaluation, ACRS review, and so forth, that
16 they can then use that as a reference in either an
17 FSAR -- so that -- they build it that way,
18 stepwise, but not --

19 MEMBER RAY: Those are steps too.

20 MR. RECKLEY: Yes, different steps.

21 MEMBER RAY: Different steps, and I
22 just want to make sure it is -- it is what you're
23 talking about --

24 MR. RECKLEY: Right.

25 MEMBER RAY: -- and not something else.

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1 MR. RECKLEY: Okay.

2 MS. CUBBAGE: But what you were talking
3 about is sending in parts? That could also be all
4 part of a standard design approval where they could
5 submit portions of a design and get approval for
6 those, and then submit other portions, but we're in
7 discussions to figure out what does a major portion
8 mean? Bill mentioned that earlier. Does it mean
9 you have to have enough of a design to be able to
10 make a meaningful conclusion?

11 MEMBER RAY: Well, I mean --

12 CHAIRMAN BLEY: The problem though is
13 the one Bill hit on, and we saw it in the design
14 certs. Almost any way you cut it, there are
15 linkages that either won't get picked up or will
16 cause problems later.

17 MS. CUBBAGE: Yes. We fully appreciate
18 that.

19 MEMBER RAY: Yes. That is -- if
20 somebody thinks we can do it the way I just heard
21 you express, which is fully approve a portion --

22 MR. RECKLEY: Okay.

23 MEMBER RAY: -- then I -- I think that
24 requires more discussion.

25 MR. SEGALA: And I think the way maybe

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1 it might be done, if they submit, you know,
2 whatever, Chapter 15 and Chapter 4, several
3 chapters together of an application, we review
4 that, write an SE that is conditional on certain
5 things, and then we review other chapters, write a
6 conditional SE, and then when all the chapters are
7 done, we then consolidate that all and write a
8 final SER packaging the whole thing together.

9 MEMBER RAY: I know. We talk about
10 that down at Forrestal, but the problem is the
11 conditions are just so lengthy that it is -- it
12 becomes problematic in the political realm, it
13 seems to me.

14 MR. RECKLEY: And we will talk -- that
15 is two more slides, we will address this topic
16 again.

17 One of the things that we brought out,
18 and unless we hear otherwise, is that at least at a
19 chapter level, we are going to basically organize
20 things the same way they have traditionally been --
21 been organized. So these are just the 19 chapters
22 of an FSAR, if you're familiar with other aspects
23 of designs, applications for either design
24 certifications, operating licenses, or other formal
25 approvals.

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1 So we are going to organize it this way
2 with the understanding that for many of these
3 designs, once you get below the actual chapter
4 heading, it won't look very much like a light water
5 reactor FSAR because the design is different enough
6 that even the next level down after the chapter
7 starts to differ enough that you won't have it, and
8 therefore, the standard review plan and all of the
9 other material that we typically rely on for light
10 water reactor review will not be applicable. So --

11 MEMBER KIRCHNER: Can we test that,
12 Bill? Let's test it. Let's pick one: Chapter --

13 MR. RECKLEY: And --

14 MEMBER KIRCHNER: -- 4. Pick Chapter
15 4, no, just --

16 MR. RECKLEY: Yes, okay.

17 MEMBER KIRCHNER: -- take it. It's
18 going to be so different that you wouldn't do what
19 you would do -- it would be so different that it
20 wouldn't be like the LWR. In what way?

21 MR. RECKLEY: I am only saying the way
22 the information is -- is organized. In Chapter 4,
23 it actually does hold in that it is organized by
24 fuel --

25 MEMBER KIRCHNER: Yes.

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1 MR. RECKLEY: -- and reactivity control
2 systems and so forth, but one level below that,
3 they will -- they will start to differ because the
4 fuel is going to be a different form, there won't
5 be cladding, for some designs the reactivity
6 control might be different --

7 MEMBER KIRCHNER: Yes.

8 MR. RECKLEY: -- so we will take it as
9 far as the similarity goes, but we're not going to
10 force-fit the technology into the format.

11 MEMBER KIRCHNER: Okay.

12 MR. RECKLEY: So we will start to
13 develop.

14 Now, the other one topic I wanted to --

15 MEMBER KIRCHNER: I would --

16 MR. RECKLEY: -- mention --

17 MEMBER KIRCHNER: -- just submit that
18 it won't be that different.

19 MS. CUBBAGE: The underlying --

20 MEMBER KIRCHNER: I have been this -- I
21 have been down this path with you --

22 MR. RECKLEY: No, it won't be that
23 different.

24 MEMBER KIRCHNER: -- for the MHTGR and
25 for PRISM.

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1 MR. RECKLEY: And they will organize
2 this --

3 MEMBER KIRCHNER: Very similar.

4 MR. RECKLEY: They will organize this
5 way. We were only trying to get this past us
6 because there was a decision point to be made. I
7 mean, it is not too late, but we are -- basically,
8 unless we hear otherwise, we are going to continue
9 with this format.

10 If we were going to organize the
11 information a different way, now is the time to
12 make that decision, and -- and the -- the easiest
13 way to think about it is if you were going to go
14 into the IAEA safety guides, they are organized
15 slightly differently in the way they -- it is the
16 same information, it is just organized slightly
17 differently. If you wanted to go that approach, we
18 are just asking tell us now. Otherwise, are going
19 to start to develop the guidance using this.

20 I don't want to make too big a deal out
21 of this because it is just basically whether it is
22 sliced or diced, and how it is organized. It is --

23 MEMBER KIRCHNER: I don't --

24 MR. RECKLEY: -- the same --

25 MEMBER KIRCHNER: -- either, Bill, but

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1 I wanted to take up the next topic, then, which is
2 the standard review plan. And there -- now -- and
3 I understand the criteria now where you are going
4 to be looking at different design criteria, et
5 cetera. All I would like to emphasize, though, is
6 that having that injects predictability in the
7 review on both sides.

8 So is there -- is there an assumption
9 that there will be a standard review plan adapted
10 for each technology type, or for generic advanced -
11 - non-LWR advanced reactor, or what is your
12 thinking about that?

13 MR. RECKLEY: Let me get to the -- to
14 the next slide.

15 The only last point I wanted to make on
16 this slide was that what we are basically offering
17 in the yellow there is that if a -- in the pre-
18 application phase, if an applicant wants to give us
19 basically an FSAR, we can do a preliminary design
20 assessment similar to what we did for the -- in the
21 1990s, and we can do that complete kind of an
22 evaluation.

23 What we are also saying, though, is, as
24 I mentioned earlier, there may be critical design
25 aspects that are going to determine the feasibility

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1 of a design, and if that's identified early on, we
2 can address any sub-part of these -- this structure
3 to get to that decision that a designer needs to
4 make. So it may not make a lot of sense for them
5 to look at power conversion and possibly even
6 instrumentation and control if the critical issue
7 is the fuel, for example.

8 So Amy, if you can go to the next one,
9 we will pick up on the standard review plan and
10 discussions. What we are going to try to do is we
11 will use the guidance as it exists, but we -- with
12 the -- with the understanding that it was written
13 for light water reactors, and, again, in many
14 cases, you are going to run into the case where the
15 applicability starts to fall apart almost from the
16 beginning.

17 MS. CUBBAGE: I will give you an
18 example. I just pulled up SRP Chapter 4, 4.5.1,
19 Control Drive Structural Materials. Do you have
20 control rods? I mean, you start to pretty much get
21 really far away from the SRP once you go down a
22 level.

23 MR. RECKLEY: So -- but what we will
24 take, and this is where we are looking at the
25 safety-focused review effort as it was developed

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1 for NuScale, using it as an evolutionary step, but
2 really taking it to the next up. And the question
3 is will we develop a standard review plan? Not
4 until we have a need for a standard review plan.
5 And the reason I say that is --

6 MEMBER CORRADINI: Repeat that since
7 that sounded like doublespeak.

8 MR. RECKLEY: Well, it is doublespeak
9 because when you're dealing with -- when you're
10 dealing with an applicant for a design and a
11 technology, you need a review plan. But the
12 standard review plan can be dropped. The standard
13 review plan implies something you are using because
14 you have a multitude, and you can apply a standard
15 in order to get consistency.

16 So we will have a review plan for each
17 design and technology. As we feel the need, it
18 might evolve into a standard review plan if the
19 numbers justify that we need a standard, but in the
20 meantime, the considerations that are incorporated
21 into the safety-focused review for SMRs will be
22 applied as we look at each chapter and each sub-
23 chapter in describing the design. What is the
24 safety significance of this, you know? And we can
25 look at, you know, the key, is it -- is it

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1 supporting reactivity control, heat removal, or the
2 -- limiting the release of radioactive materials?
3 I mean, those are the three critical safety
4 functions.

5 How is it addressing one of those three
6 critical safety functions? If it is not or does
7 not have an impact on them, maybe on the secondary
8 side, for example, do we need to look at it? How
9 much information do we need? So we will -- we will
10 use this structure as it has been developed: safety
11 significance, compliance, the degree to which it
12 has been tested if it's a novel design, and so
13 forth.

14 Operational programs, we talked about
15 that a couple times. This isn't just going to be
16 the design. From the design and from the
17 regulatory reviews and the issuance of licenses and
18 approvals will come constraints on that design,
19 including what surveillances need to be done over
20 the long-term; what are operating limits that if
21 you exceed, you might have to shut down the plant
22 or you might have to do some other corrective
23 action? So this is the kind of thing that we're
24 going to basically be applying as the review tool
25 for each design as we look at each aspect of the

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1 design.

2 The -- an example that is -- that is
3 often brought up is -- I think Steve mentioned the
4 safety margins and the thermal margins. In
5 discussions, the thermal capacity of these systems
6 -- an advantage, and mentioned in the advanced
7 reactor policy statement and incorporated into
8 these designs, is a larger thermal capacity on the
9 primary side, be that the difference between the
10 temperature of the sodium and its melting point;
11 the existence of large graphite heat sinks within
12 the -- the coolant system; or in the salts, again,
13 the large thermal capacity between the operating
14 temperature and the boiling point of the salt.

15 Large thermal capacities: those thermal
16 capacities can diminish the importance of the
17 interactions between the primary and the secondary
18 side in terms of secondary side plant upsets. I
19 mean, that is a big thing in light water reactors.
20 You have a secondary side event, it can lead to a
21 fairly rapid pressurization on the primary side,
22 and now you have to have safety functions to
23 address the pressurization of the primary side.
24 That may not exist for some of these designs, and
25 therefore, the importance of the secondary plant

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1 can be greatly diminished from its safety
2 significance and its possible ability to cause a --
3 a plant transient that is challenging safety
4 systems.

5 If that is true, then the amount of
6 review that we should do of that secondary side is
7 greatly diminished from what we have historically
8 done for light water reactors, so that is the way
9 this would be used and -- and developed. So with
10 that, I will open it up --

11 MEMBER SKILLMAN: Bill --

12 MR. RECKLEY: -- or --

13 MEMBER SKILLMAN: -- let me ask this:
14 you described in the prior two or three slides a
15 process that has been used and useful. It is well
16 understood by the staff. There are thousands and
17 thousands of pages of documentation that instruct
18 how to -- how to approach Part 50 license or Part
19 52 license.

20 Later this afternoon, we are going to
21 hear from a group that is going to tell us you
22 really ought to use the Canadian system, which is a
23 partial license system. Here is my question: in
24 your toil to get to this place, what other
25 countries' licensing systems did you evaluate, and

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1 why did you choose the current Part 50 and the
2 current Part 52 approach as your standard? What
3 other countries' processes did you consider, and
4 why did you end up where you are?

5 MR. RECKLEY: We looked -- not in
6 detail, so I am not -- I can't give you a document
7 where we did the comparisons, but just from general
8 familiarity with some of the European systems and
9 the Canadian system, I think in large part, the
10 reason we picked what we have now as opposed to
11 going to a -- a different model is because it
12 exists and we have that -- we have that -- that
13 structure.

14 To the -- to the degree that you go to
15 a -- an approach that is more developed on a safety
16 case where an applicant basically is -- presents a
17 safety case, and we don't have the guidance and the
18 acceptance criteria defined ahead of time as to how
19 that would work, I -- I just have not heard in the
20 interactions with stakeholders a -- a desire for us
21 to go to that --

22 PARTICIPANT: So --

23 MR. RECKLEY: -- approach --

24 PARTICIPANT: -- so --

25 MR. RECKLEY: -- to be honest --

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1 PARTICIPANT: -- so --

2 MR. RECKLEY: -- with you.

3 PARTICIPANT: -- so you are being --

4 MEMBER SKILLMAN: Did you hear the
5 opposite, an unwillingness to consider other --

6 MR. RECKLEY: I don't think --

7 MEMBER SKILLMAN: -- processes?

8 MR. RECKLEY: -- I don't think we're
9 unwilling.

10 MEMBER SKILLMAN: I mean from the
11 stakeholders?

12 MR. RECKLEY: I think --

13 MS. CUBBAGE: What -- I want to just
14 make sure we're all talking the same thing --

15 MEMBER SKILLMAN: Okay.

16 MS. CUBBAGE: -- because you mentioned
17 Part 50 and 52.

18 MEMBER SKILLMAN: Yes.

19 MS. CUBBAGE: Are you talking about the
20 Canadian conceptual design review in a pre-
21 application, or are you talking about --

22 MEMBER SKILLMAN: It's a -- the
23 Canadian process is a six- or seven-step process.
24 It is different fundamentally from --

25 MS. CUBBAGE: Right, but --

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1 MEMBER SKILLMAN: -- Part 50 --

2 MS. CUBBAGE: -- what we're --

3 MEMBER SKILLMAN: -- and 52.

4 MS. CUBBAGE: -- what we're hearing
5 from stakeholders is not that we should abandon
6 Part 50 and 52. What we're hearing is that at the
7 conceptual stage and the pre-application stage,
8 some stakeholders like the structure of the
9 Canadian model, and what we're saying is we can do
10 that under our existing regulatory framework. We
11 can give that type of feedback to an applicant at
12 the pre-application stage if they provide that
13 level of information, but we also have the
14 flexibilities to engage with applicants if they
15 want to submit different information.

16 We are trying -- we are trying to
17 accommodate everybody's different business models
18 and situations and not have a one-size-fits-all.
19 Some people want a one-size-fits-all, and I don't
20 know that that is going to be universal.

21 MR. SEGALA: In the Canadian process,
22 they make a finding of no obvious impediments to
23 licensing in Canada. Well, that is the same
24 finding we made for PRISM in the pre-application
25 safety evaluation report, so we are -- we are just

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1 saying that we think we have the flexibility in the
2 current regulatory framework to basically do what
3 the Canadians are doing within our current
4 framework.

5 MEMBER CORRADINI: So -- so you must
6 have asked -- I mean, I guess I have a guess of
7 what the answer is. When you ask potential
8 applicants why do they even find some benefit from
9 the Canadian system, what is their -- what is their
10 --

11 MS. CUBBAGE: Are you going to have to
12 ask the folks that are going to speak to you later
13 this afternoon what they are interested in, but we
14 --

15 MEMBER CORRADINI: But they must tell
16 you.

17 MS. CUBBAGE: -- but we know that not
18 everybody shares the same view.

19 MEMBER CORRADINI: But the -- because
20 when I have spoken with the Executive -- the EDO
21 equivalent, Ramzi Jammal, he says they come to us
22 because they think it's faster, and he says it is
23 not going to be faster.

24 MR. RECKLEY: The -- the most often-
25 cited thing is the predictability. The Canadians

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1 have given estimates of time and resources to do
2 the various phases of their pre-application review,
3 and we don't have a published estimate of that --
4 that kind of thing. We have said we will deal with
5 an applicant to come up with that if they come to
6 us, but we don't have a standing this will take
7 about 18 months and cost about -- I forget what it
8 is --

9 PARTICIPANT: 4000 hours.

10 MR. RECKLEY: Yes.

11 MS. CUBBAGE: Right, I mean we --

12 MR. RECKLEY: Number of hours or
13 millions of dollars, so --

14 MS. CUBBAGE: We plan to do that on an
15 application-specific basis with the licensing
16 project plans, and based on the design and the
17 outcomes that are desired, then we can give
18 estimates of scheduling and, you know, estimate of
19 cost, but, you know, a one-size-fit-all is kind of
20 difficult for a cost and schedule when you have a
21 range of designs, from very simple single-megawatt
22 designs up to the 1000-megawatt. I mean, a lot of
23 range of complexity there.

24 MEMBER REMPE: And it also depends on
25 the quality of the application --

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1 MS. CUBBAGE: Absolutely.

2 (Simultaneous speaking.)

3 MEMBER REMPE: -- conditional --

4 MS. CUBBAGE: Yes, so --

5 (Simultaneous speaking.)

6 MEMBER REMPE: A lot of times, in the
7 discussions I read in the popular press, they keep
8 talking about the need to modernize the NRC's
9 licensing framework, and what I have heard in your
10 last few slides is basically saying our existing
11 framework can accommodate this. We don't -- I
12 don't see you saying I need to modernize it, and I
13 think your arguments sound solid to me, so have you
14 tried to push back and get some of those comments
15 resolved? Because I am puzzled why they keep
16 saying you need to modernize the --

17 (Simultaneous speaking.)

18 MR. SEGALA: I think the comment is
19 that our current regulations were written for light
20 water reactors, and so you -- as you saw in Amy's
21 slides, we had, for the mid- and long-term, we
22 added that strategy to look -- or the contributing
23 activity to look at should we update the regulatory
24 framework or not, and we have that as necessary.

25 So I think in the near term, the zero

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1 to five years, we are looking at what we can do to
2 be more effective and efficient within our current
3 regulatory framework, and then as a mid- and long-
4 term activity, we are going to look at whether --
5 whether or not it makes sense to revise the
6 regulatory framework for non-light-water reactors.

7 MS. CUBBAGE: And part of that frankly
8 is in recognition that rulemaking takes time, and I
9 think if there is going to be any near-term movers,
10 they are -- they would have to wait for a rule --
11 you know, I don't think they would want to --

12 MEMBER REMPE: But they --

13 MS. CUBBAGE: -- wait --

14 MEMBER REMPE: -- may --

15 MS. CUBBAGE: -- for a --

16 MEMBER REMPE: -- want you to --

17 MS. CUBBAGE: -- rulemaking.

18 MEMBER REMPE: -- expedite even sooner
19 is what I have --

20 MS. CUBBAGE: Right.

21 MEMBER REMPE: -- heard, and so again,
22 I am not sure why they are -- maybe I will ask them
23 why they need to --

24 MS. CUBBAGE: Right.

25 MEMBER REMPE: -- modernize it. What

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1 is their vision here to -- to get it vastly,
2 quickly done, and with a modern framework?

3 MS. CUBBAGE: So the word
4 "modernization" you may have heard in the context
5 of NEI/Southern's initiative. They are calling it
6 the Licensing Modernization Initiative, and you can
7 ask them --

8 MEMBER REMPE: Yes.

9 MS. CUBBAGE: -- later what they mean
10 by that, but in the near term, we have a common
11 understanding that that means within the current
12 regulations.

13 MEMBER REMPE: Okay. Thank you.

14 MR. RECKLEY: Okay. Next?

15 So I did want to spend a couple slides
16 on licensing basis, license basis events and the
17 discussion of those that we have underway. It I
18 think has been mentioned by a few of the members.
19 It does form a central element of how we go
20 forward, and it is very hard to imagine how you
21 make some of the decisions until you have at least
22 an idea of how you're going to do this
23 construction.

24 So before getting into how it might be
25 modernized, I will address at least my

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1 representation of how it is currently constructed
2 for light water reactors, and if -- you know, it is
3 -- it is a complex topic in that we are now, as
4 someone mentioned, 60 years into light water
5 reactors, and I -- we still have a lot of
6 discussions about how this works and how it doesn't
7 work, what it means, and how to apply it. And so
8 one of the things we would hope I think going
9 forward is -- is to start from a better place where
10 things are better-defined.

11 But just -- just to spend a couple
12 minutes on the current construct, I think one thing
13 that is important to understand is that this
14 evolved over those 50 or 60 years. It did not
15 start off like this, and so it was simpler -- it
16 was simpler in the beginning. Things were more
17 black and white. And over the years, we introduced
18 at least 50 shades of -- of gray.

19 (Laughter.)

20 MEMBER CORRADINI: Oh, you must have
21 thought that one through.

22 (Laughter.)

23 MS. CUBBAGE: Some have called it a
24 patchwork, in fact.

25 (Laughter.)

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1 MR. RECKLEY: So anyway, there we go.

2 So in this -- in this construct, the
3 anticipated operational events and design basis
4 accidents and the siting source term are fit into
5 three kind of analyses that were performed, and
6 part of this was the availability of technology and
7 the way the computer codes worked and the fact that
8 they were not integrated, and the fact -- so that
9 is in part why it is constructed the way it is.
10 And there were a lot of other reasons why it's
11 constructed the way it is. But within the
12 blue area, anticipated operational events, design
13 basis accidents, and the siting source term, that -
14 - that really formed what is called the design
15 basis accident, design basis event realm. Defined
16 what equipment would be safety-related: if you
17 needed the equipment to address any of those
18 things, then that largely met the definition of
19 what needed to be safety-related. It largely
20 defined what had to be in the technical
21 specifications and controlled.

22 The external events were handled a
23 little differently in that once you identified all
24 those safety systems and critical elements within
25 the plant to address those events, then you had to

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1 protect them against the external events, and that
2 was done largely deterministically: a design basis
3 earthquake, a design basis flood, and you would
4 define what restraints you needed, how high your
5 flood protection needed to be, and et cetera.

6 MEMBER CORRADINI: When you wrote
7 "external events," I took it as man and not man,
8 not just natural.

9 MR. RECKLEY: And that would be true
10 too, manmade events for the most part.

11 MEMBER CORRADINI: Okay.

12 MR. RECKLEY: Right.

13 CHAIRMAN BLEY: Just --

14 MS. CUBBAGE: Manmade --

15 CHAIRMAN BLEY: -- to interrupt --

16 MS. CUBBAGE: -- but not --

17 CHAIRMAN BLEY: -- you a --

18 MS. CUBBAGE: -- intentional.

19 CHAIRMAN BLEY: -- second, if you use
20 this slide again, you have a frequency and a
21 consequence scale, and the BDBEs ought not be up in
22 the upper right-hand corner. They ought to be in
23 the lower right-hand corner if you're going to keep
24 those --

25 MS. CUBBAGE: Well, the concept was

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1 they were add-ons, and they were not necessarily --

2 CHAIRMAN BLEY: Oh, they were, but --

3 MS. CUBBAGE: -- done in a --

4 CHAIRMAN BLEY: -- but if you didn't --

5 MS. CUBBAGE: -- in a --

6 (Simultaneous speaking.)

7 CHAIRMAN BLEY: -- have that frequency,
8 implying there was a frequency relationship there,
9 it would be better.

10 MS. CUBBAGE: You are right, but the
11 fact that they were added on in response to
12 specific things like station blackout and they were
13 not necessarily done in an explicit --

14 MR. RECKLEY: Next time --

15 MS. CUBBAGE: -- risk --

16 MR. RECKLEY: -- I will --

17 MS. CUBBAGE: -- consequence --

18 MR. RECKLEY: -- just leave --

19 MS. CUBBAGE: -- way --

20 MR. RECKLEY: -- those arrows off.

21 CHAIRMAN BLEY: You want the arrows to
22 apply to the L, the blue L and only the blue L, and
23 --

24 MS. CUBBAGE: Right, right.

25 CHAIRMAN BLEY: -- an observer of this

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1 slide --

2 MR. RECKLEY: Yes.

3 CHAIRMAN BLEY: -- might not --

4 MR. RECKLEY: Know.

5 MS. CUBBAGE: Agree with you.

6 CHAIRMAN BLEY: -- know that's what you
7 meant. Well, they ought to be able to figure it
8 out --

9 MR. RECKLEY: Yes.

10 CHAIRMAN BLEY: -- but still.

11 MR. RECKLEY: And -- and then over
12 time, the beyond design basis events were added,
13 station blackout, and more recently, Japan lessons-
14 learned-oriented mitigating strategies, the B5B,
15 9/11 mitigating strategies, and so forth. So -- so
16 that is -- is basically the -- the current
17 construct. Go to the -- the next one.

18 And you see the kind of integration now
19 within the current proposals. This is from the --
20 the NGNP activity, and even before then, the MHTGR
21 work that was done in the 80s. And basically, you
22 introduce PRA now not as an overlay to see what
23 maybe additional mitigating strategies you need,
24 but you're incorporating it into the design
25 process, and you're using the PRA to help you

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1 design your licensing basis events.

2 And from the licensing basis events,
3 you are taking a subset to analyze using more
4 traditional means by using conservative assumptions
5 and calling them your design basis accidents on the
6 -- on the graph, where you would only credit
7 safety-related equipment. Again, going back, you
8 could construct it different, but the -- this
9 approach allows you to keep those traditional
10 safety classification of equipment designations and
11 some of the other infrastructure.

12 MEMBER POWERS: That just will increase
13 the complexity and the --

14 MR. RECKLEY: It's, in part, I think,
15 due to the fact that this was started and this has
16 been a fairly constant proposal, but it goes all
17 the way back to the 80s. And so keeping that --

18 MEMBER POWERS: So in your view, we
19 should continue to ride horses and churn our own
20 butter and things like that?

21 MR. RECKLEY: It is a way, it is a way
22 to do it. And --

23 MEMBER POWERS: It is a way.

24 MR. RECKLEY: And 1860 and some other
25 proposals have had other ways to identify what the

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1 special treatment and special requirements on
2 equipment would be.

3 MEMBER POWERS: Well, let me ask you a
4 serious question. Do we have definitive evidence
5 that all these special treatment requirements
6 actually accomplish anything for us?

7 MR. RECKLEY: I would say yes. If you
8 look at quality assurance -- I mean, this is a
9 little dated now, so it's a harder question than
10 maybe at first it would appear. If you look at the
11 --

12 MEMBER POWERS: It was certainly
13 intended to be a very hard question because I'm
14 unaware of evidence that this helps us.

15 MR. RECKLEY: It depends on from where
16 you start. If you start from before Appendix B and
17 some of the quality assurance issues that plagued
18 not only the nuclear industry but other areas, you
19 would say quality assurance has certainly played a
20 large part in approving the safety of plants. If
21 you get into a more difficult question and start to
22 say, well, that was then, this is now, compare ISO
23 9000 to Appendix B, it's a harder question.

24 So this construct is what the burn
25 activity has picked up. It was pulled into NGNP,

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1 and now it's in the licensing modernization
2 technical requirements. Something. I get mixed up
3 on the acronym.

4 So you have the individual events, some
5 of which would fall into the category of
6 anticipated operational occurrences because they're
7 at frequencies on the order of ten to the minus two
8 and then design basis events, which gets down to
9 ten to the minus five or six. And, again, the
10 design basis accidents that are handled separately
11 and given a special analysis using the more
12 traditional deterministic approach.

13 So we're looking at these. One of the
14 things on this graph and one of the parts that
15 we're having discussions with is you see the dotted
16 line at one rem. That becomes, under NGNP and
17 other designs, a goal in order to limit the degree
18 of emergency preparedness you need to develop and
19 maintain at whatever distance exceeds one rem.
20 And, normally, we talk about at the fence for most
21 of the facility.

22 So one of the discussions is how does
23 that, how does that play in, whether it's an after-
24 the-fact, I've designed my plant, I've used the
25 top-level regulatory acceptance criteria, which

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1 would be 25 rem for a design basis event, but my
2 design is good enough that it's showing that one
3 rem can be met. Now I can take advantage of that
4 one rem and get some regulatory relief from that
5 performance in my plant. That's one approach. A
6 subtle difference would be to establish one rem as
7 a design criteria and treat it more like the top-
8 level regulatory criteria, as opposed to a
9 performance goal.

10 So those kind of discussions are where
11 we are in the process right now.

12 MEMBER SKILLMAN: Bill, let me jump in
13 here just for a second. To my prior question about
14 other countries' licensing systems, the Germans use
15 what is known as a Teilrechnung. It's a partial
16 erection permit license. It's seven pieces, and
17 the first piece is a petition to the Department of
18 Interior of Bundes Republik for the land, and that
19 has all kinds of political bells, lights, and
20 whistles. That is a big deal.

21 But once the permit is granted, part
22 two is the establishment of the accident design
23 basis. Part three actually pours concrete and
24 allows the components to be installed, but you
25 can't go to a concrete pour until you've satisfied

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1 the off-site dose issues. Then four, five, six,
2 and seven follow a fairly methodical construction -
3 inspection process.

4 I lived in that system for a number of
5 years, and I was fully familiar with the Part 50
6 process before I went to Europe. When I came back,
7 Part 52 was just really getting started. And we
8 had multiple debates, whether the old Part 50 with
9 the two preliminaries and two finals and all of the
10 meetings was the better process than the seven
11 steps in Germany. But what we determined is the
12 thoroughness of the seven steps is extraordinary as
13 long as there was a QA program applied.

14 To those who say the system needs to be
15 modernized or whatever those words are, I just
16 wonder if there isn't something better, and I think
17 it can be done under the existing 10 CFR 50 with
18 regard to the design of components, Part 100, and
19 all the other pieces that we rely on to ensure that
20 the health and safety of the public is protected.

21 But it just seems as if we're heading
22 into this new world of new reactors with the
23 question that Joy was posing. What's new? Why
24 isn't there a new process? There may be one that
25 really is better.

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1 I'm just going to leave it at that. I
2 know that system works, and I know it's very
3 successful. Some say it's very costly, others say
4 not so much. It's probably the same as what we
5 have in this country. But if you hadn't looked or
6 no one has looked, you might want to get a sounding
7 on that and say that might be something that is
8 advantageous for the new plants going forward.
9 What it really does is it establishes up-front what
10 your accident requirements are, and I would think
11 that that would be very valuable for the new
12 materials, chemistry, fuels, enrichment, the types
13 of questions that are accompanying those
14 technologies relating to the siting.

15 MR. SEGALA: One of the things also
16 that seems to be out there is that they want a
17 performance-based risk-informed technology-neutral
18 framework, you know. I don't know if that's what
19 the Germans are doing or not, but that's kind of,
20 that's where they want us to go with this new
21 framework.

22 MR. RECKLEY: And you can look at this
23 frequency consequence curve. Usually, when you're
24 talking about modernization, you're largely
25 involved in adopting this kind of --

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1 MEMBER SKILLMAN: And that's why I
2 asked the question at this point.

3 MR. RECKLEY: One more. So also within
4 the discussions is the age-old questions of how do
5 you balance the use of the risk information with
6 more traditional deterministic or engineering
7 analysis approaches. I pulled the graph out of one
8 of the NGNP that shows how these things interrelate
9 and how you have to consider basically all of them.
10 So we're still having those discussions.

11 I always like this because it shows
12 both, as we've talked a number of times, not only
13 the design, which is the plant capability, but also
14 the programmatic defense-in-depth side. There's an
15 operation side to all of this. We tend to get very
16 focused on design, but equally important is the
17 operational side. And then in the beginning, the
18 deterministic evaluations and risk insights and how
19 they're used together to provide the desired
20 confidence.

21 The 4S table that I provided was only a
22 personal observation for me. Some of the designs,
23 and particularly maybe some of the simpler designs,
24 the traditional approach of actually doing a
25 deterministic assessment of fission product

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1 barriers might be an easier approach. And if they
2 were to do that, we didn't want to rule it out.
3 And so all this table basically shows is that
4 there's not necessarily a disagreement between
5 these approaches.

6 If you set up the frequency consequence
7 curve as the highest-level regulatory approach, in
8 general, if you can show that a transient or an
9 accident doesn't challenge a fission product
10 barrier, then there would be no reason to assume
11 that it was going to challenge the frequency
12 consequence curve. And so, again, I wanted to
13 include that just because for some designs they
14 might want to look at it from that aspect, as
15 opposed to developing a more complicated
16 mechanistic source term and carrying things all the
17 way off through an off-site dose calculation.

18 So I think, with that, we can end and
19 go to policy.

20 MS. CUBBAGE: Okay. So for the policy
21 issues, I'm not going to go into every one of the
22 issues on the next three slides. I'm going to
23 highlight the ones that we're actively working on.
24 So this list shows many issues that have been
25 gathered over the years that relate to SMRs and/or

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1 non-LWRs. And we've been tracking these. There
2 was a paper in, I think it was 2010 was the one
3 that listed a whole long list of issues that needed
4 to be resolved in readiness for the SMR reviews.
5 And a lot of those are equally applicable to non-
6 LWRs. And at this point, most of them have been
7 resolved for SMRs, but we're looking at them again
8 to make sure there's nothing that needs to be done
9 further for the non-LWRs.

10 For example, the annual fee issue was
11 resolved for SMRs where the fee rule that has a
12 variable fee structure for smaller light-water
13 designs, that was not applicable to non-LWRs. We
14 would need to re-assess later when we got closer to
15 a non-LWR operating reactor what the regulatory,
16 what the cost of regulating that class of reactors
17 is, and that would go into figuring out what the
18 fees should be. So --

19 CHAIRMAN BLEY: Before you leave this -
20 -

21 MS. CUBBAGE: Oh, I'm not going to
22 leave it yet. Go ahead.

23 CHAIRMAN BLEY: I'm looking at the
24 bottom one and the safety focus, have you already
25 written sections of the SRP that include that?

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1 MS. CUBBAGE: So for the use of PRA in
2 the licensing process, we have the SRP Chapter 0,
3 Rev -- what do we call it? Part two or I don't
4 know. There's the SMR section of the SRP --

5 CHAIRMAN BLEY: Yes, and that was kind
6 of almost blank before just an outline.

7 MS. CUBBAGE: Yes, it's the
8 introduction to the SRP, introduction part two, and
9 it talks about how we're going to use risk insights
10 in SMRs. And then that led into the DSRs for
11 mPower and NuScale and has now led into the
12 enhanced safety focus review for NuScale.

13 CHAIRMAN BLEY: But that one hasn't
14 been documented yet, right? The safety focus
15 review? In any formal --

16 MS. CUBBAGE: We're implementing it.

17 MR. RECKLEY: Not to the level of
18 detail, I think, that's been described to you. But
19 that is the --

20 CHAIRMAN BLEY: We saw the spreadsheet
21 thing, but we haven't seen anything beyond that.

22 MS. CUBBAGE: That's what you'll see.

23 CHAIRMAN BLEY: Okay.

24 MS. CUBBAGE: So, basically, from an
25 SMR perspective, that's being implemented on

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1 NuScale, and that's an area where we're clearly
2 going to be doing more work in the non-LWR arena
3 because that's where we're looking at licensing
4 basis event selection, how PRA is being used to
5 guide what sections of the design we even look at
6 or to the extent we look at it. So that's one
7 that's definitely more to follow for non-LWRs.

8 CHAIRMAN BLEY: Are you working on the
9 SRP revisions now, or is that --

10 MS. CUBBAGE: The SRP has already been
11 revised for -- so we have the SRP --

12 CHAIRMAN BLEY: Okay. I know the one
13 you're talking about. The third case, which is
14 what we're talking about here, not quite complete.
15 It said we'll expand that in the future.

16 MS. CUBBAGE: Right. When it says SRP
17 revisions, that was relative to LWR, SMR. There
18 are SRPs in place, DSRs in place, and the safety
19 focus review is ongoing.

20 So a couple of things that I wanted to
21 point out on this page is that, for prototype
22 reactors, we're drafting a guidance document. It
23 should be available in April, and that will be
24 just, there's no policy issue there, that's just
25 explaining what our current regulatory processes

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1 for prototypes. MEMBER CORRADINI: This is
2 the Part 53 dot, dot, dot, whatever it is.

3 MS. CUBBAGE: 50.43e.

4 MEMBER CORRADINI: Thank you very much.

5 MS. CUBBAGE: Siting. That's been
6 resolved from the perspective of the use of
7 mechanistic source term. There's no policy issue
8 on that front. However, with reduced source terms
9 and reduced siting area, there's another
10 requirement in Part 100 that may come into play
11 where you're supposed to avoid siting near very
12 densely-populated areas.

13 So we don't have anyone right now
14 that's proposing to be sited near a very densely-
15 populated area. But if that were to happen, we're
16 looking at what that would mean and we're planning
17 to engage stakeholders this year, consistent with
18 what we told the Commission in SECY-16-0012. That
19 could be an issue for non-LWRs who may be wanting
20 to site near facilities to take advantage of
21 process heat applications.

22 There wasn't anything I wanted to
23 particularly focus on in this one, other than maybe
24 the bottom line there, and that's that defense-in-
25 depth, that's going to be something we're going to

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1 be looking at for advanced reactors, clearly, as
2 part of licensing basis event selection and
3 everything we do.

4 The next page, we already talked --
5 yes?

6 MEMBER SKILLMAN: If I could, please,
7 back to that one. I don't recall our committee
8 reviewing SECY-11-0098. That might have -- well, I
9 don't know whether we did or not, but I would sure
10 like for us to get our oar into that one.

11 MS. CUBBAGE: Okay. And that was
12 relative to SMRs and, basically, we can get you a
13 copy of that.

14 MEMBER SKILLMAN: May I ask you?

15 MS. CUBBAGE: Oh, absolutely. It's on
16 the --

17 MEMBER CORRADINI: Just because I think
18 I know where Dick is going with this, this was
19 cited when we had the subcommittee meeting relative
20 to -- now I forgot the title of the subcommittee
21 meeting. And staff, in fact I think it was
22 research, Mark Caruso, mentioned that this would
23 have to be brought into a discussion for multi-
24 module. Because it was mentioned, I just don't
25 think staff has decided exactly how this fits.

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1 MS. CUBBAGE: You're talking about the
2 staffing for multi-module?

3 MEMBER CORRADINI: Yes.

4 MS. CUBBAGE: Okay. So what we told
5 the Commission is that we would develop guidance.
6 We did that. So we have guidance on how to do a
7 task analysis, etcetera, etcetera, to ultimately
8 determine what is the appropriate staffing for any
9 particular modular reactor. And then, in the near
10 term, if someone wants to propose less staffing
11 than would be required by the 10 CFR requirements,
12 they could do that through the exemption process,
13 but they would have to justify their staffing level
14 based on task analysis and all the human factors
15 evaluations that we already have guidance in place
16 for.

17 So we're not seeing it as an open
18 policy issue. It's clearly a review issue on
19 NuScale. You have to review what they've decided,
20 you know, what they are using to justify their
21 staffing. I hope that -- and NuScale is doing
22 that, and we would use a similar process for any
23 non-LWR staffing down the road.

24 Anything else on that?

25 MEMBER SKILLMAN: Thank you.

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1 MS. CUBBAGE: Okay. So we already
2 discussed a little bit security requirements. From
3 a Strategy 3 perspective, we have the security
4 design considerations that look like GDCs for
5 security, and those have been signed out and will
6 be published in the Federal Register probably next
7 week.

8 This is talking here about further
9 looking at security. NEI submitted a white paper
10 recently. During the break, I sent it to Maitri.
11 She can distribute that to you all. And this is
12 taking it a step further to look at the specific
13 design, what the consequences are, and having the
14 security be reflective of the potential
15 consequences of the reactor. So instead of a one-
16 size-fits-all, it would be scaling security
17 requirements based on source term and accident
18 consequences.

19 Aircraft impact. That's one that, you
20 know, it's not an issue, per se, from a policy
21 perspective right now, but we're looking at, you
22 know, for a very small design, potentially if it's
23 embedded, does aircraft impact assessment need to
24 be re-looked at as what we would do in that area.

25 Then I've listed some of the key

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1 technical and policy issues coming out of NGNP.
2 Licensing basis event selection we've already
3 discussed. We're going to be hearing from Amir on
4 that shortly, and we're engaged with them on that
5 project.

6 Functional containment performance
7 criteria, that's an issue we hope to take to the
8 Commission in the near term to establish what the
9 performance criteria should be. Fuel
10 qualification, that's going to be technology-
11 specific, but that's an area that we want to spend
12 a lot of time on. We know that's a long lead
13 issue. A lot of work has already been done in the
14 NGNP area, but we have to look at, for the other
15 designs, what does fuel qualification look like,
16 particularly the molten salt brings in some unique
17 issues there.

18 I mentioned previously fuel cycle
19 issues and enrichment issues. We're having ongoing
20 discussions with stakeholders to figure out are
21 there any regulatory or policy issues we need to
22 deal with in the near term.

23 And just globally, we're looking to
24 work with stakeholders to, if you see a policy
25 issue that we're not working on, let us know what's

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1 important to you, what decisions do you need to
2 support your business decisions.

3 And that wraps up the policy issues.

4 MEMBER KIRCHNER: Amy, may I ask you --

5 MS. CUBBAGE: Sure.

6 MEMBER KIRCHNER: Some of these
7 obviously bear on each other in different ways.
8 Let me just pick a couple. PRA in multi-module
9 facilities where you could have common-cause
10 failure, implementation of defense-in-depth and
11 functional containment, and then obviously the
12 siting and evacuation guidelines, they're all
13 interrelated. So is your expectation that you'll
14 just have a SECY as a paper or policy decision, and
15 how do these all get pulled together and --

16 MS. CUBBAGE: Yes, so there's clearly a
17 close relationship between a lot of these. So for
18 example, the Commission has already approved
19 rulemaking on EP, so scalable EP. That would be
20 contingent on demonstration that the source term
21 supports, so you can kind of look at the EP sort of
22 independently with the assumption that the source
23 term calculations are going to show a certain,
24 justify a certain amount.

25 So then, separately, you can look at,

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1 well, mechanistic source term, there's no policy
2 issue there. You can use mechanistic source term.
3 And then the issue of siting near densely-populated
4 areas, that's a very specific issue. We're going
5 to go to the Commission with that.

6 We're aware of all the
7 interrelationships, but we kind of have to tackle
8 the specific issues that need to go to the
9 Commission. To the extent that they arise, we're
10 going to bring them to the Commission.

11 MEMBER KIRCHNER: And those would
12 likely find their final embodiment in rulemaking or
13 --

14 MS. CUBBAGE: Some could eventually
15 have rulemaking. So the EP went to rulemaking.
16 The security design, consequence-based security
17 proposal from NEI is proposing rulemaking. So some
18 of these eventually could go to rulemaking.

19 Okay. So just to wrap up, looking for
20 your feedback on our plans. Next steps after we
21 consider your feedback and stakeholder input, we'll
22 be providing the documents to the Commission later
23 this spring, and we're interested in hearing from
24 you also at what point you want us to come back,
25 what documents you're interested in having more

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1 dialogue on. So we'll be looking to continue to
2 have that dialogue maybe informally as we go to
3 figure out when you want to see us again.

4 CHAIRMAN BLEY: Okay. And we'll have a
5 session at the end of today's meeting to have a
6 little discussion about tomorrow and what happens
7 after that. Anything more for this? Then I think
8 it's time to switch and we'll go to Jim Kinsey.

9 MR. KINSEY: So my name is Jim Kinsey.
10 I work with the Idaho National Laboratory. I'm
11 providing you some feedback today on behalf of --

12 CHAIRMAN BLEY: Green light.

13 MR. KINSEY: Thank you. My name is Jim
14 Kinsey. I work at the Idaho National Laboratory,
15 and I'm providing you some feedback today on behalf
16 of the Department of Energy. I understand the
17 focus of the discussion or the input I got a couple
18 of weeks ago in preparation for the meeting --

19 CHAIRMAN BLEY: I'm sorry, Jim. Let me
20 interrupt you. Did we get hard copy slides?

21 MR. KINSEY: I have the hard copies in
22 the back. The focus of the dialogue of the notes
23 that I've pulled together look at the various
24 connections between programs that DOE either
25 already has in place or is moving toward and how

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1 those connect or align with or maybe, in some
2 cases, not really very many but in some cases may
3 have not put the connection with the NRC's plan.
4 But I guess the conclusion that I'll leave with you
5 at the beginning, and I'll come back to it at the
6 end, is we think that there's very good alignment,
7 pretty much end to end, and we just need to work
8 toward focusing our resources on the relative high
9 priorities in each of the three or four areas that
10 I'll talk about.

11 Next slide. So real briefly, I think
12 it came up earlier today, but you all know that the
13 DOE pretty recently issued its vision and strategy
14 document, which focuses on the deployment of both
15 light-water based SMRs and advanced non-light water
16 reactors. A draft of that document went out in May
17 of 2016. The DOE collected input from industry
18 stakeholders and then, based on that input, made a
19 revision to the plan and then issued in its final
20 form just a short time ago.

21 One of the pieces of that plan that
22 I'll talk about over the next couple of slides is
23 it has a very specific near-term focus on the
24 development of an NRC regulatory framework for
25 advanced non-LWRs.

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1 So the couple of key priorities and
2 focus areas within the plan are, first, to
3 accelerate deployment of a variety of advanced
4 technologies through appropriate partnerships with
5 industry and universities and working to be sure
6 that we're taking full advantage of the
7 capabilities and maybe past work that's been done
8 within the national lab system in support of the
9 commercial private sector.

10 The couple of time lines that are
11 included in there are to enable commercial
12 deployment of the water-based SMRs in the mid-2020s
13 and the commercial deployment of advanced non-LWRs
14 by the 2030s. And I want to spend a minute or two
15 in the next slide or two better clarifying back to
16 your point earlier, Dr. Corradini, what 2030s
17 means. I think you made some reference to the
18 options study, as well, so I just want to spend a
19 few minutes on that picture, if you want to go to
20 the next slide.

21 This chart or waterfall chart is taken
22 from the DOE vision document, and it's written in a
23 way that includes, if you look at the third and
24 fourth line there, it includes reference to the
25 gain initiative that's currently underway and also

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1 a sequence of development and testing that includes
2 the development in deployment of a test or
3 demonstration reactor to gather additional
4 information on a path toward commercialization.

5 So this is reflected in this figure to
6 show all of the steps that any technology might
7 endeavor down, including the less mature
8 technologies. But what I also wanted to point out
9 is in that 13 to 15-year time frame that you
10 mentioned earlier from the options study, that's 13
11 years to start a commercial operation. And it's
12 associated with some of the technologies that are
13 considered to be more mature.

14 And so in those cases, the third and
15 fourth of the five lines here would probably be
16 eliminated or not implemented in that way. So then
17 that gray line at the bottom, which would move for
18 the commercial build and operation, would move
19 about five or six years to the left. And so when
20 we say 2030s, in that sequence of events, in the
21 course of about 13 or 14 years, you'd be at a place
22 where you'd have a technology design, license,
23 built, and starting operation.

24 MEMBER CORRADINI: That matches what
25 the option study had. They had a different bar

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1 chart but same conclusion.

2 MR. KINSEY: So the option study is
3 essentially speaking of, for the more mature
4 technologies, it's basically the first, second, and
5 fifth lines of this chart. The fourth and fifth
6 are the less mature, so this is just to provide a
7 complete picture.

8 MEMBER CORRADINI: The reason I brought
9 it up to the staff was that the conclusion, as I
10 remember the conclusion from the option study, is
11 that it's technology independent in terms of cost
12 and schedule. So whether I have a mature
13 technology, whether it's gas or sodium, it has some
14 length of time and potential investment, which is
15 different than if it's less mature and I can pick a
16 less mature, which would be a good five or six
17 years, as you indicate here.

18 MR. KINSEY: Right. In the example, it
19 speaks to sodium fast reactors and modular HTGRs as
20 the two categories of more mature. Again, those
21 would be lines one, two, and five here nominally.

22 MEMBER REMPE: So for the less mature
23 ones and knowing how long it's taken to get the gas
24 reactor to have a commercial vendor making the fuel
25 and start the irradiations, I might buy that time

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1 chart. But, boy, for the other ones where they
2 don't even, even the sodium reactor, I don't
3 believe they have a commercial vendor who's
4 starting to fabricate the fuel and then getting the
5 irradiation data. I'm having trouble -- I mean, is
6 there some sort of belief that you can do a molten
7 salt reactor fuel faster and get it qualified than
8 an evolutionary light-water reactor fuel?

9 MR. KINSEY: I'm not familiar with the
10 specific details of the molten salt reactor fuel
11 qualification plan at the moment, but I could make
12 sure that the right folks are available on the
13 phone in tomorrow's session and we could go through
14 that --

15 MEMBER REMPE: I'm just curious on why
16 it's even envisioned to be plausible, reactors for
17 which they don't even have a commercial vendor
18 fuel. Again, there's so many, 50, 60 folks
19 proposing this, I might why not acknowledge some of
20 these are just going to take longer to get through
21 it?

22 MR. KINSEY: Yes, I think in a lot of
23 our dialogue with the reactor development
24 community, we bring fuel to the forefront as an
25 item that they really need to think through pretty

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1 early in the process. You know, I think some of
2 those organizations tend to start with a focus on
3 reactor physics, and that's part of the concept,
4 and maybe don't start on fuel quite as early. So
5 we've been trying to stress the fact that you need
6 to make sure that that's part of the story. And I
7 think in some of the NRC workshops, I know for sure
8 in the last NRC DOE workshop that was held back in
9 the fall, I think fuel qualification was a specific
10 item on the agenda where that topic was discussed.
11 But I think it's recognized.

12 MEMBER REMPE: Thank you.

13 MR. KINSEY: So the key point I wanted
14 to make in this slide, as well as clarifying that
15 time line, is that you will see that the first item
16 out of the chute in this waterfall chart is the
17 development of the regulatory framework in parallel
18 with some R&D work, and it's on a, you know, it's
19 on a three to five-year time line, which is what
20 I'll be speaking to here through the rest of the
21 discussion.

22 So any questions about this before we
23 move on? All right.

24 So on the topic of framework, I guess
25 we've observed that that term is used pretty

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1 regularly in a lot of different circles, and I
2 think it's maybe not used consistently or it means
3 different things to different people. So within
4 the bounds of what we're doing in the DOE programs
5 and the way we look at it in this licensing or
6 regulatory area is we see the framework as really
7 being or as really having four key constituents.
8 The first three are really related to what are the
9 rules of engagement, and then the fourth one is the
10 process that you use to move an application through
11 those sets of rules.

12 So the first is the Commission policy
13 issues topic. The second is the need to adapt the
14 LWR-based structure to advanced non-LWRs. The
15 third, which is closely related to those first two,
16 is what are the licensing technical requirements
17 that come from those and how do those three fit
18 together. And then, as I said, the fourth is
19 establishing the review process that would apply
20 and that you might use for a sequential or a phased
21 review in some cases that I think others later in
22 the afternoon are going to talk about.

23 A couple of things that we wanted to
24 clarify, though, were that on the near-term
25 deployment path, we don't believe that an entirely

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1 new regulatory framework, which is sometimes
2 referred to as Part 53, is needed. Our view of the
3 world and how this will play out is that we need to
4 work through the near-term adaptations, get some
5 experience from one or two technologies moving
6 through that process, and then, in a longer period
7 of time, in the 10 to 15-year time line, we'd be in
8 a position where we could develop a Part 53 or that
9 sort of approach if it looked like that made some
10 sense, and that would bring some deficiency and
11 further clarity to the process. So, again, in our
12 view of the world, when we say framework, we're
13 talking about those four beings but not Part 53.

14 MEMBER REMPE: Aren't some of the bills
15 that we see in Congress, they're called the NRC
16 modernization bills or something like that, and so
17 has that message from DOE gotten to the folks on
18 the Hill that are proposing those bills?

19 MR. KINSEY: We work on those messages.

20 MEMBER REMPE: Okay. Just curious.

21 MR. KINSEY: So, again, this is back to
22 the four major parts of the framework that I just
23 mentioned. And, again, DOE is very focused in
24 working with industry and with NRC in priority
25 areas where we can retire or reduce the existing

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1 areas or levels of risk.

2 What I'll be talking about next, we
3 really focus our activities on the three boxes to
4 the left, which are all somewhat intertwined. Some
5 of those are relatively longstanding issues. And
6 then the work to support industry, where needed, in
7 developing the various review processes. And,
8 again, I think some of the other industry folks
9 will focus on the stages of review or that topic a
10 little later this afternoon.

11 So, again, the bulk of our programs are
12 focused on the three items on the left.

13 MEMBER CORRADINI: The bulk of DOE's
14 programs?

15 MR. KINSEY: Yes.

16 MEMBER CORRADINI: Okay. But I'd be
17 very curious as to what your conception of staged
18 is versus what staff just discussed is their idea
19 of staged, whenever it fits within your 15 minutes.

20 MR. KINSEY: Just real quickly, I don't
21 know that I have it necessarily a view of staged.
22 I've heard it used in a couple of different ways.
23 One is the approve the DCD one or two chapters at a
24 time, and the other is get sequential levels of
25 confidence over the whole design, which is I think

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1 the one -- and I've heard both of those discussed,
2 and there may be some pursuit of either or both of
3 those options. So I don't get too hung up on what
4 stage means, but those are the two uses of the term
5 I've seen.

6 MEMBER SKILLMAN: Jim, why do you offer
7 that the risk is constantly decreasing as you go
8 through this process?

9 MR. KINSEY: I guess when I say risk,
10 maybe that was not the perfect term, but I don't
11 want to cause any confusion there. It's really a
12 reduction or a retirement of uncertainty.

13 MEMBER SKILLMAN: Licensing
14 uncertainty?

15 MR. KINSEY: Regulatory uncertainty.
16 It wasn't intended to mean societal risk or
17 anything like that.

18 MEMBER SKILLMAN: Did you anticipate
19 that you'd get three-quarters of the way through
20 this and have some reviewer say, oh, I forgot to
21 tell you this, and all of a sudden you have to
22 reset your risk curve or your licensing uncertainty
23 curve?

24 MR. KINSEY: That's why we've been
25 working very closely with the staff to try to work

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1 toward having the outcomes that we work through
2 documented in a way so that we eliminate or at
3 least minimize that potential. This regulatory
4 guide that's coming out shortly that's in draft
5 form now on the advanced reactor design criteria is
6 one, an example of that. We're trying to formalize
7 some of these outcomes so that they're, you know, a
8 little more concrete going forward.

9 MEMBER SKILLMAN: Okay, thank you.

10 MR. KINSEY: Next slide. So you've
11 seen this before, so I won't spend much time on it.
12 But, again, in the near-term area, we're really
13 focused on Strategies 2 through 5. We recognize
14 there are a lot of interconnections and integration
15 between 3 and 5, but, again, I'll be talking a
16 little bit or primarily about Strategies 2 through
17 5.

18 I think, as Amy or one of the earlier
19 NRC presenters mentioned, we do in the DOE and lab
20 system support some of this knowledge/skills
21 transfer activity. I think it was mentioned DOE
22 supporting some through the Oakridge National
23 Laboratory some training on molten salt reactors.
24 But, again, I'll be focused on 2 through 5.

25 So we worked to get input for the

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1 number of different places in industry. A number
2 of recent examples is there was a joint response or
3 DOE GAIN in EPRI modeling and simulation workshop.
4 I think Steve Bajorek mentioned that, and that was
5 a very good exchange of information. We worked
6 very closely through some relatively recently-
7 established groups within NEI. Those have been
8 around for about a year and a half or so. There's
9 an advanced reactor working group and, under that
10 working group, an advanced reactor regulatory task
11 force.

12 We work closely, as well, with the
13 Nuclear Innovation Alliance and with the Nuclear
14 Infrastructure Council, who you'll hear from
15 shortly. And then we've had a series of workshops,
16 and we still continue to get inputs through the DOE
17 technical review panel.

18 So the message here is we're working,
19 we're trying not to work in a vacuum and we're
20 trying to go after the things that the industry
21 tells us is causing them the most difficulty in
22 moving their designs forward.

23 This is just a shorthand depiction that
24 I'd like to use that tends to tie a lot of the
25 various topics that we've talked about together.

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1 MEMBER CORRADINI: So can I just, going
2 into this picture, I think I've seen other versions
3 of it.

4 MR. KINSEY: We should have copyrighted
5 it. Sorry.

6 MEMBER CORRADINI: You should have.
7 I'm not sure how much money you'll get out of it.
8 But what this tells me is there's enough
9 interrelation that having something staged in
10 little bundles is a pipedream.

11 MR. KINSEY: I would personally agree
12 with that.

13 MEMBER CORRADINI: Okay, thank you.

14 MR. KINSEY: So the depiction I have
15 here, if you look at this sort of as a tree, if you
16 look at the trunk of the tree, the key foundation
17 to the whole licensing story, and I think we've
18 mentioned it a couple of times this morning, is you
19 really have to have a process for identifying or
20 selecting the events that are going to challenge
21 the system. And as you work through those
22 challenges, you know, they challenge moving up
23 through the center. They put some challenge on the
24 fuel, which creates some potential release
25 mechanisms of the fission products, and then you

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1 have a series of boundaries. That sequence of
2 events generates a mechanistic source term or a
3 series of source terms that then go over the fence
4 on the site boundary --

5 CHAIRMAN BLEY: Just for me, because I
6 look track of this every time I run into it, what's
7 the mechanistic mean in mechanistic source term?
8 What are you conveying?

9 MR. KINSEY: It's actually an
10 evaluation of the event itself and all of the
11 transport phenomena that occur in that event.

12 CHAIRMAN BLEY: A particular event, a
13 particular scenario?

14 MR. KINSEY: So you're mechanistically
15 calculating the source term, rather than using, for
16 instance, the three-percent fuel melt prescriptive
17 number that the LWRs use.

18 CHAIRMAN BLEY: So you're doing the
19 best you can including uncertainty kind of --

20 MR. KINSEY: Right. And we include
21 uncertainties in the discussion, but it's an actual
22 evaluation of various release sequences.

23 CHAIRMAN BLEY: Okay.

24 MR. KINSEY: So, again, then there's a
25 postulated release from the site, and that moves

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1 into the emergency planning zone discussion at the
2 top of the page.

3 So the way this is arranged or the way
4 it tends to fit together is the bulk of the policy
5 issues in the areas of largest uncertainty are in
6 the trunk of the tree moving up through that chain.
7 So topics like, again, the event selection process
8 or, Joy, back to your point, how do you develop the
9 fuel and have some certainty around the performance
10 and what's the time line for developing it.

11 So those kinds of, the big-hitters tend
12 to be in the trunk of the tree. The related
13 research that helps to support that story tends to
14 be in the branches. So for instance, in the lower
15 right you'll see core heat removal, so we're
16 supporting some work on passive heat removal
17 systems. This is where a lot of the analytical
18 code development work comes from.

19 So I don't want to spend a lot of time
20 on this picture, but that's how we go about
21 thinking about how the pieces fit together and
22 where the relative priorities ought to be.

23 MEMBER REMPE: So the GAIN program, for
24 example, since you're acknowledging that DOE is
25 trying to emphasize the importance of the fuel, has

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1 the way DOE is allocating funding showing that same
2 emphasis?

3 MR. KINSEY: I can't speak to all
4 allocations, but I can tell you that there's a, I
5 think as you're aware, pretty consistent and large
6 allocation or commitment to working through the
7 particle fuel qualification program for HTGRs.

8 We have a similar, a bit newer program
9 but a similar support effort in place where we're
10 working with primarily the folks at Argonne
11 National Laboratories and some of the sodium fast
12 reactor developers to evaluate the historical data
13 that's available from EBR2 to sort out both what's
14 there and then what level of quality it had and
15 whether that would be evaluated to be acceptable in
16 today's world, so we can then do a gap analysis and
17 sort out what's left to be done on the fuel
18 qualification story for sodium.

19 MEMBER REMPE: So you'll have a better
20 estimate then on the sodium reactor and how many
21 more years because you've still got to go from the
22 Argonne old data to a real vendor and things like
23 that.

24 MR. KINSEY: Right. But we're starting
25 down that path. And then, again, the molten salt

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1 path I'm just less familiar with. Not that there
2 isn't one, I just haven't delved into that one too
3 much.

4 MEMBER REMPE: Thanks.

5 MR. KINSEY: Next slide. So just going
6 through the four major pieces, they're not in the
7 same order as the strategies are presented in the
8 NRC document, but on the topic of policy issues,
9 DOE is working to directly support the utility-led
10 licensing technical requirements modernization
11 project that Amir will be giving in more detail
12 about later this afternoon. And that's being
13 coordinated through or closely with NEI.

14 A couple of other policy-related
15 activities that we've been engaged with are the
16 joint initiative with NRC on adapting or developing
17 adaptations to the general design criteria. I
18 think the picture that industry was faced with
19 three or four years ago was, if they were going to
20 move into developing principal design criteria,
21 they may have had the right 10 or 15 or 20
22 exemptions from the GDC, which was just an
23 insurmountable task for everyone. So --

24 MEMBER CORRADINI: Was that done for
25 Clinch River, PRISM, and Fort St. Vrain, just to

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1 take history there? Did they have to have that
2 level of exemptions to get through the current --

3 MR. KINSEY: We used those activities
4 as inputs into what these criteria ought to look
5 like, but I don't recall that they actually got to
6 the point where they were processing exemptions. I
7 don't think they were quite that far, you know,
8 into the process.

9 MEMBER CORRADINI: I only ask because
10 I'm just looking at how staff dealt with it at
11 those time periods.

12 MR. KINSEY: At this point, the staff
13 has used the lead-in language in Appendix A that
14 mentions that the GDCs are representative of what
15 might apply to a non-light water reactor until they
16 found the, we've agreed and found a way to work
17 through this new guidance as an adaptation, rather
18 than an exemption or a rule change.

19 So I already talked about fuel testing
20 and passive cooling system testing. I think you
21 all are familiar with a lot of the DOE programs on
22 materials.

23 And another item that just came up a
24 little bit before I came to the front here was the
25 topic of the standard review plan. So we've

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1 actually been working on a pilot that looks only at
2 Chapter 4 on the reactor for both the sodium fast
3 reactor and the modular HTGR. We're wrapping that
4 up in the next couple of weeks, and we plan to
5 spend a little time talking about the results of
6 that activity in the April workshop, the DOE/NRC
7 workshop. And the purpose of that was to figure
8 out if trying to adapt or re-write NUREG-0800 is
9 the most efficient way to move forward and, if it
10 is, to decide what sort of resource it would take
11 to do that for those two technologies, again, as a
12 pilot.

13 The other thing I guess I'll mention is
14 we've started, in the last two or three months,
15 we've started some pretty regular dialogue with the
16 NRC team, a lot of the folks who were up here at
17 the table before, on, nominally, about every six
18 weeks time line. And that's really moving into
19 sort of a working group format, which we think is
20 going to be the most efficient and the best way to
21 work through a number of these topics. So we
22 really do appreciate the opportunity for those
23 kinds of interactions, and we'll continue to
24 support the industry in making those go forward.

25 Next slide. On the topic of analytical

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1 tools development, I think I've already mentioned
2 some of the workshops and some of the other
3 interactions that we've had there. The dialogue
4 that we've started with NRC is that, within the
5 national lab complex, we've either done a lot of
6 this work or have the capability to do a lot of it.
7 And I think the challenge in the near term is to
8 work closely with both NRC and industry to figure
9 out which of those tools in that long list are the
10 more important ones and also sort out how the
11 national lab complex can engage in supporting these
12 efforts while keeping the industry and the NRC
13 adequately independent. And there's some judgments
14 that we have to work through there on each of
15 those, but we're prepared to continue to support
16 that area. I think it's an area that needs some
17 prioritization and clarity on, again, whether we're
18 developing an industry tool or an NRC tool or one
19 that might be able to be used by both with certain
20 controls.

21 Next slide. In the codes and standards
22 area, again, we have the capability to do a fair
23 amount of support work there of industry. What
24 we're doing right now is, again, another pilot
25 study that we've discussed with the folks in NRC

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1 research who are involved with that part of the
2 business. And what we've essentially done is,
3 again, we're doing a pilot on just a handful of
4 codes and standards that could be applied to a
5 sodium fast reactor to sort out how large that
6 effort is if we were to do something on a more
7 technology-expansive basis and how we might go
8 about prioritizing the codes and standards that are
9 out there.

10 It turns out that there are, depending
11 on how you count, there are about 900 out there
12 right now that apply to, in one way or another, to
13 an LWR. So, again, we're just doing a small pilot
14 on a small subset for an SFR to see what a viable
15 path might be for a non-LWR.

16 Next slide. And then, again, on the
17 staged regulatory review process, we maintain
18 awareness of what's going on there. We provide
19 input through the working groups that we
20 participate in with NEI, but we really have left
21 this more to the reactor developers and their
22 associated license applicants to sort out. And
23 they've been doing that through the three industry
24 organizations there.

25 And I think that's all I have. Any

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1 other questions?

2 MEMBER REMPE: Just as a history
3 lesson, Mike asked the question about the Fort St.
4 Vrain is filed back with the Atomic Energy
5 Commission and way before the GDCs were in place.
6 And I'm not sure --

7 MEMBER CORRADINI: I'm sorry, Joy, I
8 didn't hear.

9 MEMBER REMPE: It was before they had
10 the GDCs and, in fact, it was --

11 MEMBER CORRADINI: In the 1980s?

12 MEMBER REMPE: It went operational,
13 when they started out it was filed in application
14 with the Atomic Energy Commission, and then I think
15 it converted over with the NRC. I'm not exactly
16 sure, but it was, they were before the GDCs were --

17 MEMBER CORRADINI: Right. But maybe I
18 misspoke. I was thinking more about the mHTGR pre-
19 PSAR review, as well as --

20 MEMBER REMPE: The 1980s thing, and I
21 don't know on that one because --

22 MR. KINSEY: With the mHTGR, they
23 actually did a, they did a GDC comparison in their
24 FSAR or in their PSAR and have a discussion of the
25 various applicabilities of those GDCs and then what

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1 the alternative information ought to be. But they
2 didn't get to the exemption stage because it wasn't
3 an actual application.

4 MEMBER CORRADINI: All right, thank
5 you.

6 MR. KINSEY: But we used that as very
7 direct input into this current effort.

8 MEMBER CORRADINI: Thank you.

9 MEMBER POWERS: In your slides, you
10 mention very frequently DOE and the national
11 laboratories collaborating on this and that. One
12 of the issues that I've always been curious is
13 suppose that an applicant came forward and said
14 I've used this super computer at the national
15 laboratories that does billions of FLOPS per second
16 and calculated this result, and that's the
17 validation I have for these contentions I have in
18 my license. How do you suppose that the staff
19 would possibly do an independent verification of
20 that calculation?

21 MR. KINSEY: A couple of pieces of
22 that. The first thing that we've been working to
23 do is help, especially some of the less mature
24 developers, help them in thinking through which
25 tools they're using to learn more about their

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1 concepts versus which tools and their outputs would
2 actually be used to support a reasonable assurance
3 conclusion with the staff and be part of their
4 application. So we've been working through that.

5 And then the second part of the answer,
6 I guess, would be we're trying to help the industry
7 folks with support through the labs identify the
8 paths that they intend to be on through this
9 licensing project plan initiative that NRC
10 mentioned so that, if that sort of a proposal is
11 going to be coming to the staff down the road, we
12 can all have some dialogue around that at the
13 beginning of the process to sort out an option to
14 address just what you said. I don't know that I
15 can give you a specific solution, but I think the
16 intention is that we're working to help be sure
17 that the industry doesn't surprise the NRC with
18 something like that that they're not able to deal
19 with on a timely basis.

20 MEMBER POWERS: So you're saying either
21 such a thing will never occur because you've
22 tutored people not to do that sort of thing or
23 that, if it does occur, that some mythical strategy
24 will be invented to handle it?

25 MR. KINSEY: I don't think I'm

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1 suggesting that all available tools wouldn't be
2 taken advantage of. All I'm trying to suggest is
3 that we need to stay closely coordinated from the
4 beginning in those kinds of evolutions with the
5 regulator so that everybody can sort out how to
6 best implement their responsibilities as we move
7 down the road.

8 MEMBER POWERS: One of the problems
9 that we've consistently had is that when an
10 applicant comes forward and says, yes, I've used
11 one, then this fluid dynamic sort of thing with
12 wonderful view graphs and gotten this result is
13 that we find it almost impossible to review that
14 because we don't have access to the convergence
15 criteria built into a commercial code.

16 MR. KINSEY: I understand.

17 MEMBER POWERS: It's been a persistent
18 --

19 MR. KINSEY: Again, I don't know that
20 it's the perfect answer, but I think that's the
21 kind of thing that I would expect an applicant
22 ought to flesh out with the staff through the
23 project plan, any of those big-ticket longer lean
24 time issues.

25 CHAIRMAN BLEY: Anything more from the

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1 --

2 MEMBER MARCH-LEUBA: Yes, I do. I also
3 come from the national laboratory background and
4 just to work out for NRC, and the word conflict of
5 interest was the kiss of death. It didn't matter
6 what you thought was reasonable. It didn't matter
7 what you thought was logical. It's what the law
8 department told you to do.

9 Now, DOE is almost acting like an
10 applicant here. Have you guys talked to the law
11 department to make sure that what you're planning
12 to do is okay?

13 MR. KINSEY: I think, at this stage,
14 we're continuing to do technical development work
15 that supports the reactor developers, and I think
16 we're at the stage where, as described in the NRC's
17 IAP, they've recognized or have an interest in
18 leveraging where it makes sense and where it's
19 legal to do so so that we aren't developing, you
20 know, two or three sets of the same sets of tools.

21 MEMBER MARCH-LEUBA: Under the rules
22 they made me work, and, of course, I didn't have
23 the budget you have. I could not do that. So
24 before we hit a wall somewhere ten years from now,
25 it would be nice to at least involve the law

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1 departments and make sure that they have an
2 agreement that this is okay.

3 MR. KINSEY: I appreciate that input.
4 And, again, the slide that I had there and my
5 conclusion was that we really need to start working
6 toward the implementation plan.

7 MEMBER MARCH-LEUBA: But, I mean, as I
8 said, it wasn't what was reasonable or what was
9 logical.

10 MR. KINSEY: I agree. Attorneys are an
11 important part of that discussion.

12 CHAIRMAN BLEY: Mike, you were saying
13 something.

14 MEMBER CORRADINI: I don't want that on
15 the record. So I want to get back to about a plan.
16 So has DOE given this way in which that you're
17 interacting with potential applicants, has DOE or
18 have labs suggested a reorganization of how DOE
19 actually handles advanced reactor development, I'll
20 call it research and development, versus
21 demonstration and deployment? Because it strikes
22 me, until there's a reorganization of it, the
23 process may not all fit together nicely.

24 In other words, I'll just throw out the
25 idea that --

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1 MR. KINSEY: Yes, give an example.

2 MEMBER CORRADINI: Well, my example is
3 that if truly NRC, in terms of criteria and
4 planning, is looking at sodium, gas, and other,
5 other being molten salt, one would expect to see
6 project offices at DOE that would help organize,
7 help provide appropriate research and development
8 of information so that applicants or vendors could
9 actually do something along those lines. It
10 strikes me without that sort of organizational
11 structure, there could be lack of optimization on
12 the non-NRC side.

13 MR. KINSEY: There's a structure that
14 has recently come together that centered around
15 technical directors that have to do with those
16 individual technology types, and they have a
17 responsibility to work to coordinate the related
18 research and technical development work that's
19 going on to be sure that those activities are
20 filling the right technical gaps.

21 MEMBER CORRADINI: Within the last few
22 months?

23 MR. KINSEY: It's pretty recent, yes.

24 MEMBER CORRADINI: Thank you.

25 MR. KINSEY: And I'm working from the

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1 licensing side to help them on the, you know, the
2 tree picture, to help on the regulatory inputs.

3 MEMBER CORRADINI: I mean, this is
4 really not our purview, but, on the other hand, I
5 bring it up since you're looking to help, rather
6 than lead. It kind of gets back to Jose's question
7 about I don't view you as the applicant, I view you
8 as potentially providing research and development
9 information that would help the applicants in their
10 dealings with NRC.

11 MR. KINSEY: Right. And, again, the
12 DOE is working in a way of structuring its
13 communications with the lab so that they tend to
14 focus on technology areas like that.

15 Anything else?

16 CHAIRMAN BLEY: Anymore from people? I
17 guess we'll turn it over to David. David, I
18 apologize, but, given the way people butcher my
19 four-letter last name that starts with B-L-E, I'm
20 going to ask you to introduce yourself.

21 MR. BLEE: I was wondering if you were
22 a cousin of mine. David Blee. I'm the Executive
23 Director of the U.S. Nuclear Infrastructure
24 Council, and I bring regrets from Commissioner
25 Merrifield. Jeff was going to be here today. He

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1 had a last-minute development at his day job. It's
2 actually a very positive development, so you'll
3 hopefully see an announcement on that soon. But he
4 sends his best.

5 You know, from my own personal point of
6 view, it's great, it's my first appearance at ACRS
7 and it's a very storied committee. Not very many
8 committees, advisory committees are sanctioned with
9 the Atomic Energy Act in 1954.

10 CHAIRMAN BLEY: Just one.

11 MR. BLEE: And, by the way, how do you
12 pronounce your last name?

13 CHAIRMAN BLEY: Bley.

14 MR. BLEE: Bley? Okay. Captain Bley.
15 There we go. But in terms of, this would not be an
16 advisory committee unless, I have not actually been
17 before a nuclear advisory committee that have not
18 included Dr. Corradini, actually, who seems to be
19 ubiquitous in everything I appear before. But good
20 to see you, also, Doctor, and many others here at
21 this --

22 MEMBER POWERS: We've been trying to
23 escape him ourselves. We understand your pain.

24 MR. BLEE: I was glad that you actually
25 delayed the first part of this morning because I

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1 was able to, there was a Senate hearing this
2 morning on advanced retro-legislation, so I was
3 running late, but I was able to get the essence of
4 the conversation, and I really commend you on your
5 really good observations and questions. And if
6 you're wondering how often you ought to meet, you
7 ought to look upon yourselves as the board of
8 directors, at least, I would say at this point,
9 every six months on this subject. I think this has
10 been a lively and useful discussion so far.

11 So the answer to your bottom line here
12 is progress is being made, and I say that
13 guardedly. And why do I say that? Before I jump
14 into the weeds here on the presentation, I think
15 that go up to 10,000 meters and then also go back a
16 year ago, a year ago we had an advanced, we have an
17 annual advanced reactor technical forum in which,
18 and this is the third one at Oakridge last year,
19 and Commissioner Ostendorff came down with the
20 party line from White Flint, basically saying that
21 they were open for business and, by the way, the
22 NRC preferred one voice when it came to licensing
23 matters and that it was looking forward to
24 deployment in the 2035 to 2040 range.

25 Well, he got a real earful down there

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1 on that thesis for a number of reasons. One is
2 there was, the industry did not feel that the NRC
3 was ready for a license application, they did not
4 agree with the 2035 deployment, and they also felt
5 that, in this case, in terms of where this is
6 going, in terms of the end user, you may have
7 utilities, you may have traditional utilities, not
8 sort of non-utility generators, and potentially
9 government users in the case of the new advanced
10 test reactor or potentially in some of these demos.

11 So we did, since then, however, the NRC
12 has moved with dispatch, I'll say, to address
13 concerns and really that has been very, very brisk.
14 And they have engaged with multiple stakeholders,
15 although we have worked hard to coordinate our
16 efforts with the coordinating group that we do with
17 NEI Southern and NIA. They have held regular
18 status meetings, held regular stakeholder meetings.
19 And even though they have not gotten the resources
20 from the Congress they've asked for, and, actually
21 asking for resources was a great first step of the
22 \$5 million that's still pending in the continued
23 resolution dispute or settlement, they have moved
24 things along here.

25 In terms of the DOE has played a very

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1 good supporting role. We think DOE is very, very
2 important, probably early on and later, unless
3 there is something on the DOE site, I think
4 particularly in funding, in terms of the
5 involvement of the national laboratories.

6 But I think, again, what we're trying
7 to give voice to is the developers. They don't
8 like to be called designers. It's technology
9 developers now. It's the state of the art here.
10 Technology developers. Some are very, very small,
11 some are well know, like General Atomic,
12 Westinghouse, General Electric.

13 And you also have had the Congress
14 enter into this. In the last Congress, the Nuclear
15 Energy Innovation and Modernization Act was
16 introduced. It passed out of committee in a
17 bipartisan fashion in the Senate side, and it was
18 actually, a companion version, a similar version
19 actually passed the House of Representatives. It
20 came very close, one unanimous consent away from
21 being passed.

22 In this Congress -- and there's also
23 the nuclear NEICA, Nuclear Energy Innovation and
24 Capabilities Act, just figured these things out
25 during the congressional recess, which basically

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1 deals with demos and test reactors, which has
2 already passed the House of Representatives this
3 year, as well as the licensing modernization on the
4 House side and you had a hearing today.

5 So things are moving very, very fast,
6 and they've got some sweeping mandates, not just
7 necessarily on modernization, something you'll hear
8 about from Amir further, but on the issue of NRC
9 reform in terms of fee structure and that sort of
10 thing.

11 Our emphasis has been on the early,
12 being a business consortium, we're focused on
13 nearer-term actions and really pre-licensing, NRC
14 readiness for pre-licensing engagement, pre-
15 licensing engagement, and then engagement.

16 CHAIRMAN BLEY: Since you've said what
17 you are, can you give me a little tutorial on the
18 Nuclear Infrastructure Council? Just what is the
19 organization and how are you structured with the
20 other people who you're serving.

21 MR. BLEE: Yes, Mr. Bley. Thank you
22 for that question. Or Dr. Bley probably.

23 CHAIRMAN BLEY: Probably, yes.

24 MR. BLEE: We're focused on new nuclear
25 energy and the promotion of the U.S. supply chain

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1 internationally. So it's on research of nuclear
2 energy in the United States. We're a business
3 consortium. We have over 90 member companies.

4 CHAIRMAN BLEY: Are they all
5 developers?

6 MR. BLEE: No. We have about 14
7 developers.

8 CHAIRMAN BLEY: Okay.

9 MR. BLEE: And we are focused on four,
10 about five things: key movers, you know, basically,
11 Gen 3+ deployment, but then also, since Dr. Chu
12 wasn't able to resolve it, the back-end, resolving
13 the back-end path forward in terms of supply chain
14 readiness and manufacturing innovation, and
15 advancement of technology. That's what Jeff
16 Merrifield's, he chairs our task force on that.
17 And finally it's the whole international paradigm
18 in terms of export controls, 123 agreements, those
19 sorts of things.

20 So we're not just focused on advanced
21 reactors, but we feel -- and, by the way, we're
22 agnostic on technology advancement. We're entirely
23 supportive of Gen 3+ SMRs, advanced reactors, all
24 moving forward in parallel.

25 So we're multi-faceted. We're just

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1 focusing, again, on resurgence of nuclear energy in
2 the United States and the involvement of the U.S.
3 supply chain internationally but a very business-
4 driven focus in that sense. In terms of -- and it
5 really includes the whole, you know, panoply of
6 household names that you would expect, starting
7 with GE, Westinghouse, AREVA, NuScale, CB&I, Fluor,
8 AECOM, etcetera, etcetera, moving on down the whole
9 supply chain. Southern key mover utilities, as
10 well.

11 So, again, our focus has been on the
12 pre-licensing engagement. In particular, we wonder
13 if we're not focused on the right thing in the
14 sense that one of our members, Terrestrial Energy,
15 has said that they're going to submit a license
16 application in 2018, is it? 2019? 2019. And to
17 us, that becomes, not because it's Terrestrial but
18 because the fact that someone is going to come here
19 with a license application.

20 We have issued a white paper on
21 modernization, and, basically, it really advocates
22 far more emphasis on NRC readiness in terms of not
23 learning about a technology on the customer's
24 nickel, learning about it beforehand, and then in
25 terms of really kind of a cost-share with respect

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1 to the engagement.

2 We actually don't like the word, the
3 use of the term "quality review," Dr. Rempe, in the
4 sense that we think, actually, the NRC, if an
5 applicant fails, we really think, in large part,
6 the buck stops with the NRC on the lack of a
7 quality application.

8 So, again, we are --

9 MEMBER POWERS: What exactly does that
10 mean, the buck stops at the NRC?

11 MR. BLEE: The buck stops? You've
12 never heard that term? I think it was Harry
13 Truman, I think, or was it Ronald Reagan?

14 MEMBER POWERS: I'm aware of that. Why
15 does it stop at the NRC?

16 MR. BLEE: The view is, in the past,
17 when they've sent, mailed back the application to
18 folks, they sent, they've said, you know, it wasn't
19 a quality application. Well, I mean, you can say
20 that all day long. The fact of the matter is if
21 you have a customer of yours that fails, you should
22 own at least part of that.

23 I mean, in the past, this past year, on
24 an early-site permit, they mailed back, they didn't
25 mail it back but they essentially almost did mail

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1 it back, the TVA application for the SMR at Clinch
2 River. You know, it seems to me -- so NRC has to
3 own that, as well. As the customer, they can't
4 just say, you know, it wasn't a quality application
5 and we're off the hook.

6 MEMBER REMPE: Let me be clear. I'm
7 not saying it's not a quality application. I'm
8 saying does the applicant have a process that
9 involves some sort of peer review, technical peer
10 review? And that is part of the vendor design
11 review that the Canadians use, which is going to be
12 referenced later in your slides.

13 MR. BLEE: Yes.

14 MEMBER REMPE: And so I'm thinking that
15 might be a good thing to emphasize early because
16 the Canadians have said we get higher-quality
17 applications if we emphasize early on that they
18 have some quality process in place. And so that's
19 what I'm trying to get to. It's important to have
20 a good quality application, but processes that have
21 peer review and some sort of technical review might
22 eliminate what happened with Transatomic Power,
23 right?

24 MR. BLEE: Right. I agree. And you
25 did use the term "popular press," which I don't

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1 think is being used very often these days.

2 MEMBER REMPE: Oh, yes.

3 CHAIRMAN BLEY: It depends on where you
4 come from, I think.

5 MEMBER SKILLMAN: Let me support Dr.
6 Rempe for a second.

7 MR. BLEE: Sure.

8 MEMBER SKILLMAN: We speak as
9 individual members here on the subcommittee, so
10 whatever comes out of the subcommittee is Joy's
11 point of view, my point of view --

12 MR. BLEE: I wasn't personalizing
13 because I'm sure that quality --

14 MEMBER SKILLMAN: I know, I know. Let
15 me offer a point of view that I, for one, advocate
16 very strongly. I think if a vendor comes in and
17 puts in a C-minus application, the NRC ought to
18 return it and say file a Part 21 on yourself. And
19 what that does is that forces an extended condition
20 and it forces that vendor to look very
21 introspectively of what went wrong, that the burden
22 is not with the NRC, it's with the equipment vendor
23 who just happens to be peddling a reactor design.

24 MR. BLEE: Right. I would agree with
25 you. I would agree that some sort of process other

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1 than, hey, you didn't put a quality application in.
2 There's some kind of step-off, and I think they
3 have tried where they have had applications where
4 they effectively would have mailed them back, but,
5 unfortunately, it seems that -- and then it gets
6 picked up by the antis, and, you know, it could be
7 used as an excuse.

8 But I agree there should just be, like
9 anything else, a very transparent. You shouldn't
10 be accepting C-minus applications.

11 MEMBER SKILLMAN: Well, you know, if
12 you buy an automobile or a truck and there's a
13 recall, GM or Ford or Chrysler or somebody fixes
14 that at their expense, not yours, and you get a
15 notification, and the notification is dear Mr. or
16 Mrs. so-and-so, please return your vehicle for this
17 fix. That is not a bad analogy here.

18 I can tell you that I've been involved
19 with design certs where we've pointed out the error
20 by the design cert applicant, and their reaction
21 was what do I do now, and we said file Part 21 and
22 that assures that the process is filed. And those
23 who have operated plants who bought equipment who
24 have been through this understand what they get as
25 the result of that is a mighty fine product.

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1 But I just wanted to support Joy. I
2 think she's right on the money.

3 MR. BLEE: It's better than a code red.

4 MEMBER SKILLMAN: That's correct, yes.

5 MR. BLEE: So just to -- how do you
6 adjust the slides here, sir? Oh, okay. I'm going
7 to walk through here real quickly because I know I
8 had a big warm-up there.

9 Okay. So we've already gone through
10 that in terms of, again, the emphasis here is we're
11 giving voice, not entirely successfully as yet
12 because of the resource constraints with some of
13 the advanced reactor developers and the fact that
14 they're focused on different stages. They really
15 are focused on peer design in many cases. But
16 that's what we're trying to give voice to.

17 In terms of the timing, I talked a
18 little bit about the goalpost here. And,
19 basically, again, beginning with the end in mind, I
20 mentioned the Terrestrial application, but I was a
21 little bit alarmed today to see your goalpost had
22 moved back again. You said 2030s, which could be
23 construed as 2039. But we felt we had got it
24 forward to at least 2030. But we really think the
25 market is telling us late 2020, so that's just,

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1 again, beginning with the end in mind.

2 In terms of the DOE focus, you know,
3 again, I think the DOE is playing an important role
4 here, and Jim always is really value-added. I
5 think, at the end of the day, if we do our job
6 right, the DOE is really going to be sidelined,
7 except potentially as an end user. So we want to
8 give voice again to those developers and what their
9 needs are, as opposed to having a government-
10 centric type of approach, more free market.

11 With respect to -- so to that end, we
12 are, we aren't encouraging NRC and DOE. We
13 encourage them to collaborate but not necessarily
14 to link their goals. The NRC should be linking
15 their goals to what the end users are looking at
16 and what those developers are looking at, rather
17 than what their sister government agency is telling
18 them to do, as important as they are.

19 I mentioned Terrestrial and that the
20 fact that there's at least one other party that is
21 in pre-licensing engagements. There is also, I
22 believe you're going to get an announcement very,
23 very soon about a very innovative new advanced test
24 reactor moving forward in a really private-sector
25 led fashion. Your schedule on that advanced test

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1 reactor demo actually fits pretty well with that.
2 So your goal posts are fine there.

3 You know, we are concerned that,
4 basically, four of our members are seeking, and you
5 talked about the Canadian model, several of you
6 over here, with respect to the migration, the
7 outward flow to Canada. Four of our companies have
8 either filed, a couple have filed and I think two
9 more are getting to get ready to get in the queue.
10 And I think that the, you know, this is something
11 where we think, actually, the Congress has
12 recognized this, and I think they will definitize
13 this further as they go through their markup
14 because they've asked us for further input on this.
15 But the attractiveness of the Canadian thing isn't,
16 is the fact that, not that they do it, necessarily,
17 just in a prescribed manner. It's two years, and
18 the fact is it's a fixed price. They don't come
19 and say, hey, we're going to give you a schedule
20 and a budget for your design. They're saying for
21 \$5 million, basically right now, in two years, we
22 will give you, you will have a benchmark in terms
23 of the feasibility of your license application
24 review.

25 So it's also, that fits into another

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1 need in terms of it also offers a stage, the desire
2 for pre-licensing engagement benchmarking and then
3 a staged approach, and that represents the first
4 stage. So that's the attractiveness to it. They
5 don't want something in which they come in here and
6 say, yes, it's going to cost you \$15 million in
7 three years. No, right now the Canadians say,
8 maybe the price is going up because everyone is
9 coming there, they're just saying two years and \$5
10 million and, again, it's a phased approach. That's
11 the first stage of their licensing process. And as
12 you know, as you go through it beyond that, it's
13 not, it is more of, I think, a phased approach. So
14 we, again, with emphasis on pre-licensing review,
15 we are pushing in the Congress and certainly with
16 the NRC on that sort of paradigm.

17 In terms of the -- I think I've covered
18 this here. Jeff, NRC staff to emulate the CCC,
19 yes. We're also supportive, by the way, and I
20 think it's very important to -- it's one thing to
21 have a Canadian style pre-licensing vendor design
22 review, but you also need to have off-budget money.
23 We thought it's a very, very important step that
24 the NRC took in asking for \$5 million off budget,
25 off fee base, to basically do the kind of work that

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1 they do to get up to speed on the various
2 technologies. We believe next year we hope it will
3 be at least 10 - 15 million really, and, beyond
4 that, in terms of we think that there's an appetite
5 in the Congress for this kind of support, and we
6 think that would be very, very helpful.

7 Frankly, the NRC has been working on
8 fumes here, and we applaud them for the fact they
9 just didn't shut down this whole development in the
10 sense because they didn't get the money. They
11 haven't gotten the money yet, and we're halfway in
12 the fiscal year.

13 In terms of the -- I'm going backwards.
14 Actually, going forward, Jeff did want me to
15 mention about the higher assay LEU. It is, I
16 think, as you know, the work on the fuel, as Dr.
17 Rempe mentioned, is very, very important or
18 critical. I think that a lot of progress was made
19 this year under the aegis of the DOE in that
20 regard. I think that there is an issue on higher
21 assay LEU, and we are trying to work towards some
22 sort of path forward on that because there's some
23 concern there won't be higher assay LEU available
24 to the reactor designers going forward, and we
25 haven't really gotten much clarity on that and

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1 that's something that we're pursuing.

2 In terms of -- let's see.

3 MEMBER KIRCHNER: David, pardon my
4 interruption here. Could you be explicit? Is this
5 an issue for DOE and the government, not an NRC
6 issue --

7 MR. BLEE: No, it's not an NRC issue,
8 but it's an issue that Jeff mentions everywhere he
9 goes, so he put it in here.

10 MEMBER KIRCHNER: Okay. I just wanted
11 that clarification.

12 MR. BLEE: Yes. No, it's --

13 MEMBER KIRCHNER: There's nothing
14 about, inherently about licensing less than 20
15 percent of --

16 MR. BLEE: No, no, no --

17 MEMBER KIRCHNER: -- fuel line other
18 than to criticality issues, etcetera.

19 MR. BLEE: This is really a DOE issue.
20 And we've got the DOE here.

21 MEMBER KIRCHNER: Okay.

22 MR. BLEE: In terms of the vision and
23 strategies, some specific comments from Jeff. In
24 terms of the executive summary, the staff states
25 NRC recognized that non-LWR vendors may wish to

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1 commence re-application activities or submit
2 applications for review in the near term in advance
3 of the DOE supplement goal. We believe it is
4 positive that NRC is not tying itself to the DOE
5 deployment goal. I already addressed that issue.

6 The document discusses the use of
7 computer models and analytical resources. And a
8 point here is that we support an approach that
9 maximizes collaboration, minimizes cost and
10 duplication. We have every indication from the NRC
11 staff that they're pursuing that option, rather
12 than re-inventing the wheel.

13 On page seven, the staff emphasizes the
14 need to identify policy decisions appropriate to
15 govern the acceptability of non-LWR designs and
16 recognizes several of these, as well as some which
17 may apply to both LWRs and non-LWR designs. And we
18 support the need to readily identify these policy
19 issues.

20 And later on this month, we will be
21 presenting some findings from our Advanced Reactor
22 Technology Owners Group to provide a prioritized
23 roadmap to what I think Amy presented earlier this
24 morning in terms of the actual developers. So stay
25 tuned on that.

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1 Let's see. Also on page nine, NIC
2 continues to be concerned regarding language
3 discussion of the prioritization review and the NRC
4 identification of which particular technologies are
5 more likely to come ready for the Agency's
6 regulatory review. In general, we don't like the
7 government picking winners and losers. That's
8 number one. But at some point, the market will
9 pick winners and losers, and the regulatory process
10 will pick winners and losers in the sense that
11 those who are able to have the resources and the
12 fortitude to get through the process will get into
13 the end zone.

14 In terms of the -- we believe that the
15 role of the Agency is to establish a set of risk-
16 informed performance-based licensing requirements
17 that are, to the extent practical, technology
18 neutral and provide a framework for various
19 advanced reactor technologies to move forward.

20 We're concerned with this language
21 because it leaves the impression that the Agency
22 may attempt to make a qualitative judgment about
23 various reactor vendors. And NIC's view, as long
24 as the applicant meets the NRC requirements and
25 pays the applicable fees, it should have the

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1 opportunity to have its design reviewed in a timely
2 fashion.

3 MEMBER REMPE: Excuse me, but your
4 third bullet about the you want a risk-informed
5 performance-based licensing requirements for the
6 advanced reactors, is that in conjunction with
7 we're going to have the applications starting to be
8 submitted by 2018 and something could happen by
9 2020 --

10 MR. BLEE: Oh, you have until 2019, I
11 think.

12 MEMBER REMPE: Oh, 2019. So you want
13 this to happen, the modernization of the framework
14 in time for your first movers; is that your vision?

15 MR. BLEE: Not necessarily just my
16 vision, but that's Congress's vision. I mean, the
17 Congress is going to come out with a bunch of
18 edicts basically saying within 180 days the NRC has
19 to do the following. So, you know, that's the
20 conundrum.

21 MEMBER REMPE: It is a conundrum, and
22 so maybe some people need to work with those,
23 coming up with those edicts and --

24 MR. BLEE: Well --

25 MEMBER REMPE: And so I'm just curious,

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1 your organization seems to be involved with some of
2 those bills, I guess, at some level or something.

3 MR. BLEE: Well, we've been asked to
4 comment on them. You know, well, Congress does
5 things in sweeping ways. I mean, they're basically
6 going to bat the ball in the NRC's court on a
7 number of them saying 180 days put on something
8 that addresses, you know, more effective pre-
9 licensing engagement, do this, do that. And that's
10 not necessarily the way we want it --

11 MEMBER REMPE: So you don't agree with
12 that? That's just what you think Congress is doing
13 is what --

14 MR. BLEE: Well, I would say that
15 Congress is -- when I say don't agree with it, I'm
16 saying that that is, that Congress is, that's
17 normal for legislation in terms of a regulatory
18 agency. And rather than actually put prescriptive,
19 something prescriptive in, they're asking for the
20 NRC to come back, you can look at it in a positive
21 way, they're asking for the NRC to come back with a
22 prescription that addresses their concern.

23 So, you know, the other way of doing it
24 would be to say here's the prescription and go
25 implement it.

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1 MEMBER REMPE: But your vision is that
2 that's, again, not Congress's vision, but your
3 vision is that probably that's not a realistic
4 approach? Is that, am I putting words in your
5 mouth?

6 MR. BLEE: Oh, no, no, it's very
7 realistic. We think that we have to move with
8 urgency, so the Congress is moving with urgency.
9 We applaud that. And so if you're really going to
10 have an application in here by 2019, we're going to
11 have to move vigorously, and 180 days is a half a
12 year and that should be sufficient for the NRC to
13 come back with a response to the Congress.

14 So, no, I think that it is sweeping.
15 We didn't write them. But that is typical of what
16 you'll see in legislation. The fact is that
17 Congress has got involved in this issue. They're
18 responding to concerns they have in terms of the
19 readiness on a non-light water reactor licensing,
20 and we can't just use the same play book that we
21 did for light water reactor licensing.

22 MEMBER REMPE: So, again, your view,
23 though, forgetting about what Congress has in these
24 bills, is that it's best to have a new framework to
25 address this 2019 application? That's what your

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1 view is --

2 MR. BLEE: We need modernization and
3 reform, so we're pleased with the urgency that
4 Congress is moving. We're also pleased with the
5 urgency that both the NRC and the DOE are moving.
6 Now --

7 MEMBER REMPE: Because we heard earlier
8 today the NRC, you know, in the long term that may
9 be useful, but if we want to get something done in
10 a hurry we ought to work with our existing
11 framework. And you're saying something different.
12 That's why --

13 MR. BLEE: We're not saying Part 53
14 either. That could be something that NRC comes
15 back with. But what we see is modernization of the
16 existing framework and --

17 MEMBER REMPE: Be specific. I mean,
18 the GDCs, that's something that's underway and --

19 MR. BLEE: Amir is going to tell you
20 all about this.

21 MEMBER REMPE: Okay. But you don't
22 have a view that you want to convey? Because he'll
23 talk later, but I just am curious on your view.

24 MR. BLEE: My view is Amir's view,
25 actually, on that subject.

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1 MEMBER REMPE: Okay. We'll wait to
2 hear from him.

3 CHAIRMAN BLEY: That's pretty slippery.
4 I invite you to comment on the NRC's near-term
5 action plans document. Do you have any opinion on
6 those?

7 MR. BLEE: With respect to --

8 CHAIRMAN BLEY: Are they heading in the
9 direction you're looking for, or do you think
10 they're going in the wrong direction?

11 MR. BLEE: They're definitely headed in
12 the right direction. I mean, it's been very logic
13 -- your vision and strategy, then you go to
14 implementation, action plans, then you have near-
15 term, medium-term, longer-term, and now you're
16 going into the devil is in the details, of course.
17 And that's where we're all going to have to roll up
18 our sleeves and provide input.

19 CHAIRMAN BLEY: Well, since you bring
20 up the devil in the details, you were really
21 positive on what the Canadians are doing. We've
22 talked to them. How many people have gone through
23 this Canadian process and actually got a license
24 for anything? A license.

25 MR. BLEE: Oh, actually gone through

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1 the vendor design review?

2 CHAIRMAN BLEY: Yes, and ended up
3 getting a license.

4 MR. BLEE: I'll have to submit that to
5 --

6 CHAIRMAN BLEY: Why then do you have
7 confidence that what they're doing is going to be a
8 faster way to getting a license?

9 MR. BLEE: We have confidence that they
10 can, in terms of they have done this process in
11 terms of design review. I was up in Ottawa last
12 year --

13 CHAIRMAN BLEY: Yes, and they say
14 here's our stamp of whatever it is on the design
15 review, you're on the right track if you go ahead,
16 but nobody has ever carried it through.

17 MR. BLEE: Well, I mean, the fact of
18 the matter is why are companies going there instead
19 of going to White Flint, okay? They're looking for
20 surety, they're looking for fixed price, they're
21 looking for fixed schedule, they're looking for
22 something that is phased.

23 CHAIRMAN BLEY: They might be looking
24 for a stamp so they can go somewhere else and sell
25 a design.

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1 MR. BLEE: Looking for what?

2 CHAIRMAN BLEY: You know, an approval
3 so they can say the Canadians approved this and you
4 ought to buy my design, but nobody has ever gotten
5 a license from the Canadians going through this
6 process. We don't know it's faster, and we don't
7 know it's cheaper.

8 MR. BLEE: Well, we do know --

9 CHAIRMAN BLEY: Getting to the point is
10 cheaper.

11 MR. BLEE: What we do know is they're
12 promising that they will do this in two years with
13 a fixed price.

14 CHAIRMAN BLEY: With a design review.

15 MR. BLEE: And that they have four
16 companies queuing up to use it.

17 CHAIRMAN BLEY: Yes, we know that.

18 MR. BLEE: So we'll see in a couple of
19 years, presumably.

20 CHAIRMAN BLEY: But they aren't getting
21 a license at that point.

22 MR. BLEE: No, they don't get a
23 license. It's a pre-licensing interaction.

24 CHAIRMAN BLEY: They're giving them the
25 kind of thing that has been issued by, at least my

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1 understanding, by the NRC to people who come in and
2 say --

3 MR. BLEE: Well, Andy's point, we have
4 the same capability, the same thing here. Well, if
5 --

6 CHAIRMAN BLEY: If you bring something
7 in --

8 MR. BLEE: They weren't sure of the
9 time and they weren't sure of the price. So that's
10 the issue. If they had a fixed price and a fixed
11 time and it was a reasonable period of time, you
12 know, it wasn't five years, I think people would be
13 coming here. Why is the market going to Canada
14 instead of coming here if the process is available
15 here? I rest my case.

16 MEMBER KIRCHNER: So, David, maybe I
17 could follow up with Dennis.

18 MR. BLEE: But I'll find the answer to
19 your question, though. The Canadians spoke very
20 glowingly of this when we were up there.

21 CHAIRMAN BLEY: I think I know the
22 answer to my question already, but I'll appreciate
23 it --

24 MEMBER KIRCHNER: Well, you get that
25 licensing ability statement and then you go to,

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1 effectively, what is our 10 CFR 50 process. So
2 it's more about making a statement to raise funds
3 than it is about the in-depth technical quality of
4 the application and the design concept.

5 MR. BLEE: Well, just like, so just
6 like getting a loan, qualifying for a loan
7 guarantee.

8 MEMBER KIRCHNER: Precisely. It's --

9 MR. BLEE: From your investors, some of
10 these people are looking to have it financed, and
11 so it provides yet another positive objective
12 indicator to them. So if this was coming out of --

13 MEMBER KIRCHNER: But you want the end
14 result, and I can understand the value of it, but
15 do you also want to, for some of your applicants,
16 incur the other requirements in the Canadian
17 process that opens them up to an in-depth quality
18 assurance program review?

19 MR. BLEE: We don't get no --

20 MEMBER KIRCHNER: You're picking and
21 choosing what you want. I see the value of the end
22 result, but are you prepared to actually adopt the
23 Canadian process. At least as I understand it, it
24 would require a higher bar than perhaps our NRC
25 colleagues were asking of potential applicants.

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1 MR. BLEE: Well, we're advocating more
2 pre-engagement, generally speaking, across the
3 board.

4 MEMBER KIRCHNER: Unfortunately, you
5 weren't here this morning. I pressed pretty hard
6 on this because I think it's advantageous for you
7 on the applicant's side or potential applicant's
8 side down the road, as well as the NRC, to have
9 some clear understandings about what these terms
10 mean. What is a license ability statement? I'd
11 like to see the definition of that. And what is
12 required to achieve that result by the staff? And
13 then both sides would enter this phase with some
14 ground rules or whatever to get to the result
15 you're looking for.

16 The Canadian process, on the surface,
17 looks good, but it's the devil in the details, and
18 I don't think some of your potential applicants,
19 pre-applicants, whatever, developers are ready to
20 play at the level that the Canadians would expect.
21 So I'd just interject some caution here.

22 But I think for both sides, if you
23 define what you want in that license ability
24 statement, then perhaps the staff has a better idea
25 of what they're going to look for in that pre-

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1 application material.

2 MR. BLEE: We do have a paper on this,
3 we haven't released it publicly, that has some more
4 detail.

5 MEMBER KIRCHNER: I've seen
6 Commissioner Merrifield's papers, but I think it
7 would behoove you, NIC, to have a little bit more
8 depth here into what the expectations on both sides
9 would be to get such a license ability statement.

10 MR. BLEE: As I said, we've got a paper
11 on this. We haven't released it yet, but we are
12 being asked about it by, you know, the Senate. So
13 we will release it certainly. But I do agree -- by
14 the way, in all fairness, some are going through
15 that process in Canada because they're interested
16 in the Canadian market in terms of really the
17 smaller reactors. So it's not entirely that, you
18 know, there's nothing here for them. Of course,
19 you know, you've got TerraPower going to China
20 because they said that the NRC process wasn't
21 workable.

22 So the question is why --

23 MEMBER KIRCHNER: I don't feel I have
24 to defend the NRC, but have they come to the NRC
25 with an application yet to declare it's unworkable?

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1 I'd go back, I had participated in the reviews in
2 the 80s and 90s for both the mHTGR and the PRISM
3 design, and I found at the time, although we didn't
4 have the draft guidance that is expected to be
5 released in the near term for the general design
6 criteria, the staff at the time showed great
7 flexibility actually in understanding the
8 technology and why this particular set of
9 requirements wasn't going to work and was adroit
10 and flexible and adept in putting in, patching,
11 actually, at the time, in real-time the standard
12 review plan to look at those aspects of the design
13 that weren't LWR-like.

14 So I think it's not fair to the Agency
15 to say that so-and-so is going to China because it
16 doesn't work here.

17 MR. BLEE: Well, that's a statement of
18 fact. I mean, I don't know it's unfair. It's
19 simply to say --

20 MEMBER KIRCHNER: Well, that's their
21 business decision, but it's not a proof that the
22 NRC system would not accommodate that design
23 because my experience base is that they did in the
24 past with the two earlier designs.

25 MR. BLEE: That's the perception,

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1 though. That's certainly the perception.

2 MEMBER BALLINGER: So you basically
3 have what amounts to two semi-moving targets. The
4 Canadian process is sort of fixed but not quite,
5 and you'd like to see that changed, and then get
6 convergence between their process and what the
7 staff here would expect with respect to an initial
8 application, the quality of an initial application?
9 Is that what I'm -- by the way, CNNC is the China
10 National Nuclear Company.

11 MR. BLEE: I'll have to blame that on
12 Jeff then.

13 MEMBER BALLINGER: I think it's CNSC.

14 MR. BLEE: CNSC?

15 MEMBER BALLINGER: CNSC.

16 MR. BLEE: Okay.

17 MEMBER BALLINGER: So is that the
18 scheme? They have a predictable process?

19 MR. BLEE: I don't want to get too hung
20 up on the Canadian process. That's not the
21 panacea. As I said, it represents surety, it
22 represents fixed price --

23 MEMBER BALLINGER: Surety, fixed price.
24 So you get a product --

25 MR. BLEE: And you get something at the

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1 end of your two years.

2 MEMBER BALLINGER: -- to be what you
3 want so that, if you were to come to the staff,
4 they would be happy.

5 MR. BLEE: And hopefully it would be
6 something that would be useful to the NRC as you
7 then move forward to the next phase. And what's
8 the next step?

9 CHAIRMAN BLEY: I'm sorry to have
10 created this big diversion. You can go ahead with
11 your presentation, where you were headed. We need
12 to move.

13 MR. BLEE: Okay. I'm almost finished,
14 I think. So in terms of the, you know, the
15 medium/long-term IAP, again, very logical
16 framework. We recognize that the NRC is steadfast
17 and is ready to accept an advanced reactor design
18 for review, so we'll take them for their word.
19 They will be able to test that soon enough.

20 Page three of the IAP repeats the NRC
21 being ready to effectively and efficiently regulate
22 and, review and regulate non-LWRs by not later than
23 2025. And, again, that's about a six-year delta
24 between what has been stated by Terrestrial.

25 So I wouldn't call it lack of

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1 timeliness, although I think Jeff has that in here.
2 It's, basically, it's a matter of beginning with
3 the end in mind and, again, responding to the
4 market. But, clearly, we think the goal posts are
5 moving forward, rather than moving backwards, and I
6 think in terms of the advanced test reactor, I
7 think that, thereabout, what you have there in your
8 presentation, Jim.

9 So in terms of the fee requirements I
10 mentioned before is basically providing fee release
11 off the fee base, and I don't expect that this
12 group would take the lead on this. This is
13 something that the Congress is looking at is off
14 the fee base in terms of allowing more
15 interactivity in the pre-licensing engagement and
16 the NRC readiness, and the NRC has recognized that
17 by asking for the \$5 million.

18 That doesn't address the fee issue. We
19 have one free meeting, as I understand, and then
20 after that you've got pay \$260 an hour. So we
21 think that there should at least be either off the
22 fee base to a maximum extent and then possibly,
23 what the DOE does is an 80/20, 50/50 kind of fee
24 base just in terms of cost share.

25 CHAIRMAN BLEY: You're right. It's not

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1 where we work. But in fairness, they can't do much
2 unless they get money from somewhere, and they
3 can't use licensees' money to look at these new
4 things. They've been reined in in that area in the
5 past. So there needs to be an off-fee source of
6 funds if they're going to do that.

7 MR. BLEE: So in closing, I'm not
8 taking issue with the Congress of the United
9 States, just for the record. We should very much
10 support that legislation. I really appreciate you
11 all holding my feet to the fire here today and the
12 good back and forth.

13 I would really encourage this group to
14 meet in the same kind of format at least every six
15 months. We really got to keep the velocity going.
16 I think the NRC staff is doing a great job. Every
17 six weeks they're putting us backwards and forwards
18 in terms of meetings. There's multiple things
19 going on at the DOE. It has been a sea change
20 since a year ago in terms of activity, and it's a
21 multi-ring circus. And welcome to the fray.

22 And based on what I've heard today and
23 seen, we appreciate your involvement here.

24 CHAIRMAN BLEY: Thanks very much for
25 your presentation. We're going to take a 15-minute

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1 break. We'll be back at 20 until four on that
2 clock.

3 (Whereupon, the above-entitled matter
4 went off the record at 3:25 p.m. and resumed at
5 3:41 p.m.)

6 CHAIRMAN BLEY: The meeting will come
7 to order again and we are now going to hear from
8 NEI, Michael Tschiltz. Thank you, Mike.

9 MR. TSCHILTZ: Thank you, Dr. Bley.
10 I'm happy to be here this afternoon.

11 MEMBER REMPE: Why?

12 MR. TSCHILTZ: Why?

13 CHAIRMAN BLEY: That's all right. We
14 had a little go-round on that already.

15 (Laughter.)

16 MR. TSCHILTZ: So you'll be glad to
17 know that I know nothing about Canadian
18 regulations, other than --

19 CHAIRMAN BLEY: You may be too.

20 MR. TSCHILTZ: Other than I went
21 fishing there once and I can assure you the fishing
22 regulations are very complicated, as far as what
23 you can catch and keep.

24 CHAIRMAN BLEY: Otherwise, they keep
25 you.

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1 MR. TSCHILTZ: That's right. So I'm
2 here to provide NEI's perspective on the near-term
3 implementation action plan, and we basically
4 solicit comments from our members and specifically
5 the Advanced Reactor Regulatory Task Force on this
6 issue. So we've submitted our comments via letter
7 to the staff earlier this week, with specifics and
8 details.

9 I will say in general that there's no
10 significant issues that are raised in those
11 comments from the industry on the near-term action
12 plan. I've got some issues in here that get into
13 the detail, but I think we'll be able to work with
14 the staff on those issues.

15 So I think that the action plan
16 improves the transparency of the NRC activities and
17 keeps the industry abreast of what's going on
18 inside the NRC. Our goal and objective, at least
19 from my role is to have the IAP actions result in a
20 more effective and efficient licensing process for
21 advanced reactors.

22 In reading through it, I think there's
23 a lot of effort that's gone into it, and but I
24 think the real benefit will be realized when we get
25 into Phase 2, which is getting into the detailed

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1 activities and trying to integrate the time lines
2 and identify the critical path activities and
3 allocation of resources to the different activities
4 to make sure things are done in a timely manner
5 that supports what people need.

6 CHAIRMAN BLEY: I didn't notice it in
7 your slides, and it might be there. But you guys
8 must be developing some guidance for the industry
9 to coincide with these action plans at the NRC or -
10 -

11 MR. TSCHILTZ: I wouldn't say it's a
12 one for one type of thing. We have, if you go the
13 next slide, Peter. So I put this on here. You may
14 have seen this before. This kind of depicts what
15 the industry organization is for dealing with
16 advanced reactor issues.

17 There's new plant advisory committee
18 that's kind of at the C&O level. There's a
19 coordination group which involves Southern, NIC,
20 NIA, NEI and INL as well, that kind of basically is
21 an information-sharing group where we try to
22 coordinate activities.

23 But most of the regulatory issues work
24 down to the Advanced Reactor Working Group, and
25 it's probably a good time for me to explain. My

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1 role has changed since I was last here before you.
2 I was the Director of Risk Assessment and I was
3 asked to take responsibility for new plants, SMRs
4 and advanced reactors.

5 In the NEI reorganization, we've split
6 into two different parts that deal with advanced
7 reactors in the plants and SMRs. One part of the
8 organization deals with commercialization, and the
9 part of the organization that I'm responsible for
10 deals with the regulatory and licensing issues. So
11 I'm the principal interface for NEI on new plants,
12 SMRs and advanced reactors.

13 CHAIRMAN BLEY: Now you used all these
14 various boxes here, these task forces and things.
15 They aren't all NEI or are they?

16 MR. TSCHILTZ: Yes, they are. They're
17 all --

18 (Simultaneous speaking.)

19 CHAIRMAN BLEY: Okay. So everything is
20 in NEI. It's all within NEI, okay.

21 MR. TSCHILTZ: Yeah. There's a
22 plethora of working groups and task forces.

23 MEMBER CORRADINI: What's the
24 difference, since you have them separated?

25 MR. TSCHILTZ: The working group is a

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1 upper, higher tier level organization. The working
2 group may have a number of task forces underneath
3 it. The working group from --

4 MEMBER CORRADINI: So one works and one
5 adjourns?

6 MR. TSCHILTZ: Well, one kind of
7 directs what things need to be done, and that's
8 when the task forces are formed and they create the
9 product then that goes back up the working group.

10 MEMBER CORRADINI: So the task force
11 has a charge. They complete the charge, the task
12 force is dissolved?

13 MR. TSCHILTZ: Yeah. Each of the task
14 forces will have a specific charter, and once they
15 fulfill that charter you'll do away with the task
16 force, although that often morphs into a new,
17 different activity so --

18 CHAIRMAN BLEY: And within your
19 language, you have a policy issues team I see. Is
20 that -- do you mean the same thing by policy issues
21 that the staff here means, or is it something
22 different?

23 MR. TSCHILTZ: Yes. I mean it's the
24 same thing, and in fact many of the -- I mean many
25 of not all of the issues that Amy covered in her

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1 slide or on a similar tracking document that we
2 have that follow those issues as well in what we
3 need to do to help move forward in those specific
4 areas.

5 But the other thing I'll point out on
6 this slide is where Amir's effort with the
7 Licensing Technical Requirements Modernization
8 Project fits in. So that's how this gets drawn
9 into that. The advanced reactor technology task
10 force is run under the commercialization side, and
11 actually we make sure that we have representation
12 from each of the technologies on the regulatory
13 task force to make sure when we review documents
14 such as the draft reg guide for the advanced
15 reactor design criteria we have comments reflective
16 of all the different designs that are being
17 contemplated.

18 MEMBER SKILLMAN: Mike, let me ask
19 this. Among those ten groups, how much overlap is
20 there of individuals from one group into another
21 group, and other responsibilities that the
22 individuals that are in those groups have to other
23 assignments in NEI?

24 MR. TSCHILTZ: Well, it varies. Like
25 for example, I'm co-chair of the Advanced Reactor

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1 Working Group. We're at Redmond now. I lead the
2 new plant working group. I'm the chairman of that.
3 Katie Austin, who works for me leads the advanced
4 reactor regulatory task force, I think with Amir as
5 well on that as the co-chair.

6 So you know, I know Peter's involved in
7 some of these activities here with the staged
8 application review and approval. So there's, you
9 know, there's a limited number of people who are
10 actively involved. I would say the Advanced
11 Reactor Working Group, we have around 60 people
12 come to those meetings. So there's a lot of
13 interest in it.

14 When it gets down to doing the actual
15 work, there's a smaller group of people that are
16 actually involved with that.

17 CHAIRMAN BLEY: We had a little slide
18 thing going on. I'm assuming most of the people on
19 these groups or committees or task forces are
20 utility people who are working part-time on these
21 projects. Or are they NEI staff or is it just a
22 mix?

23 MR. TSCHILTZ: I would say there's a
24 mix. I mean from the different vendors that are
25 contemplating, from NIC and NIA, from Southern.

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1 INL's involved. So I have very limited experience.
2 These two gentlemen can probably better answer that
3 question than I can so --

4 MR. HASTINGS: Yeah. The short answer
5 is there's utility directors entered as developers
6 of the other organizations. There's typically one
7 or two NEI staff assigned to each group, and then
8 they'll come and go as the subject matter dictates.

9 CHAIRMAN BLEY: Developers has become
10 common language now I take it. We heard it first
11 and then I hope there's still designers involved.

12 MR. HASTINGS: Yes. They do design and
13 development.

14 MEMBER REMPE: For a while, I thought I
15 saw that NEI was promoting the use of technology-
16 specific advanced reactor groups. Are you still
17 doing that so that you might be able to have some
18 cohesiveness among the 60 organizations proposing
19 different designs?

20 MR. TSCHILTZ: Yes, that there are
21 specific technologies, specific groups for molten
22 salt, fast and HD, high temperature gas reactors.
23 So there's specific groups working on those issues.

24 MR. AFZALI: If I may, first getting
25 back to your questions. Everybody in the blue box

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1 is under Part 10, non-paid guys. So there's no
2 paid individual other than NEI guys on the blue
3 boxes. The red box at the bottom, that's the
4 project. We are doing it as a paid consultant
5 groups working with that.

6 On the middle range, we've got Advanced
7 Reactor Technology Task Force. That divides into
8 three major design, high temperature gas, sodium
9 and molten salt. But they coordinate through
10 Advanced AR Technology Task Force, and anything to
11 do with regulation goes to the Advanced Reactor
12 Regulatory Task Force.

13 So we're trying to coordinate as much
14 as we can through NEI, and we're trying to create
15 and then the red one on the top is trying to get
16 coordination with NIC and NIA and INL, to make sure
17 you have one voice in what we are asking for.

18 We have a saying in our company that
19 the toughest part of the -- parts of the, any
20 project is starting it and finishing it. We are in
21 the starting point of that, so we have a lot of
22 challenges. But we are moving forward, I think, in
23 the positive direction.

24 CHAIRMAN BLEY: Thanks.

25 MR. TSCHILTZ: So the next slide. So I

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1 think we've talked about this earlier during the
2 meeting, that the importance of the near term
3 activities is to align design research and
4 regulatory processes, identify policy issues and
5 gaps and figure out how to deal with those.
6 Obviously, you know, the staff went over the policy
7 issues, security and emergency planning. Current
8 policy issues that are up front with the SMRs, and
9 you know, those issues carry over to the advanced
10 reactors as well.

11 One of the other things that we're
12 advocating is placing a high priority on
13 development of design-specific licensing project
14 plans. We're ready to start an effort at NEI to
15 basically build a template for those pre-
16 application project plans. So there's -- it would
17 be a common understanding and we think it would be
18 helpful for the developers to have a better
19 understanding of what they should be trying to get
20 out of their interactions or expecting to get out
21 of their interactions with the NRC.

22 CHAIRMAN BLEY: A question here. On
23 your previous slide where we have all the boxes,
24 the people on those committees or whatever we call
25 them, are some of the -- and there's a plethora of

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1 small groups who are starting to come up with
2 designs, developers. Are they actual participants
3 or are they represented by NIC and the NIA?

4 MR. TSCHILTZ: They're participants.

5 CHAIRMAN BLEY: They are participants
6 themselves, okay.

7 MR. TSCHILTZ: Yes. Okay, so the next
8 slide. So I think when I looked at the
9 implementation action plan, my comments were all
10 the ones that were most important to me were on
11 Strategy 3. It may align with what my
12 responsibilities are at NEI. To me, the technical
13 issues, although there may be a longer time line
14 for working those out, I think those are more
15 straightforward.

16 The issues where I think where we're
17 going to have the greatest benefit out of this is
18 trying to figure out a more efficient and effective
19 licensing process, and that's where Amir's project
20 fits into that.

21 I think we're advocating that we can
22 license these first tier at least of the advanced
23 reactor designs that are being contemplated right
24 now using the Part 52 or Part 50 process that's
25 informed by the advanced reactor design criteria,

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1 in combination with what Amir's working on for the
2 licensing basis event selection.

3 So I think it's a workable process, and
4 we're supportive of moving forward with that in the
5 near term. So I guess Amy mentioned about a
6 *Federal Register* notice that is going to be issued
7 here I think next week on advanced reactor
8 security. I think we're in line with that.

9 I think when we initially read the
10 plan, the draft plan, we thought that it needed
11 more detail in that area, and I'm thinking that
12 between NEI's white paper that the NRC has accepted
13 for review and we got a fee waiver earlier this
14 week on, we'll start those interactions and
15 interact on what's in the FRN so we can move
16 forward with that.

17 So I think we're aligned with the staff
18 on how that fits into the plan. I think our
19 initial comment was there could have been more
20 detail on that, and it looks like we're headed in
21 that direction.

22 Next slide. So I think the staff
23 alluded to the fact that we've had discussions that
24 we think that some fuel issues should be included
25 in the near term action plan. We've had

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1 discussions of whether there's any specific policy
2 issues or gaps in regulation.

3 None really readily jump out at us, but
4 I think it warrants more detailed, in-depth dive
5 into those areas, to make sure that, you know, all
6 of these areas are covered and if there are any
7 policy issues that emerge out of this, it
8 transcends across a number of different
9 disciplines, which makes the conversation harder.

10 So I think the staff is receptive to
11 that feedback and we'll be having that dialogue as
12 we move forward.

13 MEMBER SKILLMAN: Mike, does that --
14 does that approach remove existing enrichment
15 facilities from consideration, by going from five
16 to 20?

17 MR. TSCHILTZ: So I don't believe there
18 are any enrichment facilities currently licensed to
19 enrich to 20.

20 MEMBER SKILLMAN: Oh, they're not?

21 MR. TSCHILTZ: They're eliminated.

22 MEMBER SKILLMAN: Fine. My question if
23 you go to 20, are there some that cannot
24 participate because of the staging and geometry of
25 the centrifuges, other design issues in those

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1 plants?

2 MR. TSCHILTZ: I don't know the answer
3 to that question. I do know that there is one
4 entity out there who has the capability to build
5 and would build if there is a market for that
6 material. So --

7 MEMBER POWERS: As far as I know, there
8 is not an engineering challenge, that it's market-
9 driven. As to the challenges we have on enrichment
10 is about five percent on neutronic and on
11 uncertainties in cross-sections, and they get worse
12 when you talk about soluble fuels and things like
13 that.

14 Now most of those issues have been
15 hanging around for 20 years that I know of, and yet
16 the capability to resolve those has degraded badly
17 in the United States, but it exists overseas and it
18 seems to me that that's one where a great deal of
19 international cooperation can be fostered and in a
20 short time reduce that particular issue. Maybe NEI
21 is in a position to facilitate.

22 MR. TSCHILTZ: So we have this
23 discussion at NEI. You know, a lot of the issues
24 kind of bleed over into commercialization issues
25 here. Not so much all of -- all of them aren't

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1 just in the regulatory and licensing area. But
2 there's an example. Like for example the UF6
3 canisters. They're licensed to have up to five
4 percent enrichment, I believe. There's no -- and
5 the way the transportation regulations are written
6 there.

7 So there's no alternative to that. The
8 alternative would be to deconvert the metal,
9 transport and then manufacture the fuel at a
10 different location. So there are some issues and
11 potential obstacles there. So really to think
12 through that, I think, and to see if there are any
13 regulatory or policy issues that come out of that.
14 I think that's what we're advocating.

15 So the next item is the regulatory
16 review road map, and one of the issues that has
17 come up as a result of our experience with design
18 certifications is the level of detail that's been
19 expected, has expanded over time. So we're looking
20 to basically enhance the guidance for what the
21 level of detail would be needed in an application,
22 what level of detail is needed for an acceptance
23 review, and the industry has a group that's
24 starting to work on this.

25 So I think our next step would be to

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1 draft a white paper, and I know the staff is also
2 working on a revision of Reg Guide 1.206 and the
3 standard review plan to address some of these
4 issues as well. So we're coordinating on those
5 efforts.

6 Next slide. I guess my presentation is
7 short. We're --

8 MEMBER RAY: Let me extend it just a
9 little bit here. We've had -- we have a certified
10 design. I happened to chair the subcommittee, and
11 we've had to process some exemptions recently, and
12 we just had a presentation from staff on the
13 lessons learned from those exemptions, in terms of
14 the process of review and adoption, issuance of a
15 design certification.

16 Has any of that been taken into
17 consideration when you talk about what level of
18 detail is required for the future applicants?

19 MR. TSCHILTZ: So let me see if I
20 understand your question. Are you referring to
21 what happened with the delays in the COL, the
22 issuance of COLs based upon errors in the DCD or --

23 MEMBER RAY: No, I don't know anything
24 about delays in the COLs. I'm just talking about
25 exemptions that we processed for and what were

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1 found to be -- by the COL owners to be omissions in
2 the application of Appendix B during the design
3 certification development.

4 MR. TSCHILTZ: So --

5 MEMBER RAY: At least that's what they
6 said and that's what we accepted.

7 MR. TSCHILTZ: I will say --

8 MS. CUBBAGE: This is Amy Cubbage.
9 Those were the certified, the Westinghouse
10 certified design issues, the condensate return,
11 etcetera, etcetera, that were -- had to be
12 addressed by Levy for the license.

13 MEMBER RAY: So I'm basically asking,
14 we have some experience to go on terms of details
15 that weren't included in the design certification
16 and then subsequently were found to be problematic
17 and required changes in order the plant to operate
18 as it was --

19 MR. TSCHILTZ: So let me see. Amy's
20 clarification was very helpful to me because so my
21 understanding is the issues were addressed through
22 departures in exemptions, which allowed them to --
23 the staff to move forward with issuance of the
24 COLs. We actually have --

25 MEMBER RAY: Somehow actually existed,

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1 but that's a detail.

2 MR. TSCHILTZ: Okay. So we have a
3 legal advisory team who is actually looking at this
4 issue, and developing options as to what, how we
5 should proceed, whether we should have a petition
6 for rulemaking, whether we should seek some other
7 clarification from the NRC. I think that one of
8 the proposed mechanisms --

9 MEMBER RAY: Clarification about what?
10 I'm sorry.

11 MR. TSCHILTZ: How to address these
12 issues in the future, because one of the issues or
13 one of the proposed solutions to this was issuing I
14 think license conditions and I know OGC had took
15 exception with that, as granting approval based
16 upon a future action.

17 MEMBER RAY: Yeah, but that has to do
18 with the process -- the processing time and the
19 methodology, the regulatory process that you would
20 use to address the issues. What I'm trying to have
21 you talk about, because you had talked about
22 guidance for what level of detail was required for
23 the certification applicant, not the COL holder.

24 You know, you can reduce the level of
25 detail on some continuum. At some point, though,

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1 you're trying to -- it won't do what you said it
2 would do and you then need to do something to
3 revise the certified design, because if you build a
4 certified design, it simply can't be operated.

5 MR. TSCHILTZ: So I would say the way I
6 would answer your question is that there are
7 certain aspects of the design that warrant more
8 reviews than other aspects of the design, and I
9 think what NRO has done with this safety focused
10 review kind of has people spend more time on
11 looking at those areas that are most important to
12 safety and less time on other areas.

13 So I think where this would fit in
14 would be those areas where there's less time.
15 There may be less required for your submittal.

16 MEMBER RAY: Well, one of them was, for
17 example, heat load in the control room. They found
18 that you couldn't be without power in the control
19 room for as long as they said in the design
20 certification than you would need to be. You know,
21 one cure of that is just not say how long you're
22 going to be without power in the control room, and
23 that's what I'm trying to get to.

24 As you get at a high end of -- if you
25 get few enough details, then it's pretty hard to

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1 violate anything that you've certified because
2 there isn't any detail there. In this case, there
3 was a provision that required -- that you would be
4 able to occupy the control room for a certain
5 period of time with a loss of all power, and they
6 couldn't do it because the heat level is too high.
7 That's the kind of detailed, don't you think?

8 MR. TSCHILTZ: Yes, but I think -- I
9 think you could make the argument, and the staff
10 probably has made the argument that you would need
11 that level of detail to come make a safety
12 conclusion. But for other things that are in the
13 19 chapters or whatever, maybe you don't need as
14 much detail.

15 MEMBER RAY: Okay. There are some
16 things like maybe the, I don't know, the color of
17 the control room door. I don't know what it would
18 be, something anyway, that you don't need.

19 MR. TSCHILTZ: Yes, and I think the
20 safety-focused review kind of highlights the fact
21 that, you know, the staff is going to focus most of
22 its resources in certain areas, and you would
23 expect more detail in those areas and maybe not as
24 much in others.

25 MEMBER RAY: Okay. I don't want to

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1 hold you up any longer. Go ahead. I just didn't
2 think -

3 MEMBER KIRCHNER: Actually, I wanted to
4 join in, Harold.

5 MEMBER RAY: What?

6 MEMBER KIRCHNER: I wanted to hold them
7 up a little longer.

8 MEMBER RAY: Well all right, but I just
9 couldn't under -- I wasn't sure we're just talking
10 about reducing the level of detail required or
11 being maybe more specific. I'm not sure. The SRP
12 is pretty specific right now, but anyway. All
13 right, thank you.

14 MEMBER KIRCHNER: So here likely you
15 refer in the first bullet under 3.4 that the
16 expected level of design detail required -- now
17 these are evolutionary plants that they -- that the
18 NRC has looked at for design certification.
19 They're mature designs benefitting from 50 years of
20 operation, etcetera.

21 But now we're going to advanced
22 reactors that are going to start off as one of a
23 kind. So I'm just intrigued. So it looks like the
24 intent is to get a design certification for these
25 advanced designs? Then it begs the question at

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1 each step along the way in a phased review, what
2 would your recommended -- NEI, what would you
3 recommend to your stakeholders as what should be
4 included?

5 Say we take David Blee's suggestion we
6 should do something like the Canadians, and get a
7 licenseability statement. What would you expect to
8 be in the application to get such a statement?
9 Have you defined that as a group?

10 MR. TSCHILTZ: So as I --

11 MEMBER KIRCHNER: A surety at each
12 phase of this proposed phased review process?

13 MR. TSCHILTZ: So actually I don't
14 think we're, at least initially, are coming at it
15 from that angle. We're actually coming at it from
16 the review of the Reg Guide 1.206, an update of the
17 SRP and some other guidance document that I think
18 we are looking to basically develop the white paper
19 that would form the basis for that, that would get
20 into more of level of detail and what's required
21 for the specific level of detail. So we, at least
22 in my mind, I haven't married it to the staged
23 design review process.

24 MEMBER SKILLMAN: Mike, I need to make
25 this comment. The work that I've done on design

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1 certs is work where the team kept 50.9 and 52.9 in
2 front of themselves constantly. If you read that,
3 that little grouping of words basically says,
4 basically communicates this submittal will be
5 materially accurate in all aspects under, if you
6 will, throw out a perjury, and it's got to be
7 signed by an officer.

8 And so at least one of the teams I was
9 part of heeded that, and that is in 50.9 and 52.9.
10 It basically communicates you've got to tell the
11 truth, the whole truth and nothing but the truth.
12 You've got to write it down, and if you find
13 something that's not what you had represented it to
14 be, the obligation is on the designer to go back
15 and say "time out." I've got an error.

16 But I would just bring that to your
17 attention. If the goal here is to have a design
18 certification, it may be prudent for those who are
19 involved to review those very small sentences in
20 50.9 and 52.9.

21 MR. TSCHILTZ: I appreciate that. I
22 don't think anyone has any intent to reinterpret or
23 try to change any of that. I think those are good
24 regulations.

25 MEMBER KIRCHNER: Obviously those are

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1 obscure, and until those have been pointed out,
2 there are folks that say gee, I didn't even know
3 that was in there.

4 MR. TSCHILTZ: So I think maybe an
5 example that would maybe highlight some of the
6 issues associated with level of detail would be if
7 you have a small advanced reactor, you know, very
8 small power output versus something like an SMR.
9 Say SMR was a 12,000 page submittal to the NRC, but
10 for a small, smaller reactor, a different
11 technology, what would be the appropriate level of
12 detail for that?

13 What that be required a 12,000 page
14 submittal, or would that require something much
15 less? So because if you take the concept that the
16 ability to affect public health and safety is much
17 less, then the safety decision can be focused on
18 specific aspects of the plant. Then maybe you
19 wouldn't need to have a 12,000 page submittal.

20 MEMBER KIRCHNER: Michael, that's the
21 domain of things we used to do at the lab, small
22 reactors and yes, of course, the amount of paper
23 work is lot less than a large, complex nuclear
24 power plant. Is that your real customer base?

25 MR. TSCHILTZ: So that --

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1 MEMBER KIRCHNER: I know --

2 MR. TSCHILTZ: There's a full spectrum.
3 There's a full spectrum and one of the --

4 MEMBER KIRCHNER: Wait a minute, wait a
5 minute, wait a minute. Yes, I know the forest
6 design, I know all this. Are we going to -- it
7 seems to me there are mechanisms like test reactors
8 to encompass those kind of outliers. We're not
9 going to power this country on less than ten
10 megawatt reactors in any foreseeable economic way
11 in the future, right?

12 I mean really it would seem to me your
13 focus, especially because the utilities are such a
14 large part of your organization, would be on
15 making, you know, power at scale 24-7, highly
16 reliable and that is 1,000 page application or
17 whatever number you want to put on it.

18 It's not a small conceptual design
19 effort and something you go and build in the
20 Polyrito site at Los Alamos. We can't do that
21 anymore, but I did that once. So while you're
22 bringing that one --

23 (Simultaneous speaking.)

24 MR. TSCHILTZ: I mean the point is this
25 one size doesn't fit all. There's a whole spectrum

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1 of what's out there. The example I gave is a real
2 example. They're NEI members. They bring the same
3 thing to the table that other people bring to the
4 table. There's a number of designs in between
5 those power levels. So to me, it's worthy of a
6 discussion and some more thought --

7 MEMBER KIRCHNER: You already say one
8 size doesn't fit all, and it seems to me anything
9 in the test reactor category ought to be just dealt
10 with differently. I mean that can't be the test
11 vehicle for a 500 megawatt plant. It's not even a
12 prototype of a large commercial plant.

13 MR. TSCHILTZ: I think you base your
14 level of detail based upon first principle pipe
15 concepts of how you come up with your safety
16 decisions. So you know --

17 MEMBER KIRCHNER: Realistically, what
18 are you asking? You want an effective timely
19 response from the NRC with a certain degree of
20 certainty, I'm repeating my words. I mean those
21 are some of the attributes you're looking for in
22 the regulatory process. Why do you want to
23 complicate it with a less than ten megawatt small
24 reactor for --

25 MR. TSCHILTZ: I think you're going off

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1 and misinterpreting what I said that we're focusing
2 our efforts on these small reactors. It was only
3 an example of that.

4 MEMBER KIRCHNER: Well, I think it's a
5 bad example.

6 MR. TSCHILTZ: Well, it represents the
7 spectrum of what's out there.

8 (Simultaneous speaking.)

9 MEMBER KIRCHNER: Of course it does,
10 but for commercial power --

11 MR. TSCHILTZ: -- and that the level of
12 detail that's required in submittals has grown. We
13 think it's time that we need to address it. We're
14 willing to take action in the industry, to come up
15 with improvement in the guidance that would allow
16 us to do that. We plan to work with the staff on
17 it.

18 We know the staff has ongoing efforts
19 to revise the SRP and Reg Guide 1.206. We think it
20 fits in well with that. We know there's issues
21 with level of detail required for acceptance
22 reviews. We've seen it with the past two
23 applicants. So those issues are real and we think
24 we need to address them.

25 MEMBER KIRCHNER: I agree, but looking

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1 at a small test reactor is not a good vehicle for
2 that.

3 MR. TSCHILTZ: I'm not saying that
4 we're going to look at it. I'm saying that there's
5 a range of applicants out there. I think you
6 understand what I'm saying.

7 MEMBER REMPE: But Walt, again I think
8 he said a small reactor. I don't think he said the
9 word "test reactor." He's talking about a small
10 reactor that produces --

11 (Simultaneous speaking.)

12 MEMBER REMPE: You can't use the test
13 reactor, the way the regulations are is my
14 understanding, right?

15 PARTICIPANT: That's correct.

16 MR. TSCHILTZ: Right. They will be a
17 Part 50 or a Part 52 application.

18 MEMBER KIRCHNER: I understand all
19 that. But it would seem to me that you would be
20 focused on these call them mid-size, call them SMRs
21 whatever, and that size reactor is going to require
22 a lot more detail and the application is going to
23 have a lot higher page count, etcetera, etcetera,
24 etcetera.

25 I'm just objecting to bringing that in.

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1 I can't -- yes, you have a lot of customers and
2 such but --

3 MR. HASTINGS: If I may, I think the
4 point of this bullet is that it's consistent with
5 the staff's safety-focused review of NuScale as an
6 example.

7 MEMBER KIRCHNER: Okay.

8 MR. HASTINGS: It should be a right-
9 sized application. The requirements should be
10 predicated on the hazard of the facility for public
11 health and safety, and the fact is when we did
12 AP1000 and I was right in the middle of that as
13 well, we didn't recognize at the time we were
14 finalizing the DCD that we were writing a
15 construction compliance document.

16 The industry has recognized that as a
17 lesson learned. The staff recognized that as a
18 lesson learned. The prize was the design cert, and
19 so when an RAI would come in, it was a lot easier
20 to put the detail in the application because that's
21 what the reviewer wanted.

22 Then to think ahead to how difficult it
23 was going to be to try to construct that document.
24 That's primarily what this bullet is about, I
25 think, is getting the right level of detail, enable

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1 the staff to make their safety finding without
2 encumbering the application with more detail than
3 is necessary, irrespective of the size of the plant
4 as a function of the risk. I think that's the
5 goal.

6 MR. RECKLEY: Have you put out some
7 guidelines as to what you think is the right level
8 of intent?

9 MR. TSCHILTZ: No. As I indicated,
10 that's a -- it's a project that we're starting on,
11 and we're starting -- we're going to interact with
12 the staff. I talked to Frank Akstulewicz not too
13 long ago on their -- concerning their efforts in
14 revision of the reg guide and update of the SRP.

15 MEMBER REMPE: Today, I've talked to
16 several people about the need to review the quality
17 in the processes, irrespective of the size of the
18 reactor. Has that -- I mean you've talked about
19 the fuel issue and how that was important at NEI.
20 Have you started trying to talk to some of your
21 members, that it's important to think about as they
22 develop their design, if there needs to be some
23 sort of quality and peer review in their process?

24 MR. TSCHILTZ: So I can only answer
25 that from the perspective of the people that I've

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1 dealt with to a large degree. With certain
2 exceptions, our people that have 30 or 40 years of
3 experience in the industry working on these issues,
4 they're very familiar with the quality
5 requirements. I would say those few that don't fit
6 into that category, they have people involved with
7 their project who do have that experience.

8 So I personally don't have a concern
9 that there's a big gap out there between what ACRS
10 would expect or the staff would expect for the
11 quality of the application and what people are
12 actually working on.

13 MEMBER REMPE: But you heard me refer
14 to this *Technology Review* article, where there was
15 a gap in the quality and so again, I don't know how
16 many of them have done things internally to ensure
17 that there's necessary --

18 MR. TSCHILTZ: I'm aware of the issue.
19 I'm kind of aware -- I'm not exactly aware of where
20 they were in the process of developing the
21 conceptual design and progressing along that line.
22 Obviously, they haven't gotten to the point where
23 they're starting specific interactions with the NRC
24 so I mean --

25 MEMBER REMPE: I just am curious on how

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1 prevalent this is among the almost 60 groups and
2 concerned about that.

3 MR. TSCHILTZ: Yeah. I would say my
4 experience is we don't have a lot of interaction
5 with the 60 groups. There's a subset of those
6 groups that we have more frequent interactions
7 with.

8 MEMBER REMPE: Thanks.

9 CHAIRMAN BLEY: Anything else? Okay.
10 It's time to move to Amir's side. Thank you for
11 being here. Thank you, Michael. Go ahead.

12 MR. AFZALI: Okay, thanks. While
13 they're getting the presentation ready, I have a
14 pre-written script that I'm going to go through
15 that I want to make a couple of points. First, I
16 want to wish Happy International Women's Day to all
17 our colleagues here. I'm wearing a red tie in your
18 honor.

19 CHAIRMAN BLEY: Oh, is that what the
20 red's about?

21 MR. AFZALI: Yeah. It is Happy
22 International Women's Day.

23 CHAIRMAN BLEY: Is that why Joy is --

24 MEMBER REMPE: God no. We don't get
25 the news in Idaho.

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1 FP I think as women we're supposed to
2 be on strike, but we chose to come in today.

3 CHAIRMAN BLEY: And just so we're
4 clear, without you we would have been dead in the
5 water. So thank you.

6 MR. AFZALI: And if you'll notice I've
7 got my tie a little bit loose because all the heat
8 in the room. Secondly, as the presentations are
9 going on, I heard a number of references to our
10 project, so I'm kind of --

11 I'm very flattered by all those
12 mentions. I'm hoping that they don't set me up for
13 a heated discussion of that project, because what
14 I'm going to be talking about is why we established
15 that project and what the deliverables are, how
16 we're doing it. So the conversation hopefully is
17 going to be beneficial to you.

18 With that said, again my name is Amir
19 Afzali. I'm Southern Company's Licensing and
20 Policy director. When I say "policy," I'm not
21 talking about licensing policy, regulatory policy.
22 I'm talking about energy policy for advanced
23 reactors. Thank you for affording me the
24 opportunity to provide you with our perspectives
25 on advanced reactor licensing.

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1 The title of my presentation is
2 "Removing Barriers for Advanced Reactors
3 Development Through Modernization of Regulatory
4 Framework," and I know we'll have a lot of
5 discussion what is modernization. Hopefully we can
6 discuss that through the presentation.

7 We believe this modernization is
8 important to achieve utility, utilities going off
9 continuous performance program. When there's
10 objective of being to innovate, industry's and
11 NRC's objective of continued safety improvement and
12 collective goal of reducing cumulative effect of
13 patchwork regulation.

14 Next slide. So during my slide, again
15 I'm going to talk about our observations and the
16 basis for those observations, and finally what we
17 are calling a proposal to close the gap in what we
18 see as a gap in our current regulation.

19 So after this morning's interactions
20 between the ACRS and the NRC members, I feel that a
21 lot of points have been made already, but I hope
22 the reason why we think that's the best way to go
23 forward is helpful in this conversation.

24 Next slide, please. So let me start
25 with our observations. Now IAPs are comprehensive

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1 and highlight many different pieces of the puzzle
2 that have to come together to remove the licensing
3 as a barrier against nuclear fleet modernization.
4 Also, the extensive nature of the IAPs override
5 acknowledgment of the challenges that are faced by
6 our vendors and our innovators.

7 The acknowledgment, although not
8 sufficient, is an important step for the final
9 conclusion. On the other hand we believe, as
10 presented, the deliverables from these activities,
11 the interconnection within the deliverables,
12 priorities of the deliverables, and how these
13 deliverables result in a timely improvement in
14 effectiveness and efficiency of licensing process
15 are not yet clear.

16 I am -- the strategy I'm outlining here
17 is to develop not a piecemeal competency
18 improvement but a holistic approach to improve
19 license. Finally, although the need for risk-
20 informed performance-based licensing structure for
21 advanced non-light water reactors was identified
22 many years ago, 1990's, and has been emphasized
23 recently in SECY-15-0168, yet the projected time
24 lines of developing risk-informed performance-based
25 are well into the future, 2026 time window.

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1 So when you're talking about can we do
2 it quickly enough, they have been talking about
3 this for a long time and it's time for action
4 versus continuous conversation.

5 Next slide, please. So what is the
6 basis? Where does our observation comes from? The
7 basis of these observations are developed based on
8 our experience with licensing and building first of
9 a kind generation reactors at Vogtle plant, our
10 MOUs with advanced SMRs developers like NuScale,
11 our MOUs with non-light water reactor developers of
12 more mature designs like GE, X Energy and AREVA, as
13 well as working with developers of more ground-
14 breaking technologies such as TerraPower's
15 Northern.

16 Our observation and actions are
17 influenced by collaborating with NRC and risk-
18 informed performance application for the current
19 fleet, e.g. we helped with the 50.69 development
20 and exercise, as well as collaborating with NRC on
21 its Level 3 PRA study. Finally, our observations
22 are based on our work on needed energy policies to
23 support advanced reactor research and development
24 as well as deployment.

25 Next slide, please. So this is a basic

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1 time line we put together to show from concept to
2 actual final commercial plant what it takes, what
3 are the steps, the general steps, kind of phases of
4 development. As we can see, billions of dollars,
5 billions of dollars are necessary to get -- take it
6 from the concept all the way to commercialization.

7 Obviously, some of the reactors are at
8 different phases of this, but all of those, they
9 need billions of dollars for development. We
10 believe it is unreasonable to expect these, the
11 public and private sectors to time to lift this
12 heavy lift given the current uncertainties in
13 regulatory framework.

14 Therefore, we believe a clear and
15 effective framework has to be in place as soon as
16 possible to remove the regulatory uncertainty
17 barrier for investment.

18 Next slide. So again, to summarize our
19 basis for the need for timeliness observation. We
20 believe that varying national and international
21 interests and needs require the portfolio of energy
22 solutions. However, substantial investment over
23 many years are needed for research and development.

24 Technical, financial and regulatory
25 uncertainties are major barriers for enabling these

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1 investments. We are dealing with both technical,
2 financial and the regulatory uncertainties, and
3 having a modernized regulatory framework is
4 paramount in reducing the regulatory uncertainties.
5 Next slide please.

6 MEMBER KIRCHNER: Could you just
7 enumerate in roughly in order of importance what
8 those barriers are?

9 MR. AFZALI: Barriers, which? The
10 licensing barriers or --

11 MEMBER KIRCHNER: Sure. Start with
12 those.

13 MR. AFZALI: Okay. So if you don't
14 mind, give me two minutes and I'll get to the slide
15 that may cover that, and if we don't get there,
16 then ask that question again.

17 (Off mic comments.)

18 MR. AFZALI: Okay. So the next slide I
19 would like to present is based off our observations
20 regarding the need for a holistic and coordinated
21 plan that prioritizes work needed to transition to
22 a system that will be technology-inclusive, risk-
23 informed, performance-based regulation.

24 As shown in this slide, in general
25 based on pressure and temperature, reactor

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1 technologies fall into four major categories. They
2 have been developing prescriptive regulatory
3 framework for their light water reactors for over
4 40 years. Also, many successful risk-informed
5 performance regulations for the current fleet have
6 demonstrated we can do better.

7 Therefore, duplicating the same
8 prescriptive approach for other technology
9 deliveries will take too long, require considerable
10 resources and production would require -- requires
11 backfit and risk-informed performance-based
12 approaches in the future.

13 Finally, due to resource consideration,
14 trying to repeat our prescriptive approaches may
15 force us to down-select resulting in promising
16 technology to be neglected simply due to licensing
17 uncertainties.

18 Next page. So our conclusion is that
19 we believe a technology-inclusive, which enables or
20 incentivizes innovation across a broad spectrum of
21 advanced reactors is necessary.

22 We believe it has to be systematic
23 risk-informed to facilitate systematic and robust
24 consideration of the risk to the public during
25 design and licensing, and it has to be performance-

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1 based to facilitate clear and the context -- to the
2 extent possible, direct relationship between the
3 performance and licensing requirements.

4 CHAIRMAN BLEY: Amir?

5 MR. AFZALI: Yes sir.

6 CHAIRMAN BLEY: What are your thoughts
7 on how well these implementation action plans are
8 moving us in those directions?

9 MR. AFZALI: I've reviewed those action
10 plans quite deliberately and extensively, and I've
11 had many conversations. So if I look at the action
12 plans, they provide every bit of the jigsaw puzzle
13 we need to get there. However, I believe trying to
14 do everything we say in the action plan in a timely
15 manner, it takes 20-30 years. I also believe --

16 CHAIRMAN BLEY: Can you break those
17 apart? Is it all the strategies together, or is it
18 primarily one of them that looks like it's piling
19 up?

20 MR. AFZALI: Strategy 3 and 5 are 100
21 percent aligned with what we are doing. Strategy
22 2, where we're developing tools and perhaps is
23 going to take a longer time. It depends on what
24 you're developing the tools for.

25 If you don't know what is the licensing

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1 basis and events selection, what are you
2 being licensed for, how and what accidents you
3 are going to consider, it's going to be very hard
4 to ignore and develop tools which can analyze
5 that type of accidents.

6 So I think there's some order
7 challenges in there and then there are some
8 requirements challenges in there. So we believe
9 both of those have to be addressed. I want to kind
10 of answer that question within that context of our
11 next slide, where we're going to say specifically
12 what we're doing. Maybe that will answer your
13 question a little bit more clearly.

14 CHAIRMAN BLEY: Well that was pretty
15 good. I think you hit right on the things I was
16 asking.

17 MR. AFZALI: Thank you. So next slide,
18 please. Okay. So we talk about regulatory
19 framework. Internally we decided to look at and
20 tried to define what do we mean by regulatory
21 framework. There's part of it which is the
22 processes, Part 50, Part 52 or some other part or
23 stage licensing. They all have location and
24 process requirement. That's the way we categorize
25 them or bin them.

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1 We believe the current available to us,
2 tool available was in this bin is adequate for
3 near- term actions and licensing advanced reactors.
4 The next level is the administrative processes. I
5 know ACRS is a technical group, but I'm going to
6 bin it under administrative processes, because we
7 don't set requirement. We just review that for
8 right guidance.

9 So we believe ACRS reviews in public
10 hearings do not need to be modernized at this
11 point. The next level is the licensing technical
12 requirement. At the highest level, we believe Part
13 100 the safety goals and what the goals to the
14 public should be like Part 100 requirements are
15 adequate. We are not proposing to change or
16 modernize those.

17 The next level of technical
18 requirements are what you do to make sure you
19 adequately protect the public. The first step and
20 Jim provided that in his presentation, the first
21 step in doing that, you have to identify what are
22 the events that you're going to defend against,
23 you're going to protect against.

24 There's no current process for doing
25 so. There is no current systematic way of --

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1 CHAIRMAN BLEY: Since the word
2 "modernization" jumps into that step, is that
3 primarily what you're looking at when you say NRC's
4 process needs to be modernized?

5 MR. AFZALI: That's correct, because
6 what we did for light water reactors, in my
7 opinion, we developed based on a Naval reactor
8 experience through many years of experience, and we
9 decided what our licensing basis should be, right.
10 We really didn't need a process to come up with
11 that, a systematic process. So there's a gap there
12 and that gap, we think we can modernize our
13 regulatory requirements by developing a systematic
14 process.

15 MEMBER REMPE: And you want more than
16 the authority identified by the staff in Strategy
17 3, or you just think they can do it with their
18 Strategy 3 they've identified?

19 MR. AFZALI: I believe as part of
20 Strategy 3, the staff is working closely with us on
21 our project. I think the combination is going to
22 result in that modernization.

23 Previously, I'm not saying they were in
24 agreement, but there was nothing to tell me they
25 weren't going to do it. Does that make sense? So

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1 it's not that I think there was a gap; I don't know
2 you're going to close the gap. Now we are working
3 together to close the gap.

4 MEMBER POWERS: I guess by your written
5 language there, given that the agency has professed
6 an affection for the probabilistic risk assessment
7 methodologies, why would you not just use that to
8 assess what are postulated events and the
9 consequences you would protect against, provide
10 adequate protection of public health and safety
11 given that you accept Part 100?

12 MR. AFZALI: I want to make sure I
13 understood your question before I answer it. So
14 while I didn't provide an example of the process
15 being provided today, which uses PRA information
16 plus some engineering judgment to decide on
17 licensing basis event selection, it is a process
18 that we are advocating, as a process we are working
19 to.

20 Is your question do you think that's
21 where we should go? If that's your question,
22 that's exactly where we think we should go. Did I
23 answer your question?

24 MEMBER POWERS: Okay, I'll accept that.
25 That seems to fulfill your systematic process for

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1 doing it. The NRC has professed an acceptance for
2 that approach. You're going to have to defend it,
3 because they don't have for some novel design an
4 accepted staff analysis for that design. But I
5 mean it seems like it's just their charge. Go
6 ahead. Knock yourself out.

7 MR. AFZALI: So what the process we are
8 going forward with is developing a technology
9 inclusive risk-informed performance-based process
10 while identifying licensing basis events. We plan
11 to submit that to the NRC and we're already
12 engaging with the staff, reviewing our proposals.

13 We are hoping at the end of that we --
14 there will be ISG or some reg guide which endorses
15 that approach, and then there would be a process
16 that people can use to demonstrate the licensing
17 basis events selection, SSC classification and
18 defense-in-depth consideration.

19 I'm not sure that is not going to serve
20 the problem or what is your question?

21 MEMBER CORRADINI: I think all he's --
22 I think you've answered his question.

23 MEMBER RAY: Then I have a question for
24 him. Let's take the design basis earthquake event.

25 MR. AFZALI: Sure.

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1 MEMBER RAY: How does PRA apply to
2 that, in the way that you're describing?

3 MEMBER POWERS: Okay. I have to ask
4 you why are you asking that question?

5 MEMBER RAY: Well, because I wasn't
6 sure I understood your question or your
7 hypothetical, the thing that you said "go ahead,
8 have at it."

9 MEMBER POWERS: Why shouldn't they? I
10 mean --

11 MEMBER RAY: Well I guess --

12 MEMBER POWERS: I can explore the
13 seismicity of boron ring to locate this unit. If
14 I'm not locating the unit, then I can take a
15 generic application, much as we do now and assess
16 the seismic vulnerability of the plant and the
17 consequences of those vulnerabilities. I mean is
18 there anything that I'm missing here?

19 MEMBER RAY: Well, I guess what I'm
20 trying to understand Dana is whether if I have --
21 what the probability is we're talking about. That
22 is to say, you know, I've got a spectrum of
23 probabilistic seismic hazard analysis. I've got --
24 I can pick anything along that spectrum.

25 It doesn't have anything to do, though,

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1 with the -- you know, I'd want to say I don't want
2 to exceed this design basis event more than once in
3 a million years or once in 10,000 years or
4 whatever. That's the event itself, right. Is that
5 what you're saying, is the way you would establish
6 that particular design licensing basis?

7 (Simultaneous speaking.)

8 CHAIRMAN BLEY: I kind of think that
9 we're trying to solve the problem for the industry
10 and the staff, and I don't think that's --

11 MEMBER RAY: I was just trying to
12 understand what was going on here and I didn't. So
13 I'll -- we can talk about it later.

14 CHAIRMAN BLEY: I think that's better,
15 yeah. Okay.

16 MR. AFZALI: So the second we're going
17 to work on is adequate safety determination. We
18 believe that's too subjective and is going to be a
19 bigger challenge for non-light water reactor. So
20 we want a risk-informed, performance-based SSC
21 classification and defense in-depth
22 consideration.

23 Again, we are working on the solution
24 path so we'll be happy to come back to the ACRS and
25 provide you with our solution path if you are

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1 interested what the answer is. Right now we don't
2 have the answer. The last part is design criteria
3 to protect against postulated events.

4 So ARDCs. What we have done so far on
5 ARDCs, joint DOE/NRC efforts will be substantially
6 supportive of licensing advanced reactors and is
7 definitely consistent with what we are doing as
8 part of our project. So our project would be
9 feeding into the criteria. Why do the criterion
10 make sense? What are those criteria trying to
11 defend against? So our project fits into that
12 project nicely.

13 MEMBER KIRCHNER: Let me ask a couple
14 of questions here.

15 MR. AFZALI: Sure.

16 MEMBER KIRCHNER: So picking up where
17 Dana was, it sounds like you want to go --
18 typically you design a reactor from the inside out,
19 and defense-in-depth is built into the design. It
20 seems to me what you're saying here is that we go
21 to a mechanistic source term and such, and we look
22 at the consequences to the public and then we just
23 design back the other way.

24 And with that, we identify events and
25 then we screen them with PRA. I don't know how

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1 you would do that without a good detailed design
2 early on, but anyway we use PRA techniques and then
3 we're going to determine which systems or
4 structured systems and components are important to
5 safety. Is that basically what you're saying,
6 you're going to come at it from the outside in?

7 MR. AFZALI: That is consistent with
8 the overall approach.

9 MEMBER CORRADINI: Well I think, I
10 think the reason Walt's asking the question as he
11 is is that there is a certain level of design
12 detail you need so that when you do your risk-
13 informed performance-based X or Y or Z, you know
14 enough about the design that you can accept and
15 uncertainty ranges in whatever you choose to be.

16 So if we go back to the -- whoever's
17 presentation it was, I think it was Jim Kinsey's
18 relative to what the frequency dose calculation
19 might be, they had ranges. If those ranges are too
20 big, then I can't make a decision. I need more
21 details on the design. That's what I thought where
22 Walt was going.

23 MEMBER KIRCHNER: That was part of
24 where I was going, because I was coming to your
25 next bullet, which is you say currently it's too

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1 subjective. So how would you make it less
2 subjective?

3 MR. AFZALI: Well I don't discuss how
4 you're going to get it, but I'll give you an
5 example. Currently Chapter GDC-17 says you need
6 two outside power sources. For AP1000, we said we
7 need -- we negotiated. We said we need one outside
8 power source because there's a passive coolant.

9 For SMRs, with passive cooling we're
10 then back to two outside power sources, and the
11 reason given was that they need defense-in-depths.
12 Now there's no definition of what adequate defense-
13 in-depth. We want to work with the staff to have a
14 clear performance criteria for defense-in-depth so
15 we know what we're shooting for.

16 So don't know where NuScale is right
17 now. Maybe they changed that again to zero or one.
18 I'm not sure at this point, but that was -- as an
19 example, we are not clear what the definition of
20 defense-in-depth says, and therefore you have to
21 negotiate what is adequate defense-in-depths.

22 MEMBER KIRCHNER: Well, I don't think
23 it's appropriate to get into NuScale here as an
24 example, but let me just follow up. You asserted
25 that in AP1000, you were able to get to just one

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1 backup power system, right?

2 MR. AFZALI: One offsite power source.

3 MEMBER KIRCHNER: Offsite power system
4 right, and you're -- so why is the current
5 determination too subjective? It seems to me that
6 somehow, leaving NuScale aside for the moment, that
7 the regulators were able to make a determination
8 that given the passive cooling features of this
9 design, that that was adequate.

10 MR. AFZALI: What is adequate? How did
11 you measure the adequacy?

12 MEMBER KIRCHNER: Well how did AP1000
13 measure?

14 MR. AFZALI: It's just negotiated.

15 PARTICIPANT: No, it's just a
16 negotiation.

17 MEMBER KIRCHNER: I don't think it's
18 just a negotiation.

19 MR. AFZALI: If you look at every
20 difference in the measure in my opinion, I mean
21 it's not my opinion; this is the NRC position that
22 there's no, as far as I know, there's no adequate
23 definition of defense-in-depth. So we are trying
24 to make that a systematically arriving at that.

25 How do you decide on what is adequate

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1 defense-in-depth? I have not seen anywhere any
2 document which tells you what is adequate defense-
3 in-depth.

4 MEMBER KIRCHNER: I'll grant you that
5 example, but please elaborate. How are you going
6 to take the subjectivity out of this system?
7 What's your plan? What mechanism, quantitative or
8 qualitative would you propose that would reduce the
9 subjectivity of these reviews?

10 MR. AFZALI: So again, we haven't got
11 to the solution space yet, but during the NGNP
12 project became -- they came into a solution where
13 they talk about design, defense. You couldn't
14 design defense-in-depth, programmatic defense-in-
15 depth and then defense-in-depth, that we can come
16 up with a table and based on that table, based on
17 number four, based on a set of criteria to say if
18 you have got one of this, one of this, one of this,
19 it has adequate defense-in-depths.

20 MEMBER CORRADINI: But I don't -- I
21 think we should let you go on, or unless you're at
22 near the end. But I think Walt's biggest point is
23 that you might come in with a potential goal as to
24 what the fuel reliability is and what the primary
25 system reliability ought to be and the containment

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1 function.

2 But then you have to know enough of the
3 detail of the design so that if the uncertainty is
4 a factor of ten, that may not be acceptable. So if
5 you call that a negotiation by staff, then so be
6 it. Either I need to know more about the design
7 detail, so that I can be more assured, or I have to
8 develop, I have to demand for more margin in case
9 my uncertainty is that large.

10 MR. AFZALI: I get what you are saying.
11 That's a different question.

12 MEMBER CORRADINI: That's my
13 interpretation.

14 MEMBER KIRCHNER: Well, I was just
15 struck by your saying it's too subjective, and I
16 just wanted to see how you proposed in a
17 framework, in a regulatory framework sense, to make
18 it less subjective. I'll admit your one example,
19 but it doesn't provide a framework for deciding the
20 next point.

21 MR. AFZALI: Again, I'm not trying to
22 solve all the problems. Just another example
23 maybe, maybe is for high temperature gas-cooled
24 reactor, a confinement function. Is that -- is
25 that adequate or do we want to put on top of it?

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1 How do we make that decision?

2 MEMBER KIRCHNER: Well, I presume that
3 in your approach you would use a risk-informed
4 approach, which would start at the outside and
5 work in, and then systematically look at whether
6 you have sufficient defense-in-depth with your
7 final design, such that you could tolerate say a
8 single failure or something that was between, you
9 know, the ultimate barrier and the public or some
10 type of methodology. That's where I thought you
11 were going with this.

12 MR. AFZALI: So that's --

13 MEMBER KIRCHNER: But the uncertainty
14 for the -- the less mature the design going into
15 this process, the less certainty. I think you
16 would admit that, right? So you've got, you know,
17 two classes of reactors with a fair amount of
18 regulatory history in the gas and the sodium
19 categories. Once you go to a liquid fuel, now you
20 go into a different, a different world all together
21 in terms of reactivity insertion accidents and
22 such.

23 And so before you have a really good
24 design, the regulator I think would approach that
25 with some healthy skepticism about how this system

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1 is going to perform, and the uncertainty bands,
2 whether it's in PRA space or whatever, are going to
3 be larger for a system like that.

4 So there is inherently some
5 subjectivity. I was just struck with that and I
6 was thinking well, from a methodology standpoint or
7 a regulatory standpoint, how am I going to take out
8 this subjectivity?

9 MEMBER CORRADINI: But if I might just,
10 so we may need to move on. We're having too much
11 fun. Dana handed something than ran away. But if
12 I take you back 40 years, go to Clinch River,
13 right. They had a particular core design. That
14 particular core design had inherent energetics.

15 So the Commission came down and said
16 thou shall consider a core disruptive accident of
17 an energy release of as much as X, and until you
18 can show us that it's below X mechanistically, you
19 will follow X.

20 That's subjective, but the Commission
21 did it because from a health and safety adequate
22 protection standpoint, that gives them a level of
23 assurance and margin probably there --

24 MEMBER KIRCHNER: Margin of
25 uncertainty.

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1 MEMBER CORRADINI: --that we're good
2 enough. I'm not saying that that's the way the
3 advanced designs will be, but we will get to areas
4 where the design is uncertain enough that
5 somebody's going to have to make a decision. It
6 may not be us, it may be the Commission, but there
7 would be a decision and that decision will be
8 subjective.

9 It's the old adage of the umpire says
10 it ain't a ball and strike until I call it a ball
11 and strike.

12 MR. AFZALI: I agree. I think if you
13 go to the next slide. If you are interested in
14 what the project looks like and all that, I'll be
15 happy to describe. But it seems you are more
16 interested in the technical stuff. This one just
17 gives you, you know, our deliverables, which are
18 licensing basis events selection, SSC
19 classification and defense-in-depth consideration
20 and the PRA technical adequacy for making those
21 decisions.

22 Those are products of our project,
23 which I will have to come back and when we have
24 the actual solution paths, answer some of the
25 questions you have in the context of real examples

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1 and a process which is well developed and argued
2 rather than now. But can you go the next slide
3 please? Go ahead.

4 MEMBER KIRCHNER: So you raise a point
5 here. You know for the PRAs for the existing
6 fleet, that's based on a good experiential base,
7 good reliability databases for the equipment and so
8 on. We aren't going to see any of that for a
9 really advanced advance design. We'll see some of
10 it for the two classes I already mentioned.

11 So the PRA is going to have inherently
12 some -- I mean I would approach looking at it as if
13 it had a much larger uncertainty band than we see
14 with the current fleet and their PRAs. Wouldn't
15 you admit that going on?

16 MR. AFZALI: 100 percent.

17 MEMBER KIRCHNER: Yeah now. Now
18 economics come into play here. You would like, if
19 I'm an advanced reactor designer or developer, as I
20 was corrected earlier, then I would like to
21 eliminate as many pieces of equipment from the SSC
22 classification as possible, because I have a
23 passively safe great design.

24 But we're not going to have that degree
25 of confidence in our PRA that early in the

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1 processing, yet you want to -- you want from the
2 regulator a decision on the SSC classification,
3 because their cost implications are real. I mean
4 that's why you're going to passive designs, you
5 know. You're making these things bigger or more
6 surface to volume ratio, etcetera, to get these
7 passive characteristics.

8 But you pay for that. So you want to
9 vis-a-vis a large 1,000 megawatt plant, you always
10 as a designer are going to have to be making it
11 straight. So how do we -- how do you propose to
12 have some of this "subjectivity" early on in the
13 process as these designs come forward, because
14 things like the SSC classification is a critical
15 matter early on.

16 If you change your mind later or just
17 like changing the seismic design criteria later,
18 another organization does that regularly with DOE
19 facilities, it has staggering implications in terms
20 of cost. So would you elaborate here how you're
21 going to do the PRA technical adequacy and use it
22 in a way that can take out some of this
23 subjectivity?

24 MR. AFZALI: So we spent a whole white
25 paper just doing that. So we do realize that's a

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1 challenge that we have to give it. So there is a
2 point, and you have to realize these are risk-
3 informed.

4 MEMBER KIRCHNER: Right.

5 MR. AFZALI: What risk-informed is use
6 PRA insights plus engineering judgment. So there
7 is not purely just numbers. It has a risk insight
8 plus information from engineering judgment. Can
9 we go to the next slide? That I think is going to
10 -- this is what is in the current chapter, SRP 15.

11 What it says is you have to design for
12 events based on their frequency and the
13 consequences. That's what you have to do. You
14 have to decide on the rules and you have to design
15 on design basis and you have to do beyond the
16 design basis. That's what you have to do.

17 So there's only way -- if you have to
18 do that, there's only two ways to do it. Either
19 negotiate it, either negotiate -- every answer that
20 you talk about exists for a negotiated approach.
21 Or systematic, where in a systematic way you at
22 least have a tool to give it uncertainty in
23 prescriptive approach, where you just make
24 determination. You don't have any tools to deal
25 with uncertainty other than solid conservatism.

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1 I think fundamentally we continuously
2 talk about risk-informed performance-based as if
3 the uncertainties they only belong to that class of
4 -- or that approach.

5 The uncertainties have nothing to do
6 with the tool you use. Uncertainties that deal
7 with maturity of the design, maturity of the data.
8 The fact that to have to make a determination as is
9 stated in GDC, as is stated in Chapter 15, is a
10 fact.

11 So the only question is how best do you
12 do that? Do you do it in a systematic way, or do
13 you negotiate your way? You're dealing with the
14 uncertainties in an analytical way, or do you do
15 them abstract, a talk with vacuum conversations.
16 That's the only difference. Now we are proposing a
17 negotiated, comprehensive, systematic, holistic
18 approach is a better approach, achieving the same
19 object.

20 The objective is not going to change.
21 The objective is if the risk event is defined as a
22 part of the events frequency of occurrence and the
23 consequences. That's our objective. Now I have
24 not come across -- I'm not married to risk-informed
25 or performance-based. If anybody else can come up

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1 with any other way to better do that, then we'll do
2 it that way. I think 30-40 years of experience
3 working on risk-informed approaches shows the best
4 way is through systematically as opposed to ad hoc
5 negotiation, negotiated.

6 Again, I understand the people that
7 believe this has many challenges in it, and I think
8 that's when you bring the white paper. That's
9 where you're going to go into detailed discussion
10 whether what they're proposing actually has merit
11 and should be followed.

12 MEMBER RAY: Okay. Let me ask --

13 CHAIRMAN BLEY: I'm going to -- I'll
14 let you go in a second. I'm going -- I want to
15 hurry this up, because our job is to look at what
16 the staff's proposed and comment on it. So but
17 we're interested in what others have to say about
18 what they've done, but I think we've gone far
19 enough here --

20 MEMBER RAY: I'll be very brief,
21 because I mean you told me that I was getting off
22 track earlier, and I don't want to do that again.
23 The first sentence "If a risk of an event is
24 defined as a product's event frequency of
25 occurrence and its consequences."

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1 That says to me that the design basis
2 seismic event in a given plant is a function not
3 just of the site itself but of the consequences of
4 exceeding that event, right, okay. Dana, that's
5 what I was trying to figure out. And so I could
6 have a standard PWR at a site that I had a .3g
7 design basis earthquake. But if I have a very safe
8 passive plant, the design basis of the same site
9 would be less.

10 MEMBER KIRCHNER: I would take it.

11 MR. AFZALI: Yes. Just I said yes, but
12 I'm not sure I meant to say yes.

13 (Simultaneous speaking.)

14 MR. AFZALI: The risk event as
15 described there is a frequency of occurrence and
16 consequence, not consequence of exceeding that
17 event. That's the risk. That's the definition of
18 risk. I'm not defining it.

19 MEMBER RAY: Okay, and it con -- well
20 all right. The consequences of a design basis
21 earthquake should be that everything works as
22 designed and you don't have any -- you don't have
23 any consequences. But I can --

24 MR. AFZALI: So how do you make that
25 decision?

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1 MEMBER RAY: What?

2 MR. AFZALI: How do you make that
3 decision?

4 MEMBER RAY: Well I don't know. That's
5 what I'm trying to figure out. But my boss says
6 I'm out of time, so I'll let it go.

7 CHAIRMAN BLEY: I was just testing.
8 We've probably got one more.

9 MR. AFZALI: Okay, one more and I love
10 this. I wish we could do a whole day of this.
11 Next page, please. So I just want to emphasize
12 that I think IAPs provide an excellent starting
13 point for what you want to do. It shows how
14 complicated or challenged our challenges are, and
15 why is it important for us to solve those
16 challenges as soon as possible.

17 If you don't solve those challenges,
18 nobody would invest the money that we need to
19 invest in modernizing the regulatory framework.
20 So timeliness is crucial in that. We believe that
21 our technology-inclusive policy issues like
22 license-based event selection should be resolved as
23 soon as possible, hopefully in 2017, and we welcome
24 and highly appreciate that this is going to be
25 career-ending thing for Bill and Amy.

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1 But we highly appreciate Bill and Amy's
2 leadership in working with us and getting us to
3 where we are right now.

4 CHAIRMAN BLEY: They may have been
5 through more controversial things. Thank you. I'm
6 going to go to Peter, Peter Hastings.

7 (Pause.)

8 MR. HASTINGS: Good afternoon. I'm
9 Peter Hastings, and I'll try to make this as brief
10 as possible in the interest of time. I'm here
11 today representing Ashley Finan, who's the Policy
12 Director for the Nuclear Innovation Alliance. I'll
13 be making some remarks on the IAPs and some
14 additional remarks around the topic of staged
15 licensing, including SDA and CDA.

16 Ashley sends her regrets for being
17 unable to attend in person, but she had previous
18 speaking engagements on the Hill today. By way of
19 anybody who's unfamiliar with the Nuclear
20 Innovation Alliance or NIA, it's a non-profit
21 organization dedicated to leading advanced nuclear
22 energy innovation. NIA assembles companies,
23 investors, experts and stakeholders to advance
24 nuclear energy innovation and enable innovative
25 reactor commercialization through favorable energy

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1 policy and funding.

2 They research, develop and advocate
3 policies that enable the efficient licensing and
4 timely early staged demonstration of advanced
5 reactor technologies. Over the past three years,
6 NIA has been developing strategies to facilitate
7 efficient, cost effective and predictable licensing
8 of advanced nuclear plants.

9 These strategies are based on
10 consultations with innovators, safety experts,
11 former NRC staff and Commissioners, members of the
12 financial community and other nuclear industry
13 stakeholders. The most prominent result of NIA's
14 work to date was a report published a little less
15 than a year ago called "Enabling Nuclear
16 Innovation: Strategies for Advanced Reactor
17 Licensing."

18 This report's available on the NIA
19 website. It included several regulatory policy and
20 industry recommendations including recognition of
21 the value of stage licensing, which I'll discuss in
22 more detail shortly; creation of a process for
23 assessing licensing feasibility during pre-
24 application interactions -- we talked about that a
25 little bit toady already with the conceptual design

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1 assessment; the use of risk-informed technology
2 inclusive regulatory framework for new reactors,
3 which Amir just spoke about; funding to enable the
4 staff to prepare for advanced reactor licensing;
5 and development and use of code standards and
6 conventions.

7 NIA has engaged in review and
8 discussions regarding the staff's vision and
9 strategy document and the accompanying
10 implementation action plans. NIA is pleased with
11 the alignment of the NRC staff's efforts with NIA's
12 recommendations, and pleased with the interest that
13 staff has shown in working with the industry to
14 address these challenges.

15 I want to echo whoever it was that
16 indicated earlier that the staff has really done a
17 lot more work than I think maybe they had to in
18 terms of the amount of funding they were allocated.
19 So we appreciate that.

20 NIA has shared with the staff that the
21 vision and strategy is an excellent foundation for
22 the non-light water reactor mission readiness
23 efforts, and has expressed support for the overall
24 direction of the document, as well as the majority
25 of the details contained therein.

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1 The NIA comments in October also
2 discussed development of the staged review process,
3 which again I'll discuss shortly. Specific to the
4 near-term IAPs, as with the overall vision and
5 strategy, NIA believes there is generally good
6 agreement between the recommendations that NIA made
7 previously on the staff's approach, and strongly
8 supports each of those six strategies.

9 NIA's comments to the staff in October
10 recommended priority development of Strategy 3 for
11 review guidance within the next two years.
12 Ambitious, but we think it's important. In the
13 more detailed Volume 2 of the near-term IAPs,
14 Strategy 3 was further developed into a
15 comprehensive series of supporting tasks.

16 We continue to encourage development of
17 this guidance, including collaboration with the
18 industry efforts and establishment of this
19 conformed technology-neutral framework, and to look
20 for every opportunity to accelerate these efforts,
21 for all the reasons that we just spent time talking
22 about.

23 MEMBER CORRADINI: So maybe it goes
24 without saying. So am I -- is my impression of
25 your second major bullet that five years is too

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1 long and Strategy 3 should lead everything else, or
2 am I interpreting that bullet differently?

3 MR. HASTINGS: I'm not sure lead
4 everything else, but we should try to make every
5 effort to get the staff efforts and the efforts of
6 the Southern Initiative fully aligned. I think
7 they are --

8 MEMBER CORRADINI: In that time frame?

9 MR. HASTINGS: --in general, yeah.

10 MEMBER CORRADINI: Okay, and just to --
11 I'm not asking Amir. I'm just looking for a nod.
12 So my sense of it is, and Dana's question to him
13 and his acceptance of it is that if one were to
14 come up with a process, such that licensing basis
15 events are thought through in some generalized
16 fashion, and staff and industry are at least in the
17 same wave length or quasi-wave length, that would
18 be viewed as significant progress?

19 MR. HASTINGS: Yes. Okay. NIA also
20 recommended an emphasis on near term progress from
21 Strategy 5, in terms of identifying and resolving
22 policy issues for the same reasons that the staff
23 observed, that is that policy issues contribute
24 directly to regulatory certainty, effectiveness and
25 efficiency. NIA is very pleased that all the work

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1 under Strategy 5 has been planned for this fiscal
2 year in Volume 2.

3 NIA appreciates the staff coordination
4 with the NEI regulatory task force Mike spoke about
5 earlier on identification of policy issues. We
6 think we have good alignment between the list that
7 the staff keeps and the list that the regulatory
8 task force keeps.

9 Finally with respect to near-term IAPs
10 at least, NIA provided feedback that the
11 acquisition and development of sufficient computer
12 codes, that is Strategy 2, should be expanded. For
13 example, we said more effective use of modeling and
14 simulation could accelerate fuel qualification and
15 make it more efficient and conducive to innovation.

16 Such expansion obviously should make
17 maximum use of available data from the DOE complex
18 and from other sources. The Subcommittee and the
19 staff spoke earlier about gap analyses in this
20 regard, and we agree that's important. Staff
21 expansion of Strategy 2 into again a fairly
22 comprehensive list of tasks we think is a good
23 effort in this regard.

24 MEMBER POWERS: Peter, let me ask you a
25 question about this modeling and simulation. We

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1 had developed a database for the response of fuel
2 to reactivity insertions for fuel irradiated up to
3 about arguably 13,000 megawatt days per ton. And
4 maybe a couple up in the 30,000s.

5 And happily went along and a lot of
6 burn ups crept up and we said well, we can model
7 and simulate those. Burn ups eventually exceeded
8 40 and eventually hit 50. And then we did some
9 experiments in France and found that the fuel was
10 far more susceptible to damage during reactivity
11 insertions at high burn ups than it was where we
12 had done our experiments.

13 And it was because a new phenomenon had
14 emerged into the fuel once we crossed about 40,000
15 megawatt days per ton. That wasn't embodied in the
16 modeling and simulation. Can we assure ourselves
17 that we're not going to be vulnerable to new
18 phenomena?

19 MR. HASTINGS: So it's a good question,
20 and gets to sort of the guts of the issue we were
21 talking about earlier. I think NIA believes that
22 additional reliance on modeling for things like
23 fuel qualification could also require that we take
24 more advantage of prototype and demonstration
25 platforms, the same kinds of things we talked about

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1 before, operating when it's on first of a kind
2 designs, additional testing and so forth.

3 There have been a lot of advances and
4 analytical capabilities in the last several years
5 certainly. And I think from our perspective, we
6 look to sort of find the balance between aggressive
7 use of analytical tools and identification of where
8 test data is needed to substantiate things. So I
9 take the point.

10 MEMBER POWERS: And I agree 100
11 percent. You just have to use the modeling and
12 simulations, but it's one of those things that you
13 can't overuse either.

14 MR. HASTINGS: Understood.

15 MEMBER POWERS: The other challenge
16 that I think we face in this sequence of bullets
17 you have in under here is that when I look at the
18 computational capability is routinely available to
19 the staff of the NRC relative to what would be
20 routinely available to an ordinary engineering
21 consulting firm, not relative to a national
22 laboratory, relative to an ordinary consultant, I
23 find them prehistoric.

24 And that seems to me to pose a
25 challenge when you think about people developing

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1 innovative nuclear fuel concepts. They will come
2 forward with computational power far in excess what
3 the staff has routinely available to itself.

4 Is the solution to that particular
5 problem get the NRC staff better computational
6 power? I mean, I don't know what the answer is to
7 that, but it is clear that there is a disconnect
8 between computational power, routinely, absolutely
9 routinely available at any engineering and
10 consulting firm and what's available here.

11 MR. HASTINGS: Well, and I can only
12 respond sort of off the cuff. Certainly more
13 resources for the NRC staff, maybe more
14 availability to that sort of computational
15 horsepower through the labs, through something like
16 the GAIN initiative, the way that the industry is
17 trying to take advantage of --

18 MEMBER POWERS: Well, it may not be
19 part of your presentation, but I just can't avoid
20 taking the opportunity to pick your brain here
21 because I know you think about a lot of things.

22 It is that we've had a variety of
23 presentations, the thrust of which is DOE and the
24 national laboratories have gotten together and done
25 X, Y, Z. Is that not impacting the ability of the

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1 NRC to utilize national laboratories as part of its
2 independent confirmation analyses? Or jeopardize
3 maybe is the better word.

4 MR. HASTINGS: Well, I think that's the
5 point that I made earlier. It's something to keep
6 an eye on. I can't answer the question easily. I
7 do know I have worked for companies where we had
8 internal firewalls, you know, even within the same
9 group to avoid conflicts of interest.

10 That doesn't seem like an insoluble
11 problem to me, but it's certainly something to
12 watch out for.

13 MEMBER POWERS: Thank you.

14 MEMBER REMPE: On your other strategy
15 discussions you talk about a timeframe. And in
16 light of the fact that Strategy 2 may require use
17 of a demonstration or prototype, that seems to be a
18 bit longer.

19 Would you agree with what some of the
20 other individuals said, that maybe some of the
21 activities proposed for Strategy 2 should be
22 delayed because it is a very labor and cost
23 intensive strategy to implement?

24 MR. HASTINGS: I don't know. That's a
25 cheap answer, but I think it depends on whether the

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1 development is something that relies testing on the
2 back end as input.

3 MEMBER REMPE: But you've got to have a
4 vendor who makes the fuel. And many of these
5 developers don't have that. And so I would tend to
6 agree what I've heard other individuals up here say
7 about maybe some of these activities could be
8 delayed.

9 MR. HASTINGS: Yes, I take the point.
10 I don't have enough, good enough grasp on the
11 details of how those activities fit together. But
12 it seems like that's a pretty straight forward
13 project management exercise, right? You model --

14 MEMBER REMPE: You've got to have data
15 though to --

16 MR. HASTINGS: -- your dependencies,
17 your successors and predecessors and see how it
18 falls.

19 MEMBER MARCH-LEUBA: On that topic, but
20 completely different Strategy 2, this morning we
21 had to go back and forth with the staff on whose
22 responsibility it is to develop all this data and
23 validate all these fuels and do all this modeling.

24 If I read your slide, you believe that
25 this is the staff responsibility to do it.

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1 MR. HASTINGS: No, no. Well, yes and
2 no. the applicant is responsible for providing the
3 analytical basis for his license application. The
4 staff is responsible for having the tools to
5 evaluate that.

6 Where that, where the staff needs to
7 develop an independent model, that's the staff's
8 responsibility. Where there's an opportunity for
9 the staff to use the applicant's model, then they
10 may collaborate or it may be something that they
11 pull off the shelf.

12 MEMBER MARCH-LEUBA: So you think the
13 industry should have a good, a complete development
14 of methods and experiments, and have some
15 independent peer review before it's submitted to
16 the staff?

17 MR. HASTINGS: Absolutely.

18 MEMBER MARCH-LEUBA: And it is up to
19 the staff whether if you present such a good job,
20 maybe they don't need a confirmatory.

21 MR. HASTINGS: The obligation of the
22 staff to perform calculations and have them
23 reviewed internally before they --

24 MEMBER MARCH-LEUBA: The staff is to
25 review your calculations.

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1 MR. HASTINGS: Right.

2 MEMBER MARCH-LEUBA: And if they find
3 no uncertainty with them, fine.

4 MR. HASTINGS: Right. But they have no
5 obligation for development of the licensing basis.
6 That's the applicant's responsibility.

7 MEMBER CORRADINI: I think the reason
8 he asked that and the way you answered makes me
9 feel very good. But are some of the firms that are
10 considering these innovative designs aware of the
11 level of effort that that requires, because I sense
12 that they may not be.

13 MR. HASTINGS: I can't speak for many
14 of them individually. The ones I've spoken to
15 recognize it.

16 MEMBER CORRADINI: Okay.

17 MR. HASTINGS: Whether they have fully
18 internalized what that means in terms of the level
19 of effort, that's another matter. But they
20 understand the obligation.

21 MEMBER CORRADINI: Okay. And is that,
22 and maybe I misinterpreted. I guess is that what
23 they may require enhanced use of demonstration and
24 prototype provisions mean? I don't know what that
25 bullet means. I interpreted it one way, but maybe

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1 I misunderstood.

2 PARTICIPANT: Well, I think --

3 MR. HASTINGS: I'll give you a
4 licensing answer. It depends. If a model that
5 you're developing, if the model, excuse me, that
6 you're using for your application doesn't have
7 sufficient test data to back it up in your review
8 as an applicant, you may propose additional
9 prototype controls on that design for first
10 implementation.

11 You may, on the other hand as an
12 applicant, feel that it is sufficient and the staff
13 may disagree, and there may be a negotiation of
14 prototype controls that get put on as a result of
15 NRC review. So it can happen both ways.

16 MEMBER CORRADINI: Okay.

17 MEMBER POWERS: What we see in this
18 discussion, or in the staff's portion of the
19 discussion for instance, we saw closer coupling
20 between thermohydraulics and neutronics in some of
21 these designs.

22 One has to understand that that
23 interface between two codes is in fact a model
24 itself, and it is the most difficult model to
25 independently verify without doing your

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1 demonstration and prototype sort of thing.

2 And that's pervasive through all the
3 codes. It is the interfaces between two models is
4 a model itself, and one that's very difficult to
5 validate.

6 MR. HASTINGS: Understood. All right,
7 so turning to a related topic, NIA suggested in its
8 paper and various interactions with the staff that
9 stage licensing should be further developed. And
10 this has been the subject of quite a bit of
11 confusion, mainly over terminology.

12 While it's important to emphasize that
13 stage licensing provisions are optional, excuse me,
14 that is an applicant needn't take advantage of
15 them. We nonetheless believe these tools can be
16 valuable for developers interested in using them,
17 and we're working with the industry to try to help
18 develop some guidance in this regard.

19 Our emphasis on this approach is
20 threefold. First, a conceptual design assessment
21 which we've talked about at length here, should be
22 developed to enable more structure and certainty
23 from pre-application interactions.

24 NRC staff have discussed the
25 development of the CDA process in this fiscal year

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1 and the near term IAPs which NIA believes is
2 appropriate and looks forward to progress in this
3 area.

4 Standard design approval has also been
5 discussed as a means to provide a detailed review
6 of "major portions," that's language from the
7 regulation, of the design, without necessarily
8 having to complete the entire design.

9 And there's been some discussion of
10 that in the difficulty of understanding how to draw
11 the box and how to model the boundary conditions
12 and the interfaces around that. And we recognize
13 that's the most complicated part of defining major
14 portion when developing a standard design approval
15 application.

16 NIA happens to be in the process of
17 leading the industry effort to try to right that
18 now.

19 MEMBER CORRADINI: So can I stop you
20 there because this one confuses me. And is there
21 an example, by the way, you made reference to a
22 paper. Did we miss a paper that --

23 MR. HASTINGS: It's in review as we
24 speak.

25 MEMBER CORRADINI: So we don't have it?

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1 MR. HASTINGS: You don't have it yet.

2 MEMBER CORRADINI: Okay. All right,
3 that explains one of them. So is there an example
4 of a major portion that doesn't have enough system
5 interactions that it's an island unto itself?

6 MR. HASTINGS: So to my knowledge, and
7 I would invite the staff to correct me if I'm
8 wrong, but I don't believe the SDA provision of the
9 regulation has been exercised to date.

10 MEMBER CORRADINI: Okay, I'm unaware of
11 it. That's why when I saw the, your slides I
12 scratched my head here.

13 MR. HASTINGS: In a previous life, we
14 kicked around the notion of an SDA that, speaking
15 very simplistically, involved getting approval for
16 the nuclear island with the turbine building that
17 most of the balance of plant outside the envelope
18 of the SDA.

19 And that would be a substantial set of
20 interface conditions, but it would also set you up
21 for the evaluation of the nuclear island in the
22 context of having a design that could be plug and
23 play to process heat or desalination or power or
24 whatever.

25 Setting the boundary conditions would

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1 be important, but getting design approval for the
2 nuclear island without the remarkable expense of
3 all of the civil design of your turbine building,
4 for example, could be of benefit to the developing.

5 Now very clearly, I've heard this
6 question before so I'll ask it of myself. Does
7 that mean that that in any way is going to make the
8 deployment of that plant faster, and the answer is
9 no because you're still going to have to get the
10 approval in some licensing context of the turbine
11 island.

12 So it's recognized that by introducing
13 the SDA, you're introducing another step, and a
14 more complicated licensing process and some
15 downstream licensing risk. The reasons to do that
16 could be many fold. It could be --

17 MEMBER CORRADINI: Business reasons.

18 MR. HASTINGS: -- that you only have
19 enough money to do this much design until you get
20 some commercial interest. It could be that you're
21 developing a design for deployment with sufficient
22 optionality as to what the back end looks like,
23 that you don't want to invest in that latter half
24 of that design but you do want to switch then to
25 NRC approval.

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1 MEMBER CORRADINI: But an example that
2 you bring up which is separating the nuclear island
3 from the power conversion system is a logical
4 thinking. I was trying to, I thought somehow this
5 was a smaller subdivision and I was struggling as
6 to what that would be.

7 MR. HASTINGS: Well, and that's what
8 we're exploring right now in our paper. So an SDA
9 is presumably bigger than a topical report, right,
10 but smaller than a design cert. There's a lot of
11 space in between those two, obviously.

12 MEMBER CORRADINI: Right.

13 MR. HASTINGS: And one of the
14 challenges is if one believes that a topic could be
15 developed for SDA, one should look at whether it's
16 sufficiently small that you're better off just
17 writing a topical report.

18 Just writing a topical report, it's not
19 easy obviously. But if it gets better into the
20 topical report model, why introduce the additional
21 sort of programmatic risk of an SDA process that
22 hasn't been really totally --

23 (Simultaneous speaking.)

24 MEMBER CORRADINI: So that's still
25 being kicked around by --

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1 MR. HASTINGS: Correct.

2 MEMBER CORRADINI: Okay, because the
3 reason in guess I'm bringing this up is it kind of
4 goes back to Jim's cartoon about how this all kind
5 of fits together and there's enough connection
6 boxes. But if I look at the nuclear island, then I
7 can see where there might be an argument that if I
8 had multiple applications that may or may not have
9 a power conversion system, they may -- and I see
10 it.

11 But even then, as you said, it could
12 add time. In a different meeting, Ms. Finan has
13 presented something like that. But the boxology
14 that was showing in that cartoon was smaller boxes,
15 and that concerned me.

16 MR. HASTINGS: And the smaller the box,
17 the more complicated the boundary condition.

18 MEMBER CORRADINI: That's why I point
19 to Jim's cartoon.

20 MR. HASTINGS: Yes, okay. I agree.
21 And we're wrestling with that in real time.

22 MEMBER CORRADINI: Okay, thank you.

23 MEMBER KIRCHNER: Just one other point.
24 Unless it's immaculate conception, it almost
25 presumes that you have a perfect design out of the

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1 box. I'll wager down the road that that will not
2 be the case for these advanced concepts. So I just
3 point that out.

4 MR. HASTINGS: Well, that's one of the
5 things that we're wrestling with too is --

6 MEMBER KIRCHNER: The danger that you
7 pointed out of adding complexity and another step
8 that may come with the standard design approval is
9 something that one should weigh very carefully.

10 MR. HASTINGS: That's one of those
11 programmatic risks that we need to consider, I
12 agree.

13 MEMBER CORRADINI: Sorry to delay this.
14 I'm sure the Chairman will shut us up eventually.
15 So when NIA does this, do you probe the industry,
16 the task -- I'm sorry, if you have a working group
17 or a task force, I can't tell, Amir's group and try
18 to get their input into this?

19 MR. HASTINGS: Absolutely.

20 MEMBER CORRADINI: Okay, because my
21 concern would be that as long as this is done
22 within immediate discussion with a lot of different
23 industries, then it might get to some better place.
24 But some of this I'm struggling to see how this
25 could be regularized.

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1 It seems to me for a gas reactor or a
2 sodium reactor, they're mature enough that you
3 might not want to take this approach. But for
4 other and more unusual designs, this might be a way
5 to consider it.

6 MR. HASTINGS: Yes, and there are many
7 factors to consider in deciding whether this is one
8 of the options you should exercise. So that's --

9 MEMBER CORRADINI: Did you, you used
10 the term, were you here for our little discussions
11 about stage licensing earlier? Okay, so you're on
12 the taking the alternative of the two alternatives
13 that this is a, I was going for the words there on
14 your slide.

15 Anyway, it's a, you define a major
16 portion and that becomes a basis for a stage in the
17 process as opposed to a process staging in which
18 you're going from less certainty to more certainty,
19 is that correct?

20 MR. HASTINGS: The answer's both. So I
21 take stage licensing to mean carving up the
22 continuum of NRC interactions from pre-application
23 introduction all the way to start up into
24 digestible chunks. And with as much predictability
25 and certainty as you can get for each of those.

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1 And it's a good segue to my final point
2 which is the notion of using a licensing program
3 plan to map all this out. And we've talked a
4 little bit about the fact that the industry is
5 working on what a licensing program plan should
6 look like.

7 The staff has used licensing program
8 plans in the past, somewhat inconsistently. But
9 they feel very strongly and we agree that it's a,
10 it can be a really good tool to plot out a couple
11 of things.

12 One, what those pre-application
13 interactions are going to look like. Given the
14 lack of finality to it, but the possible benefit in
15 terms of investor confidence, is a conceptual
16 design assessment something that's worthwhile. Or
17 if the money worth the incremental delay in that
18 part of your schedule, yes or no.

19 Is an SDA the right choice for your
20 design or do you want to go to a CDA. Or maybe you
21 want to go straight to construction permit and
22 operating license under Part 50 or a COLA without a
23 design cert. Or maybe you want to go to a cert.

24 A licensing program plan should give
25 the applicant and the staff a platform to have a

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1 common understanding of what that's going to look
2 like and make your schedule that much more
3 predictable.

4 So we're a big fan of the notion of
5 licensing program plan, and we're working very
6 closely with the industry to try to get our
7 thoughts of what the format and content of that
8 plan could look like.

9 Again, they could, not should because
10 licensing program plans, CDAs, SDAs, none of them
11 are required. They're all optional. But we're
12 trying to help create the optionality and the
13 toolkit if you will so applicants particularly,
14 developers without a lot of experience in licensing
15 can have a bit of a guide in how to pick the rest
16 of the right options for them moving forward.

17 MEMBER CORRADINI: So just to follow on
18 that point since there was a parallel meeting this
19 morning on this. Did your colleague emphasize the
20 need for that to the congressional people so that
21 they understood that the onus does fall upon the
22 developer to have such a thing as a licensing
23 program plan, because to me what worries me is the
24 congressional types may turn to the NRC and say
25 thou shalt whereas I think the thou shalt kind of

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1 slides on both sides.

2 And the need for a licensing program
3 plan as you've described it to me is very
4 important.

5 MR. HASTINGS: It's a good question. I
6 frankly just don't remember if NIC talked about
7 the licensing program plan or not. Does anybody
8 happen to know? I just don't remember.

9 MEMBER CORRADINI: Okay. All right,
10 thank you.

11 MR. HASTINGS: So in conclusion, we
12 appreciate and support the efforts of the staff.
13 We look forward to continue development of both the
14 strategy documents and the various aspects of stage
15 licensing. We're currently reviewing the mid and
16 the long term IEPs that were recently released, and
17 thank you for your time.

18 CHAIRMAN BLEY: Thank you very much.
19 Anything else from the members?

20 MEMBER CORRADINI: You are correct. On
21 Page 23 of Senate Bill 512, they discuss using a
22 licensing project plan as one of the needed tools.
23 So thank you.

24 CHAIRMAN BLEY: That's good. What
25 we're going to do is we're going to get public

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1 comments. Then we're going to go around the table
2 for all of the members. Then we're going to go off
3 the record, and at that point I would like the
4 staff to come back to talk with us about the full
5 committee meeting. Yes, mike?

6 MR. SNODDERLY: Yes. I just wanted to
7 add perhaps while you have some of the panel
8 members that you have scheduled for tomorrow, did
9 you want to have any kind of discussion what your
10 expectations are for them tomorrow because tomorrow
11 from 3:45 to 4:15 we have an industry perspective
12 panel with Amir, Peter Hastings, and Mike Schultz.

13 CHAIRMAN BLEY: Thank you, I forgot.
14 Yes. So maybe all of you can stay with the staff as
15 we talk about tomorrow. We'll get to the phone
16 line in a moment. At this time, I'll ask is there
17 anyone in the room who would like to make a
18 comment? If so, please come to the microphone.

19 Is there anyone on the phone line who
20 would like to make a comment? If so, identify
21 yourself and make your comment.

22 PARTICIPANT: Bridge open.

23 CHAIRMAN BLEY: I think you can close
24 the bridge again. At this time, I'm going to start
25 with Professor Corradini. I'm going to just go a

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1 little slow. If we write, you know, I have to
2 write a letter, I've already agreed to that, I
3 won't have a transcript for writing the letter.

4 So all of you members of the committee
5 who have things they're going to say as we go
6 around here, or said earlier, if you drop me a note
7 tonight with a paragraph about what you think ought
8 to be in the letter, I would appreciate it. Mike?

9 MEMBER CORRADINI: Thank you. I guess
10 I would thank the staff and members of the industry
11 and various groups that have come up because I
12 think it was very helpful. I guess my only
13 suggestion, I've sent Dennis some notes ahead of
14 time.

15 CHAIRMAN BLEY: And thank you for that.

16 MEMBER CORRADINI: Yes, right. I guess
17 my only thought would be, and I'm not sure how to
18 frame it, but I still think the strategy three and
19 strategy five have to be done early in the five
20 years, otherwise the other things don't follow
21 logically.

22 And so I'm pretty sure staff said is
23 they're still knitting together how the six
24 strategies fit, if there would be a recommendation
25 that would come from us, if the other members feel

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1 appropriate, I do think the need to flesh out how
2 Strategy 3 knits with 5 which leads to the other
3 things is a very important part of our suggestion
4 at this point in time.

5 Otherwise, some things will get ahead
6 of other things. And I do think, I'm not sure
7 which of the members of the industry said this,
8 maybe it was Amir, maybe it was Peter, I can't
9 remember, that I think those two ought to come
10 first in terms of the overall planning.

11 The second part of this is I guess it
12 doesn't fall upon the staff unless the staff in 3
13 and 5 will present it, that a project plan from the
14 applicant, whoever that applicant might be is
15 important. And it's kind of like what are they
16 expecting to do and how do they expect to do it so
17 that staff can react to it.

18 I think that's also very important.
19 That's why I think I asked the question of Peter at
20 the end. Other than that, I just wanted to thank,
21 I think staff has done a pretty comprehensive job
22 of trying to think through all the things they
23 need.

24 CHAIRMAN BLEY: Thank you. Dana?

25 MEMBER POWERS: Well, to be sure, the

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1 staff has embarked upon developing a strategy for
2 safety oriented valuation of reactor designs
3 without the benefit of a rich background of
4 operational experience.

5 And of course this is a challenge in
6 many ways. The urgency the industry has expressed
7 in developing this is probably one that deserves
8 more thought on how to expedite that.

9 I can offer a couple of observations
10 from the presentations here. It perplexes me that
11 we are retaining the baggage of the design basis
12 accident concept. This seems to be a concept that
13 accrues best to the designers and is not essential
14 for the regulatory process.

15 I am gratified to see how much the
16 staff has thought about the need for adequate
17 experimental data to validate analyses. And I
18 thought their thinking on this was fairly
19 sophisticated and adequate.

20 I am puzzled by the communication
21 strategy does not include a reach out to the
22 technical learned society is beyond the relatively
23 closed community that has participated in various
24 workshops and meeting.

25 PARTICIPANT: I think that what I have

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1 in my preliminary thoughts I will try to drop you a
2 note for --

3 CHAIRMAN BLEY: I will appreciate it
4 very much. Thank you. Dick?

5 MEMBER SKILLMAN: I thank the staff and
6 the other organizations for a thorough
7 presentation. I remain convinced that these
8 criterion 26, reactivity needs to be in full
9 alignment, particularly for those cores where the
10 coolant and the fuel have a radically different
11 neutron response.

12 What was expunged from the currently
13 recommended criterion 26 is no working on
14 controller react to any. And I believe that that
15 is a feature that needs to be in the
16 advanced reactors as here.

17 CHAIRMAN BLEY: Thank you. Harold?

18 MEMBER RAY: Well, we had a very, I
19 thought, effective and good discussion with staff
20 this morning on the proposition that I don't, I'm
21 not confident it's reflected yet in what the other
22 side will bring to the table in this plan because
23 the plan deals with sequence and stages at which
24 the review is conducted as well as with what the
25 result finally is, however that's defined.

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1 But at some point there is a
2 obligation, and under the regulations it was placed
3 there in the '70s, 1970s after many other efforts
4 had fallen short which makes the applicant, or the
5 licensee as the case may be, responsible for
6 assuring the quality of the information presented.

7 That's contrasted to the model in which
8 the applicant presents information and the
9 regulator, whoever that may be, reviews it and
10 either accepts it or either accepts it or doesn't
11 in so far as if the review by the regulator in
12 whichever areas they choose to review discovers a
13 failure to comply with the requirements for
14 assuring quality, then the applicant or licensee
15 typically then has to go back to the end of the
16 line and start over again and show that that was
17 the only place that this shortcoming occurred, or
18 that they've located and dealt with other ones that
19 were affected by it.

20 All of that means to me that we should
21 high confidence in the information, should be able
22 to have very high confidence in the information
23 presented not during the early stages let's say of
24 discussion about what, how to think about the
25 requirements, but as we're going through this

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1 staged process and get to points at which we have
2 accepted a portion or a, however whether it's
3 vertically or horizontally staged, of what's been
4 submitted.

5 That should, we should have high
6 confidence. We found that we had more confidence
7 than we should have had at times in the past, and
8 we should learn from that experience. And like I
9 said, it was at one point in the Agency's history
10 it was decided that it had to be captured in
11 Appendix B.

12 The problem is, with Appendix B is that
13 it only applies to safety related instruction
14 systems and components, and typically we're looking
15 here at a lot of information that would be
16 arguably, wouldn't meet that criterion.

17 So in any event, to try and summarize
18 for you, Dennis, I'm just interested in our having
19 confidence that the applicants understand their
20 obligation to, for example, independently verify
21 themselves, not have verified by the agency the
22 accuracy of the information that they submit.

23 And if it's found to fall short of
24 that, they then have a large burden, Dick would
25 refer to Part 21 but however you style it, they

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1 have a large burden to go back and say that's the
2 only place where I've made this kind of mistake
3 where I've found others and taken care of them as
4 necessary.

5 So that's my input. Now that doesn't
6 help you when it comes to writing a letter, but
7 I'll try and think along with the other stuff I'm
8 doing how you might express that --

9 CHAIRMAN BLEY: You have a letter of
10 your own, I understand.

11 MEMBER RAY: I have one of my own. But
12 the shorthand is simply to say if you're going to
13 apply for something and seek approval of it,
14 whether it's staged or all at once, I don't care
15 how you do it, you got to comply with Appendix B.
16 And if you don't, you got some work to do.

17 CHAIRMAN BLEY: Thank you. Matt?

18 MEMBER SUNSERI: Thanks, Dennis. I
19 agree with my colleagues that I think that the
20 staff and the industry have both presented very
21 comprehensive and given a lot of thought to the
22 process and the way to go forward here in
23 developing appropriate action plans.

24 And listening to the conversations, and
25 I'll call it unbiased way because I don't have a

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1 horse on either side here, the staff or the
2 industry. Just trying to make sure the right
3 things happen here.

4 My sense is that, you know, there's
5 discussion of this gap and expectations on, you
6 know, move faster, whatever. But my sense is
7 listening to unbiasedly, that gap is smaller and
8 that both sides are closer together than you're
9 giving yourself credit for and working together, I
10 think you can close the gaps a little faster.

11 And obviously there's some exceptions
12 to that, there's some areas but generally overall I
13 think that both sides are pretty close. So having
14 said that, Dennis, I'll just look forward to
15 working with the committee on the letter.

16 CHAIRMAN BLEY: Okay, thank you. Ron?

17 MEMBER BALLINGER: Green light.

18 (Off microphone comment.)

19 MEMBER BALLINGER: Never mind. I agree
20 with my colleagues, and Harold has said it much
21 better than I could ever say it. But I think the
22 Appendix B responsibility is really, really
23 important. And I sort of assume that people
24 already knew that. But anyway, that's all I have.

25 CHAIRMAN BLEY: Thank you. Joy?

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1 MEMBER REMPE: I wanted to share my
2 thanks too for the presentations, and the staff as
3 well as industry. I agree with what I believe Mike
4 was trying to get to about the prioritization of
5 Strategy 3 and 5. And I believe we heard that from
6 industry too.

7 I believe the staff told us that what
8 we have reviewed isn't the latest on what's going
9 to be done on Strategy 2, and I would support that
10 that strategy be thought carefully through so that
11 some tasks that could be delayed would be.

12 I find that a lot of things might be
13 resolved if the industry comes in with the
14 appropriate pedigree of models, et cetera. What I
15 learned, I guess, too was that what I heard from
16 industry today from many of the presenters is that
17 the modernization activities from the staff are
18 closely aligned to what they're thinking about in
19 the near term.

20 And I had not gotten that from the
21 popular press. And so I hope our letter conveys
22 some of that because I think that would be a
23 service that we could do in our letter.

24 And then I guess the other thing with
25 Harold and some of my colleagues have brought up

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1 about the QA, yes I understand you would have a
2 graded approach. But I think helping early on in
3 what's submitted requiring them to do as the
4 Canadians have indicated in their view graphs that
5 were provided to us, having their process for
6 ensuring quality reviewed by the staff to help
7 emphasize that point would be helpful.

8 And I think the folks from several
9 industry organizations said that the people they've
10 been working with already have a good appreciation
11 of the quality needed. So it might not be such an
12 onerous thing to stick on to the developers at this
13 time.

14 So I would like to see something like
15 that included in our letter. And then I guess I
16 just want to emphasize a bit that the staff said
17 that they're taking care of it, but I never saw
18 lead cooled included in all of their documentation
19 explicitly, and I think that that needs to be
20 conveyed at some point.

21 It's a nit but I think that the staff
22 is aware of this, they're fixing it. But it's not
23 been something we saw. And that's it, thanks.

24 CHAIRMAN BLEY: Thank you. Mr. Brown?

25 MEMBER BROWN: I'll have no additional

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1 comments other than I fundamentally align with
2 Harold relative to the Appendix B approach. I
3 think it's the responsibility of the applicant to
4 demonstrate that he satisfies and takes care of the
5 rest of the public and meets those requirements,
6 demonstrates that he has the technical background
7 to support his license application, or pre-
8 application, whatever stages we want to put him in.

9 CHAIRMAN BLEY: Dr. Kirchner.

10 MEMBER KIRCHNER: Thank everyone for
11 the presentations. I too, I guess I'm going to be
12 repetitive at this point. The emphasis on a
13 quality application I think is key. I
14 think Strategy 3 and 5 are much more important
15 right now than 2.

16 For example, just not to dwell on
17 specific points but in the NIA presentation one
18 could misread this. I think maybe I'm misreading
19 it, that the NRC should enhance their modeling and
20 simulation capabilities for fuel qualification.

21 That's the responsibility of the
22 applicant. The NRC may choose not to develop any
23 codes to look at fuel qualification. They may say
24 bring me the empirical evidence. They could
25 anyway.

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1 I then just, I'm still thinking over
2 your presentation, Amir, and I'm thinking through,
3 this is a conundrum. I'll just throw this out and
4 then I'll stop.

5 The more that you use a risk informed
6 approach, may that not require a more complete
7 design early on than doing a deterministic go
8 through the GDCs as modified for the advanced
9 reactors approach? In other words, an old fashioned
10 defense in depth, do the GDC approach versus a more
11 modern, if that's the right word that you're using,
12 risk informed approach?

13 It seems to me that I believe in using
14 these techniques like PRA to inform the design and
15 the analyses and such. But it's going to require a
16 fairly mature design for the regulatory not to make
17 a subjective decision on what is safety class and
18 what isn't.

19 Do you see where I'm going with this?
20 So with that, I stop. Thank you.

21 CHAIRMAN BLEY: I was taking notes.
22 Jose, you're up.

23 MEMBER MARCH-LEUBA: Yes. At the
24 moment I have a Wi-Fi connection I'll send you
25 these, but I'll read it right now. In the near

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1 term, the staff should develop physical insights
2 about the new reactor process.

3 One way to achieve this is to collect
4 available experimental data relevant to the likely
5 designs and concentrate on benchmarking efforts
6 instead of attempting to develop new codes.

7 Only those benchmark efforts show
8 existing co-deficiencies to the models we have
9 available. This process will also show the holes
10 in the available experimental data. We should
11 guide the staff and applicant's needs. And that's
12 it.

13 CHAIRMAN BLEY: That's good, and you'll
14 send it. I appreciate it. Pete?

15 MEMBER RICCARDELLA: Well, being last
16 in the chain, I really don't have anything to add
17 to the comments of my esteemed colleagues. But I
18 would just like to thank all the presenters for a
19 very informative day. Thank you.

20 CHAIRMAN BLEY: Just a second. Okay,
21 again, thanks to the staff and to the folks from
22 industry. This was very informative. Sometimes we
23 push a little hard because we don't have much time
24 to get through this sort of stuff, and I appreciate
25 your tolerance and that kind of grilling.

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1 It was a useful day for me. I would, I
2 certainly agree for me Chapter 3 is the, or
3 Strategy 3 is the real key for getting this thing
4 moving. I'm still a little uncomfortable with the
5 focus on codes in Strategy 2.

6 It's more than that, and it kind of
7 feels to me from the discussions we had that the
8 title is driving the thinking to some extent.

9 A couple of other things that, you
10 know, if we're borrowing the DOE design process
11 names, that's okay. But we ought to really define
12 them so people understand exactly what they mean
13 here and don't make mistakes along the way.

14 The licensing basis events kind of are
15 the key for making this whole thing work, and I
16 would go a little further than Walt. I agree with
17 Walt, but the risk informed approach requires a
18 complete design. It also requires understanding how
19 you're going to operate that complete design. And
20 further, it requires a real quality PRA, not the
21 kind of things we've been seeing in the design cert
22 stage.

23 You're going to be making decisions
24 picking the licensing basis events. You got to
25 have the design, you got to know how it's going to

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1 be operated, you got to have a really good PRA if
2 you're going to do that.

3 MEMBER CORRADINI: Or you have a very
4 big uncertainty band.

5 CHAIRMAN BLEY: Or you have a
6 tremendous uncertainty band that might completely
7 upset the apple cart when you go further down the
8 path. I just don't see how you do it without those
9 things being complete.

10 When you get to that point, you got to
11 have that. With that, we're going to go off the
12 record and then we're going to talk a little bit
13 about tomorrow and how we pass through that
14 process.

15 (Whereupon, the meeting in the above-
16 entitled matter was concluded at 5:56 p.m.)

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ACRS Future Plant Designs Subcommittee Meeting

Non-LWR Vision and Strategy Implementation Action Plans

March 8, 2017



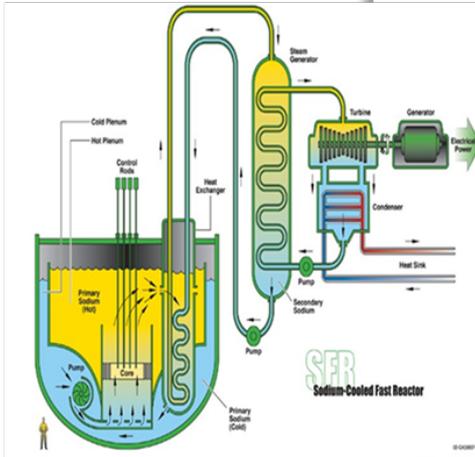
- Introduction
- Summary/Overview
 - Vision and Strategy
 - Implementation Action Plans
- Implementation Strategies
 - Strategy 2 – Computer Codes and Tools
 - Strategy 3 – Flexible Framework
 - Regulatory Review Roadmap
 - Licensing Bases
 - Strategy 5 – Policy Issues

Interest in Advanced Reactors

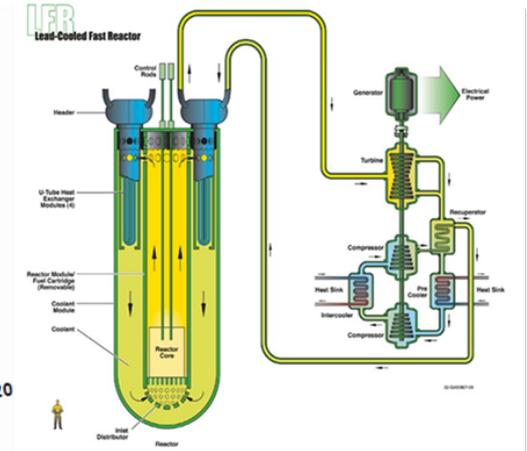
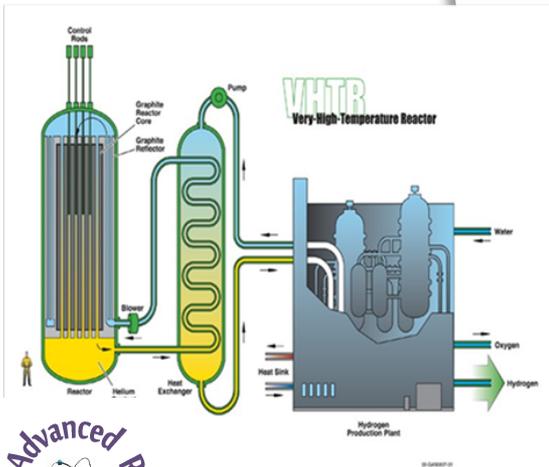
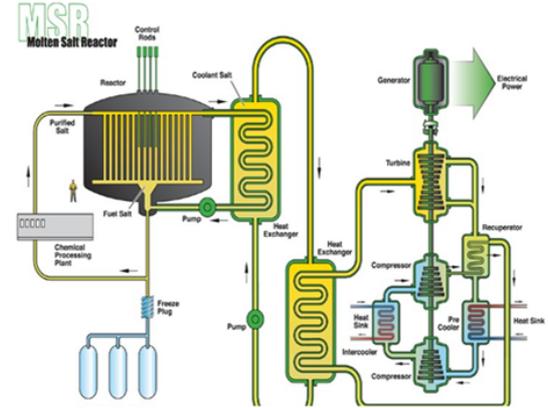
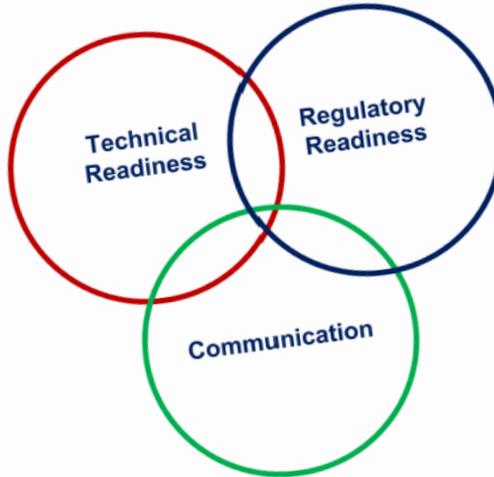
- DOE and NEI deployment goals
- Dozens of companies are working on a variety of advanced reactor designs
- Legislation has been put forward in both the House of Representatives and the Senate

Non-LWR Vision and Strategy

ML16356A670

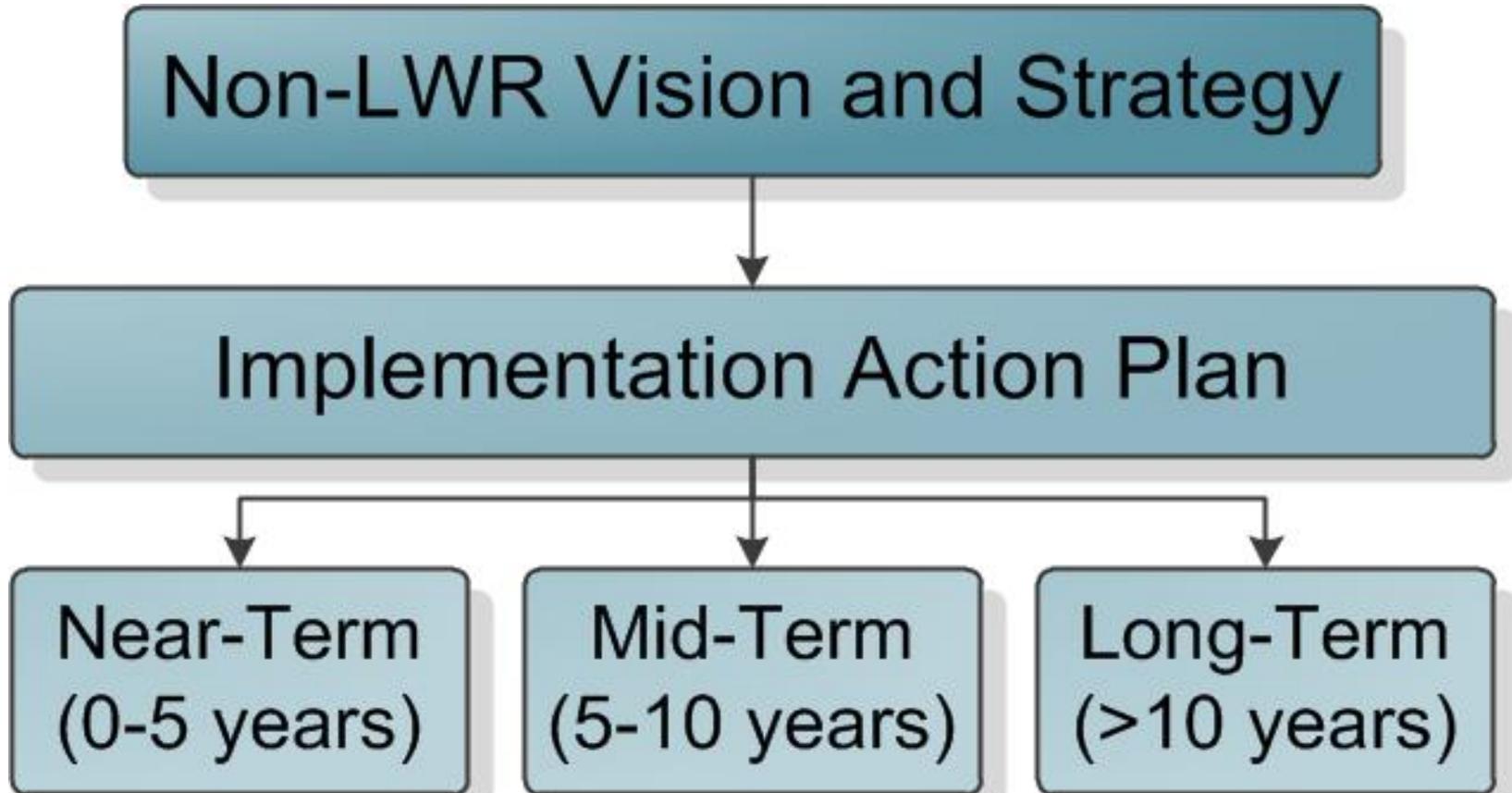


NRC Vision and Strategy:
 Safely Achieving Effective and Efficient
 Non-Light Water Reactor
 Mission Readiness



December 20

Implementation Action Plans (IAPs)



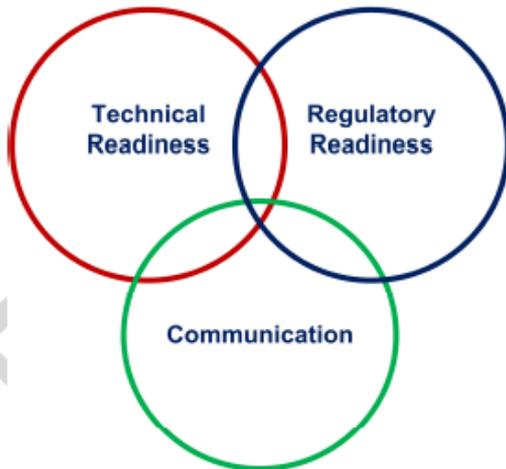
Implementation Action Plans (IAPs)

The IAPs are planning tools that describe:

- Work to be done to achieve non-LWR readiness
- Resources needed to accomplish the work
- How the work should be sequenced
- How to prepare the workforce to do the work

Near-Term Implementation Action Plans (IAPs)

NRC Non-Light Water Reactor (Non-LWR)
Vision and Strategy - Staff Report:
Near-Term Implementation Action Plans

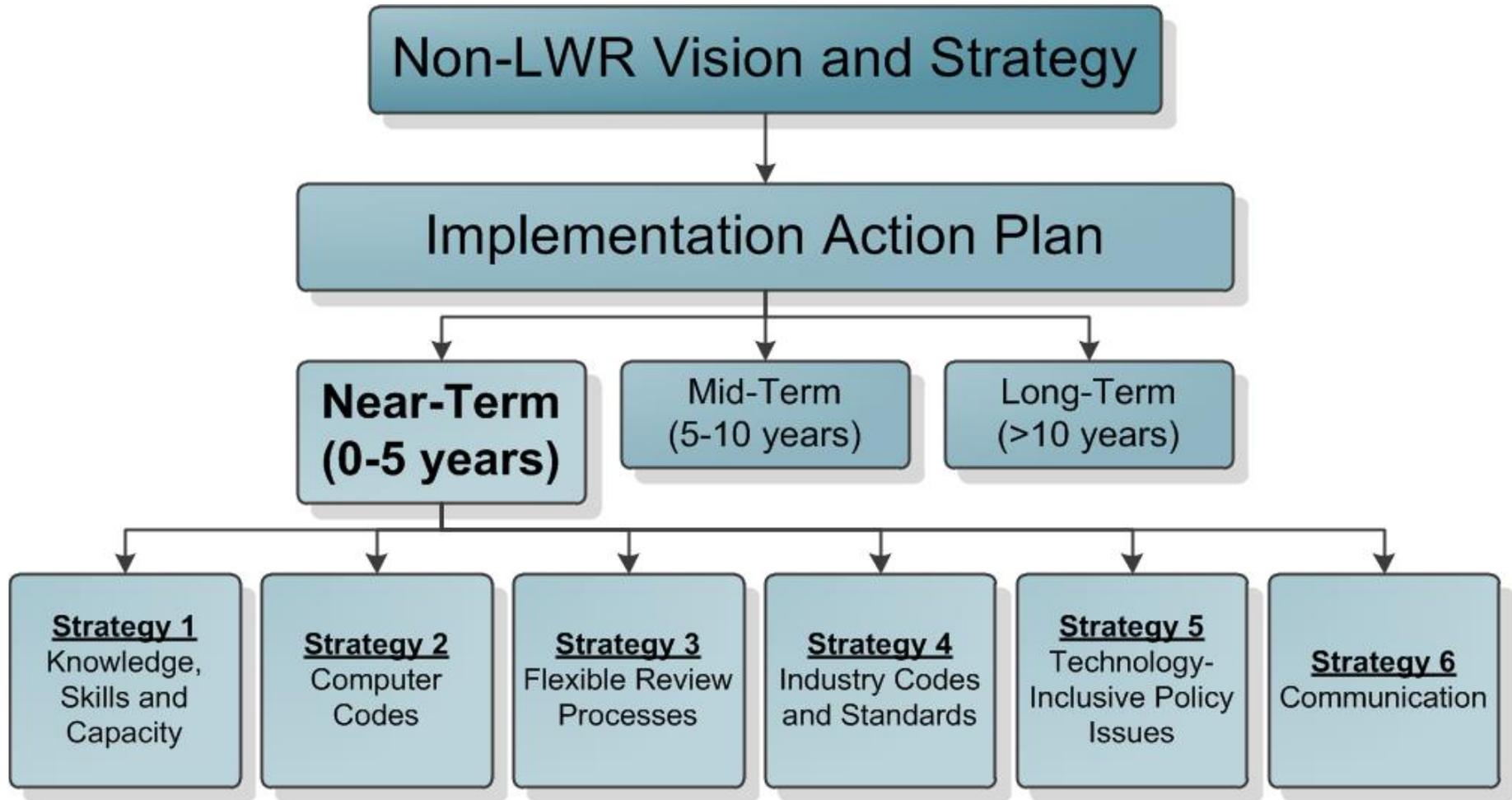


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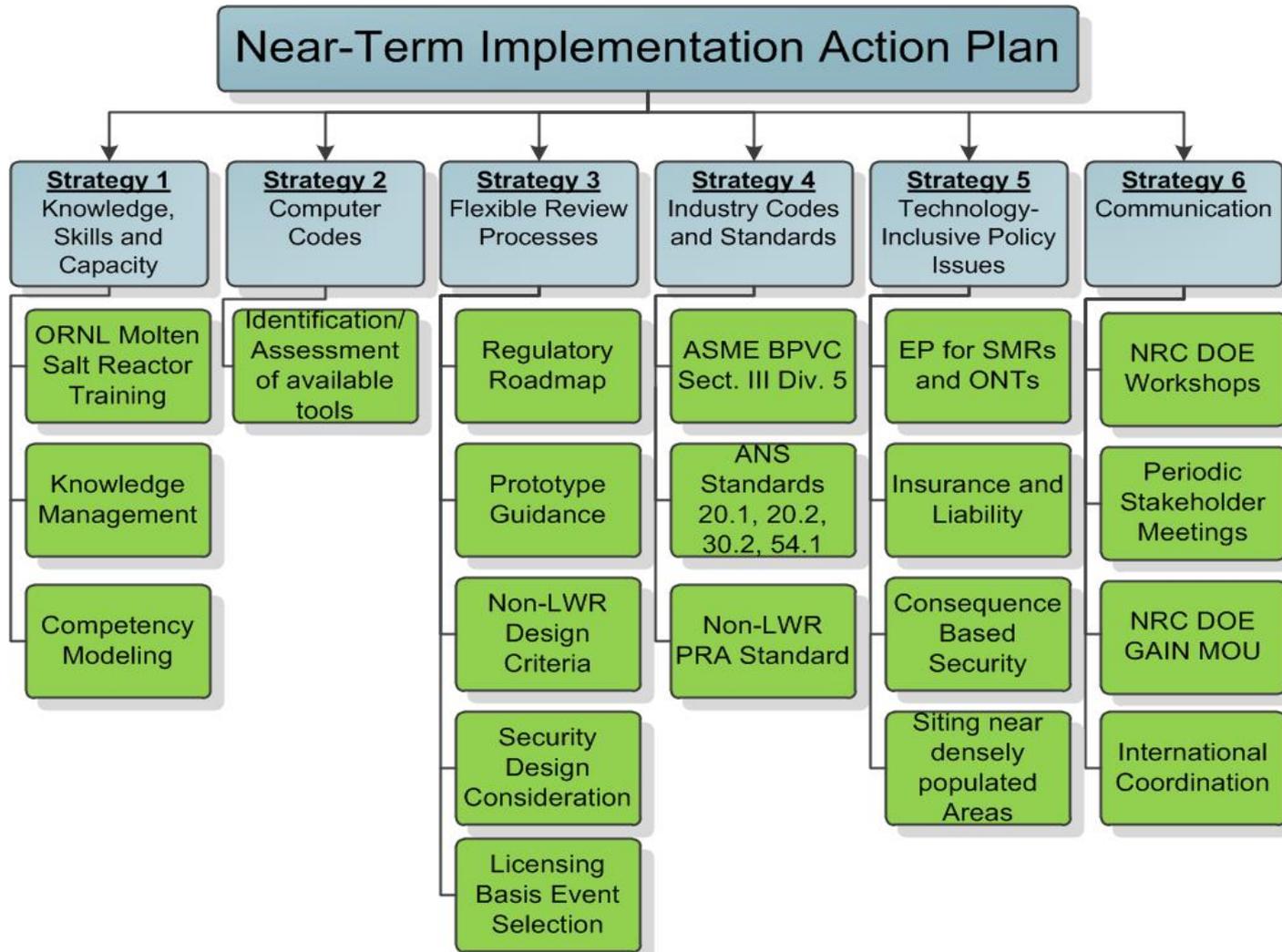
Volume 2 – Detailed Information

- Five-year timeframe
- Draft was made available for stakeholder input in Fall 2016
- Some near-term activities already underway
- Plan to finalize the IAPs this Spring

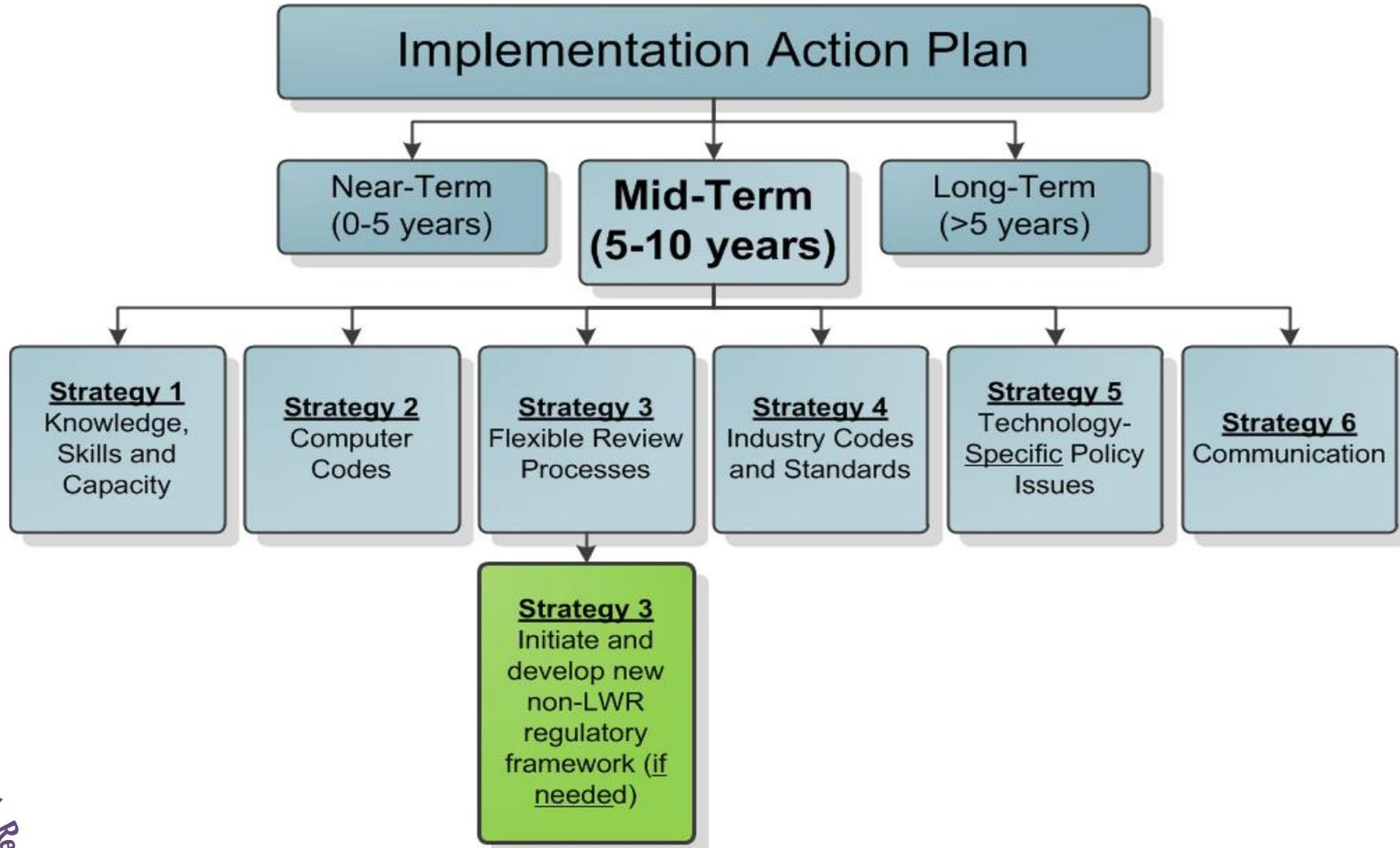
Near-Term Implementation Action Plans (IAPs)



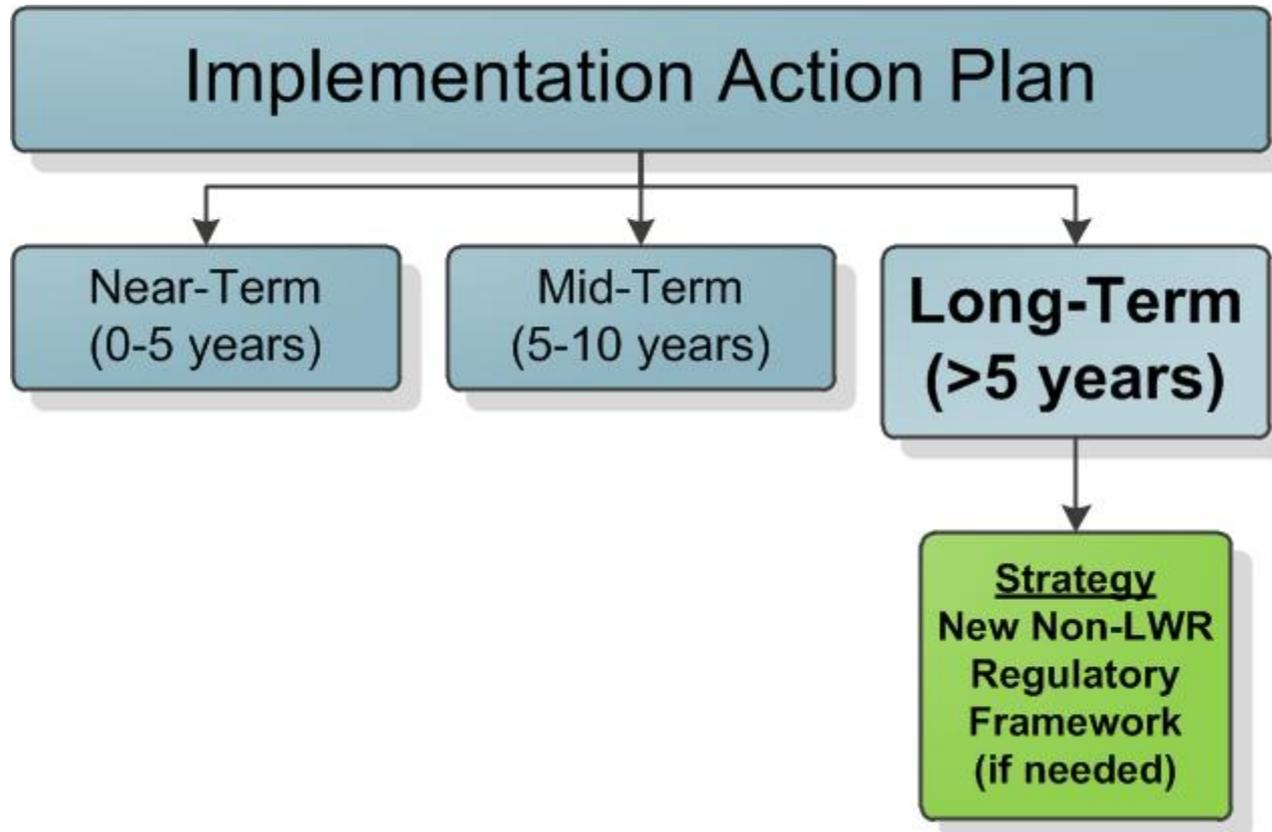
Examples of Ongoing Near-Term IAP Activities



Mid-Term Implementation Action Plans (IAPs)



Long-Term Implementation Action Plans (IAPs)



Outreach Activities

- NRC-DOE Joint Advanced Reactor Workshops
 - First workshop was held September 1-2, 2015
 - Second workshop was held June 7-8, 2016
 - Third workshop scheduled for April 25-26, 2017
- Stakeholder meetings every six weeks
 - Next meeting March 22, 2017
- Gateway for Accelerated Innovation in Nuclear (GAIN)
 - GAIN MOU signed on November 10, 2016
- International Participation
 - NRC chairs the Group on the Safety of Advanced Reactors (GSAR)

Pre-Application Activities

- Oklo, Inc.
 - Pre-application meetings held on November 17, 2016 and December 14, 2016
- Terrestrial Energy
 - Plans to seek pre-application interactions prior to the 2019 timeframe for its Integral Molten Salt Reactor
- Core Review Team Approach
 - Supports efficient and effective pre-application interactions
- Additional pre-application reviews anticipated in the near-term

Strategy 2 is designed to “Acquire/develop sufficient computer codes and tools to perform non-LWR regulatory reviews”

- Enables the staff to perform independent confirmatory analysis of safety significant design basis and beyond design basis accidents.
- Identifies experimental information necessary for regulatory decisions.
- Can provide the basis for rulemaking and regulatory guidance.

Functional Areas & Prioritization

- **Reactor Kinetics and Criticality**
- **Fuel Performance**
- **Thermal-Fluid Phenomena**
- **Severe Accident Phenomena**
- **Probabilistic Risk Assessment**
- **Materials and Component Integrity**

**Primary
Focus
FY17-FY18**

**Secondary
Focus
FY-17-FY18**

- **Offsite Consequence Analysis**
- **Instrumentation & Controls**
- **Security**
- **Human Factors**

Technical Challenges

- **Staff Familiarity of New Designs**
 - Understanding physical processes for numerous designs; GCR, SFR, MSR.
- **Fuel Performance**
 - UO₂ fuel well established, but gaps exist for non-LWR fuels.
- **Neutronics**
 - Fast spectrum systems require analysis of more energy groups.
 - Benchmarks for > 5% enrichment.
- **Severe Accident Phenomena**
 - Identification of any new phenomena, Fission Product transport.
- **Materials**
 - High temperature material behavior.

● Previous Efforts for NGNP

- Path forward relatively well known, with technical issues identified.
- Analysis codes selected and development started for GCR.

● Single Phase Coolants

- Lack the complication of two-phase flow, thermal non-equilibrium.
- Amenable to analysis with CFD.

● Significant Safety Margin

- May allow for large modeling and simulation uncertainties.

● Fission Product Capture

- Sodium and molten salt coolants may be very effective at capturing FP.

Initial Efforts

- **Phenomena, Scenario, and Issue Identification**

- To be generic when possible, but more specific as design information is made available. Goal is to facilitate planning of future development.

- **Selection of Computer Codes for Confirmatory Analysis**

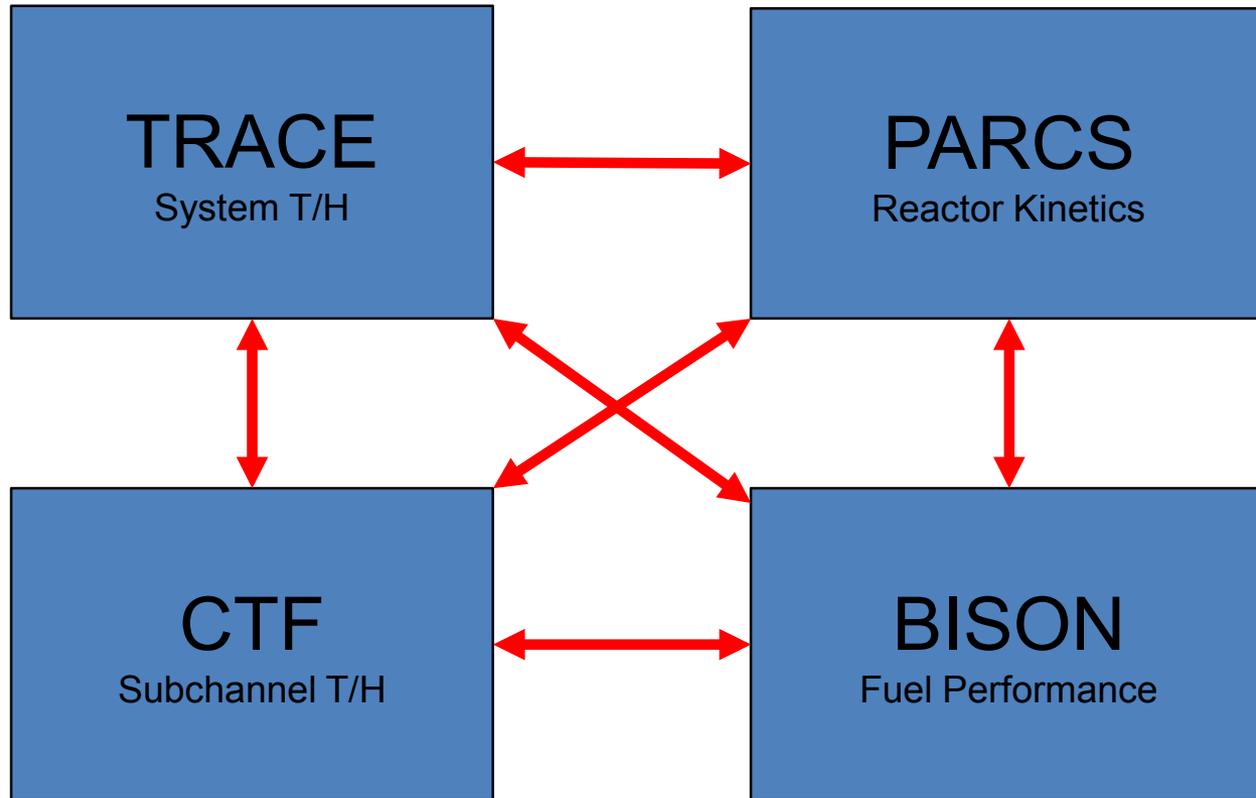
- Much tighter coupling between fuel performance, neutronics, thermal-hydraulics than in most conventional LWR analysis.
- May involve NRC developed codes, or adoption of codes developed by DOE (CASL and/or NEAMS developed, ANL codes for sodium fast reactors)

- **Identification of Experimental Data Needs**

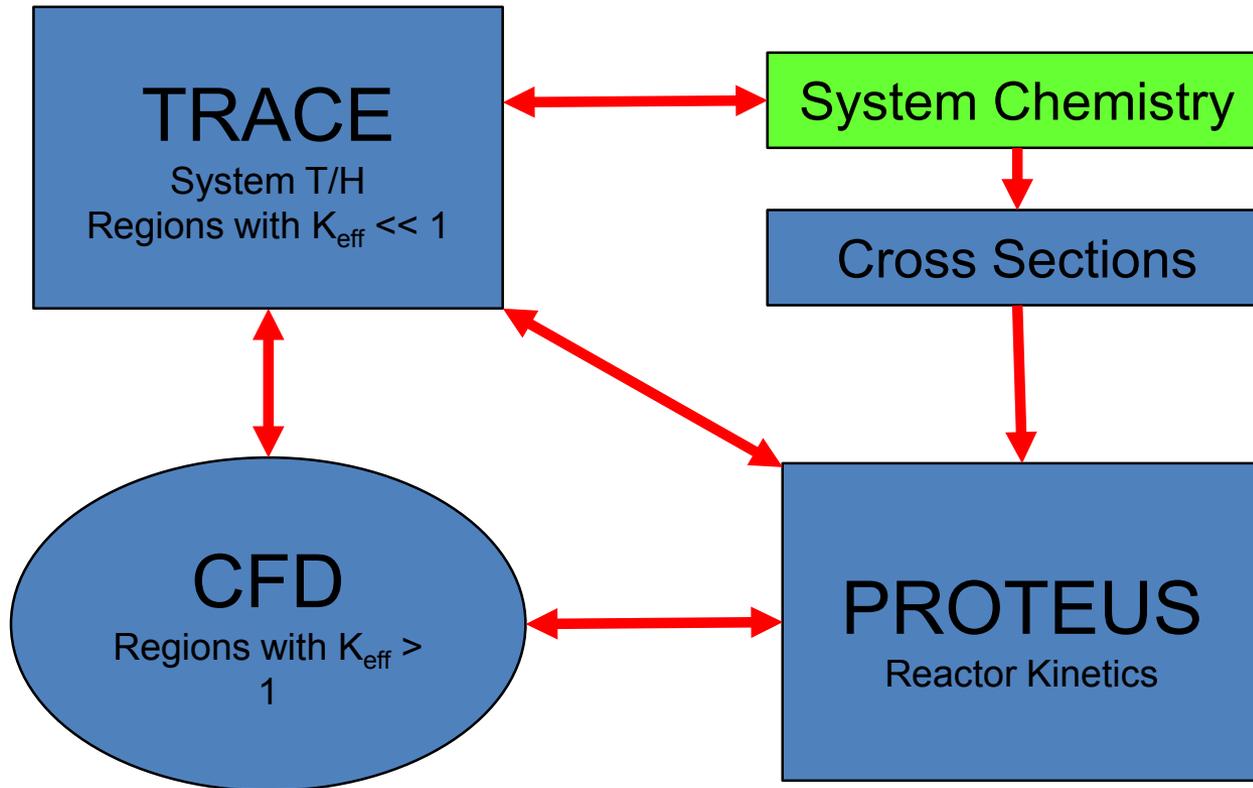
- Qualification of fuel behavior; analytical methods & data for assessment
- Material performance at prototypical conditions

- **Participation in Codes and Standards Activities**

Sodium Fast Reactor Codes (Option 2)



Molten Salt Reactor Codes (liquid fuel)



Summary:

- Initial plan has been generated and the staff is prepared to begin development of tools & capability to perform the technical review.
- Activities currently limited by funding level and available resources.
- Familiarization with new designs is necessary to increase staff knowledge level.

Strategy 3

(Flexible non-LWR regulatory review process)

Near-Term	Mid-Term	Long-Term
<p>Develop guidance for a flexible non-LWR regulatory review process within the bounds of existing regulations, including the use of conceptual design reviews and staged-review processes.</p>	<p>Continue to develop guidance for a flexible non-LWR regulatory review process within the bounds of existing regulations, including the use of conceptual design reviews and staged-review processes.</p> <p>Initiate and develop a new non-LWR regulatory framework (if needed) that is risk-informed, performance-based, and that features staff review efforts commensurate with the risks posed by the non-LWR NPP design being considered.</p>	<p>Continue to develop, finalize, and promulgate a new non-LWR regulatory framework (if needed) that is risk-informed, performance-based, and that features staff review efforts commensurate with the risks posed by the non-LWR NPP design being considered.</p>

Strategy 3

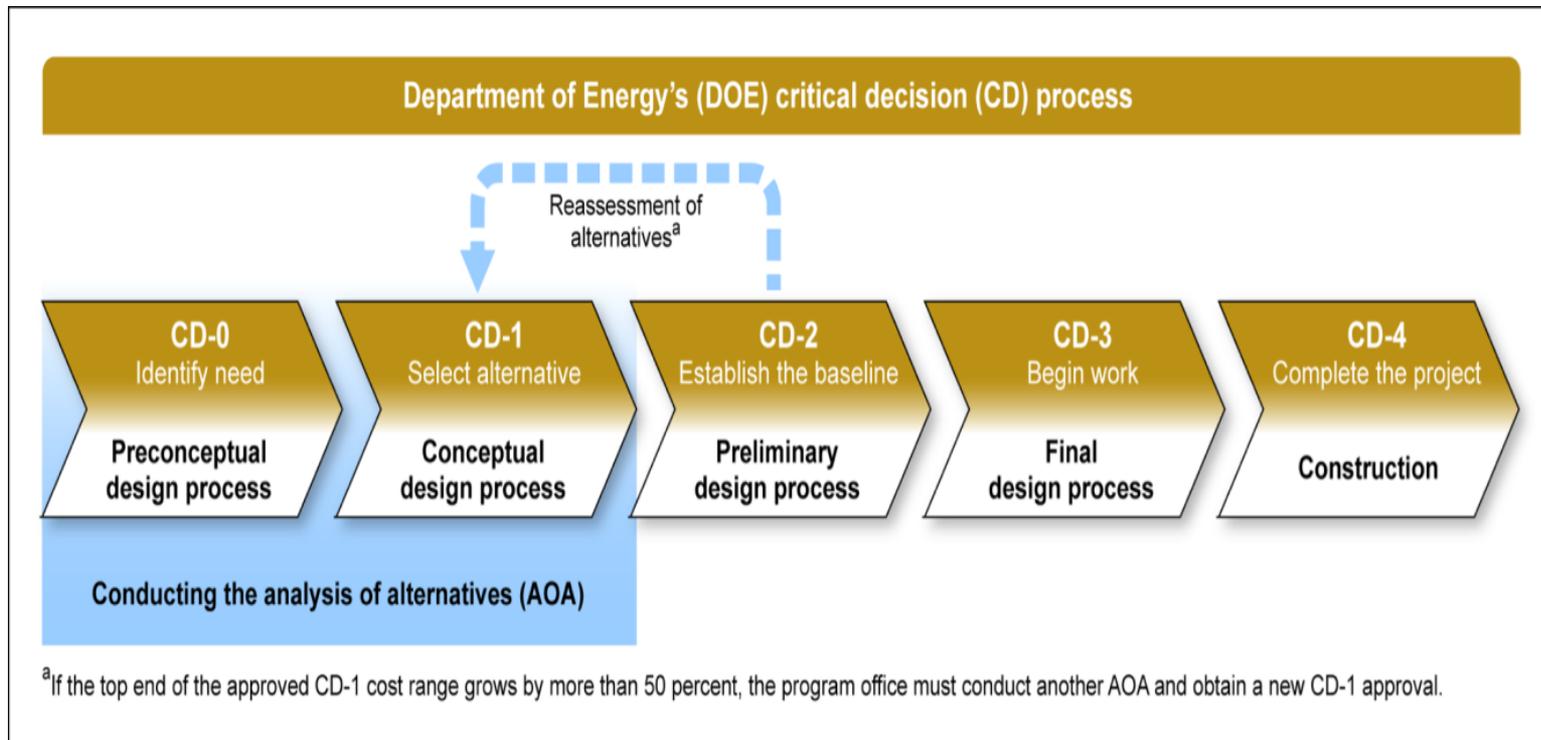
(Near-Term Contributing Activities)

- 1) Document criteria for reaching safety, security, or environmental findings
- 2) **Determine and document appropriate non-LWR licensing bases and accident sets for highly prioritized non-LWR technologies.**
- 3) Identify, document and resolve (or develop plan to resolve) current regulatory framework gaps for non-LWRs.
- 4) **Develop and document a regulatory review “roadmap” that reflects the design development lifecycle and appropriate points of interaction with the NRC, and references appropriate guidance to staff reviewers and applicants.**
- 5) Update guidance for prototype testing, research and test reactors.
- 6) Licensing project plans and develop regulatory approaches commensurate with the risks posed by the technology.
- 7) Support longer-term efforts to develop, as needed, a new non-LWR regulatory framework

Strategy 3

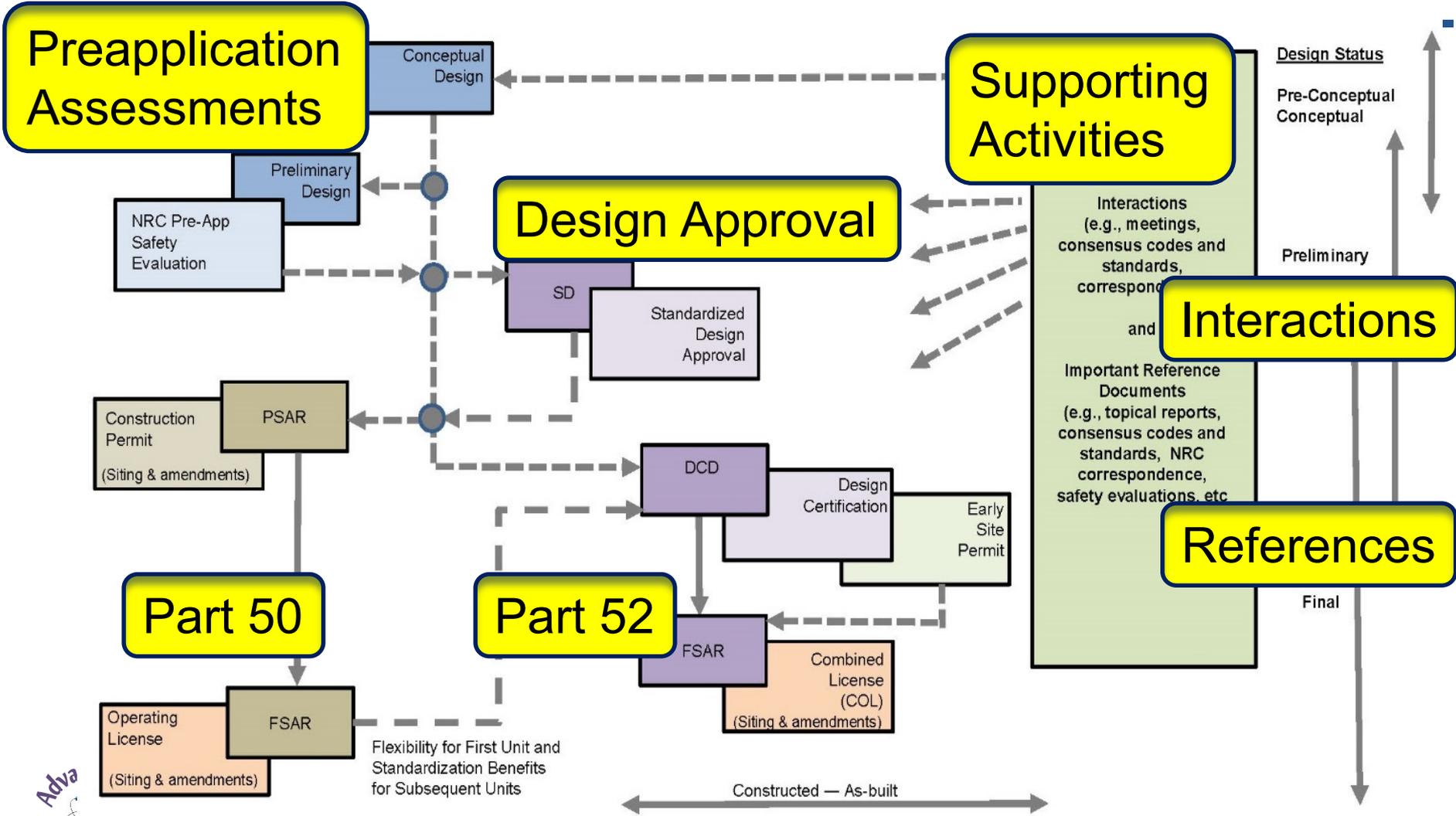
(Activity 4: Flexible Approach, Roadmap)

DOE Critical Decision Process



Source: GAO analysis of DOE's Order 413.3B. | GAO-15-37

Flexible Approaches / Roadmap



Preliminary (preapplication) Design Assessments

All or selected topics to support critical decisions

- General Description of the Plant
- Site Characteristics
- Design of SSCs and Equipment
- Reactor
- Reactor Coolant and Connecting Systems
- Engineered Safety Features
- Instrumentation and Controls
- Electric Power
- Auxiliary Systems
- Steam and Power Conversion System
- Radioactive Waste Management
- Radiation Protection
- Conduct of Operations
- Verification Programs
- Transient and Accident Analyses
- Technical Specifications
- Quality Assurance and Reliability Assurance
- Human Factors Engineering
- Probabilistic Risk Assessment/Severe Accident Evaluation

RG 1.206
Chapters 1-19

- Emergency Planning
- Security
- Staffing
- Mitigating Strategies
- Aircraft Impact Assessment
- Environmental Report
- Financial
- Inspections, Tests, Analyses, and Acceptance Criteria
- Insurance
- Fuel Cycle
- Other (design or technology specific)

Other Parts of
Applications &
Possible Issues

Enhanced Safety Focused Review for SMRs

Key Review Considerations

Safety-significance		Regulatory compliance		Novel design	Shared structures, systems, and components		Licensing approach	
Safety margin	Defense -in- depth	Operational programs		Impact on safety functions		Additional risk insights	Other considerations	

Review Tool



Output:

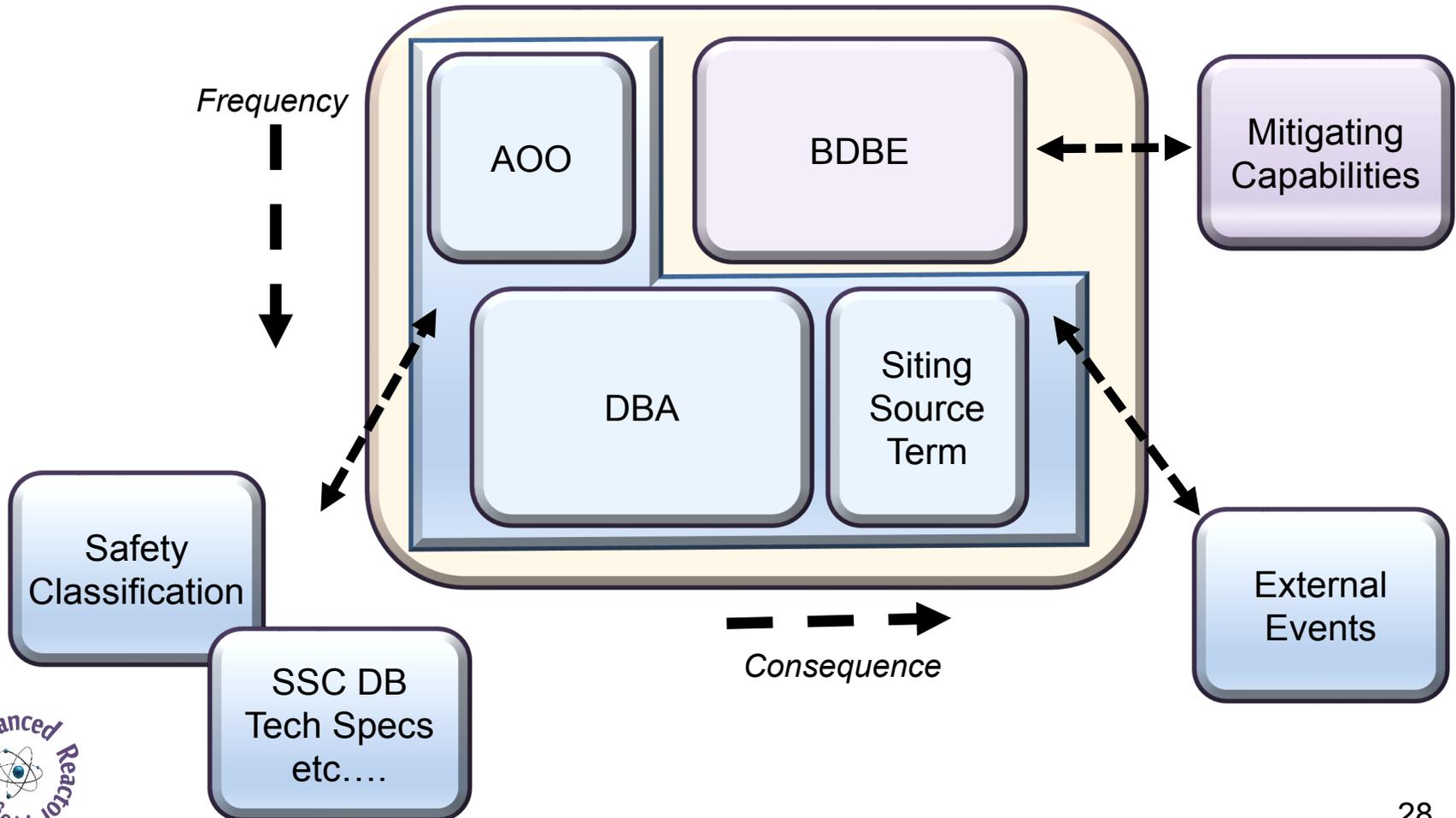
Scope and Depth of Review

- Provide supplemental approaches for implementation of NUREG-0800, Introduction - Part 2 and Design Specific Review Standard reviews
- Systematic thought process applicable to non-structure, system, or component and programmatic reviews

Strategy 3

(Activity 2: non-LWR licensing basis)

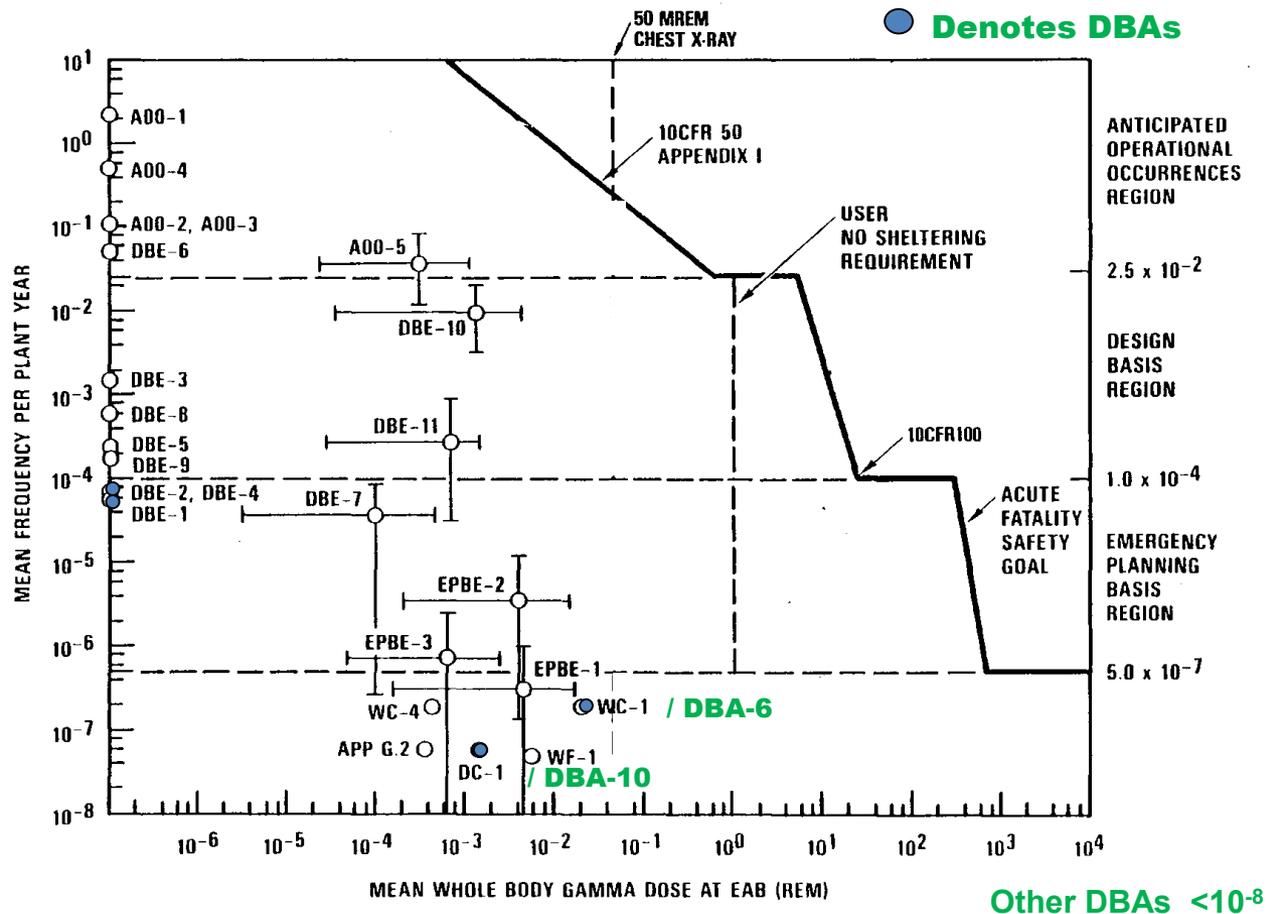
Current LBE Construct (LWRs)



Strategy 3

(Activity 2: non-LWR licensing basis)

Example MHTGR LBEs, DBAs on F-C Plot (circa 1987)
 (From 12/15/2016 NEI Presentation)



Licensing Basis Events Other Considerations

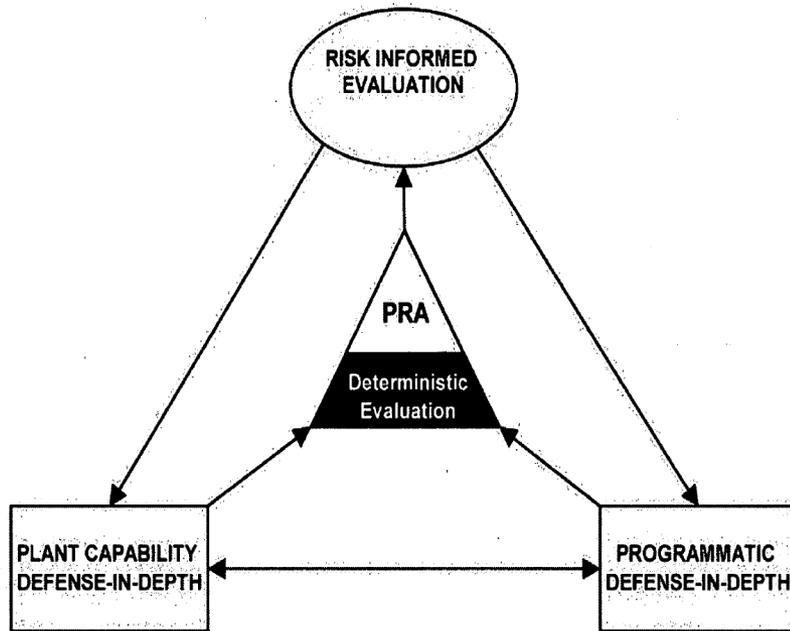


Figure E-1. Illustration showing the three major elements of the NGNP framework.

**Table 1-1
Safety Criteria and Analysis Requirements**

Event	Region	No Fuel Melting	Fuel Cladding Integrity	Core Coolable Geometry	Primary Coolant Boundary Integrity	Containment Integrity	Radiation Dose at EAB and LPZ	Analysis Requirements
DBE	AOO	✓	✓	*	✓ ASME SL [†] "B," "C"	*	*	Conservative
	DBA	-	✓	✓*	✓ ASME SL "D"	✓	*	Conservative
Beyond DBE	ATWS	-	✓	✓*	✓ ASME SL "D"	✓	✓*	Best estimate plus uncertainties

Notes:
 ✓ Explicit safety criterion is defined.
 * Meeting the safety criterion is expected if the previous criterion is met.
 † SL = Service Level

From "4S Safety Analysis"
submitted by Toshiba Corporation, July 28, 2009
ADAMS Accession No. ML092170507

INL/EXT-09-17139
Next Generation Nuclear Plant
Defense-in-Depth Approach



Policy Issues

License for Prototype Reactors	Drafting white paper
License Structure for Multi-Module Facilities	SECY-11-0079
Appropriate Source Term, Dose Calculations, and Siting	SECY-16-0012
Offsite Emergency Planning (EP) Requirements	SECY-15-0077 Drafting Regulatory Basis
Annual Fees	Final Rule (May 2016)
Insurance and Liability	Evaluating for periodic report to Congress on Price-Anderson Act
Manufacturing License Requirements	SECY-14-0095 (SMRs)
Use of Probabilistic Risk Assessment in the Licensing Process	SRP Revisions (safety focused review)

Policy Issues

Key Component and System Design Issues	Design Specific
Operator Staffing for Small or Multi-Module Facilities	SECY-11-0098 (flexibility w/ existing guidance)
Operational Programs for Small or Multi-Module Facilities	SECY-11-0112 (flexibility w/ existing guidance)
Installation of Reactor Modules During Operation of Multi-Module Facilities	SECY-11-0112 (existing guidance)
Industrial Facilities Using Nuclear-Generated Process Heat	SECY-11-0112 (assess as necessary)
Decommissioning Funding Assurance	SECY-11-0181 (Site-specific exemptions)
Implementation of Defense-In-Depth (DiD) Philosophy for Advanced Reactors	SECY-15-0168 (part of licensing framework)

Policy Issues

Security and Safeguards Requirements for SMRs	Ongoing discussions (NEI White Paper)
Aircraft Impact Assessments	Ongoing discussions
Licensing Basis Event Selection	Ongoing discussions
Functional Containment Performance Criteria	Ongoing discussions
Fuel qualification, materials qualification	Issues vary by technology
Fuel cycle facilities, enrichments	Ongoing discussions
Continuing efforts to identify and prioritize technical and policy issues	

Next Steps

- ACRS Feedback
- Upcoming milestones
- Future engagement with ACRS

Acronyms & Abbreviations

ANL	Argonne National Laboratory
ANS	American Nuclear Society
AOO	Anticipated operational occurrence
ASME	American Society of Mechanical Engineers
BDBE	Beyond-design-basis event
BPVC	Bolier and Pressure Vessel Code
CASL	Consortium for Advanced Simulation of Light Water Reactors
COL	combined license
DB	Design basis (SSC)
DBA	Design-basis accident
DBE	design-basis event
DCD	design control document
DOE	Department of Energy
EP	Emergency Preparedness
FSAR	final safety analysis report
GAIN	Gateway for Accelerated Innovation in Nuclear (DOE)

Acronyms & Abbreviations

IAP	Implementation Action Plan
INL	Idaho National Laboratory
LBE	licensing basis event
LWR	Light Water Reactor
MOU	Memorandum of Understanding
NEAMS	Nuclear Energy Advanced Modeling and Simulation (DOE)
non-LWR	Reactors not cooled/moderated by light water
NRC	Nuclear Regulatory Commission
ONT	Other nuclear technologies
ORNL	Oak Ridge National Laboratory
PRA	Probabilistic risk assessment
PSAR	preliminary safety analysis report
SD	Standard design
SMR	Small modular reactor (NRC use limited to LWRs)
SSC	structure, system, and component
V&S	Vision and Strategy

References (Public Versions)

	NRC VISION AND STRATEGY, NON-LWR MISSION READINESS	ML16356A670
	NEAR-TERM IMPLEMENTATION ACTION PLANS, VOLUME 1	ML16294A181
	NEAR-TERM IMPLEMENTATION ACTION PLANS, VOLUME 2	ML16334A495
	MID- AND LONG-TERM IMPLEMENTATION ACTION PLANS	ML17054D483
	DRAFT REGULATORY REVIEW ROADMAP	ML16291A248
SECY-10-0034	POTENTIAL POLICY, LICENSING, AND KEY TECHNICAL ISSUES FOR SMALL MODULAR NUCLEAR REACTOR DESIGNS	ML093290268
SECY-11-0079	STAFF ASSESSMENT OF SELECTED SMALL MODULAR REACTOR ISSUES IDENTIFIED IN SECY-10-0034	ML110460434
SECY-11-0098	OPERATOR STAFFING FOR SMALL OR MULTI-MODULE NUCLEAR POWER PLANT FACILITIES	ML111870574
SECY-11-0112	STAFF ASSESSMENT OF SELECTED SMALL MODULAR REACTOR ISSUES IDENTIFIED IN SECY-10-0034	ML110460434
Secy-11-0181	DECOMMISSIONING FUNDING ASSURANCE FOR SMALL MODULAR NUCLEAR REACTORS	ML112620358
Secy-14-0095	STATUS OF THE OFFICE OF NEW REACTORS READINESS TO REVIEW SMALL MODULAR REACTOR APPLICATIONS	ML14073A710
Secy-15-0077	OPTIONS FOR EMERGENCY PREPAREDNESS FOR SMALL MODULAR REACTORS AND OTHER NEW TECHNOLOGIES	ML15037A176
Secy-15-0168	RECOMMENDATIONS ON ISSUES RELATED TO IMPLEMENTATION OF A RISK MANAGEMENT REGULATORY FRAMEWORK	ML15265A488
Secy-16-0012	ACCIDENT SOURCE TERMS AND SITING FOR SMALL MODULAR REACTORS AND NON-LIGHT WATER REACTORS	ML15309A319

DOE Program Input Associated with NRC's Draft Implementation Action Plan

ACRS Future Plant Designs Subcommittee

**Office of Nuclear Energy
U.S. Department of Energy**

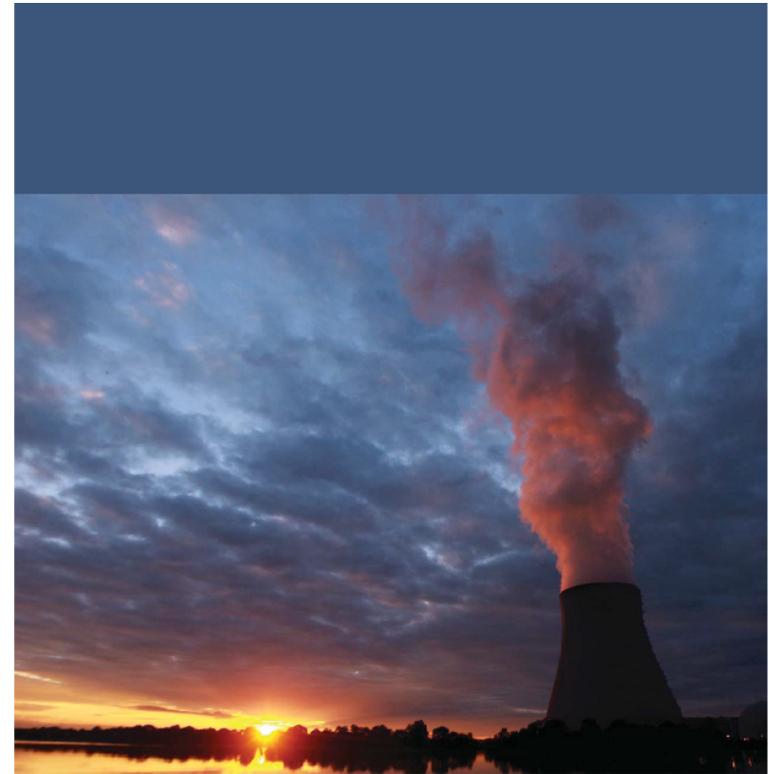
March 8, 2017

www.inl.gov



DOE Vision and Strategy

- DOE recently issued its “VISION and STRATEGY for the Development and Deployment of Advanced Reactors”
- <https://energy.gov/ne/downloads/vision-and-strategy-development-and-deployment-advanced-reactors>
- Aligned with NRC’s Implementation Action Plan (IAP)
- Incorporates feedback from industry’s review of May, 2016 draft
- Includes a near term focus on an NRC regulatory framework being established for advanced non-LWRs

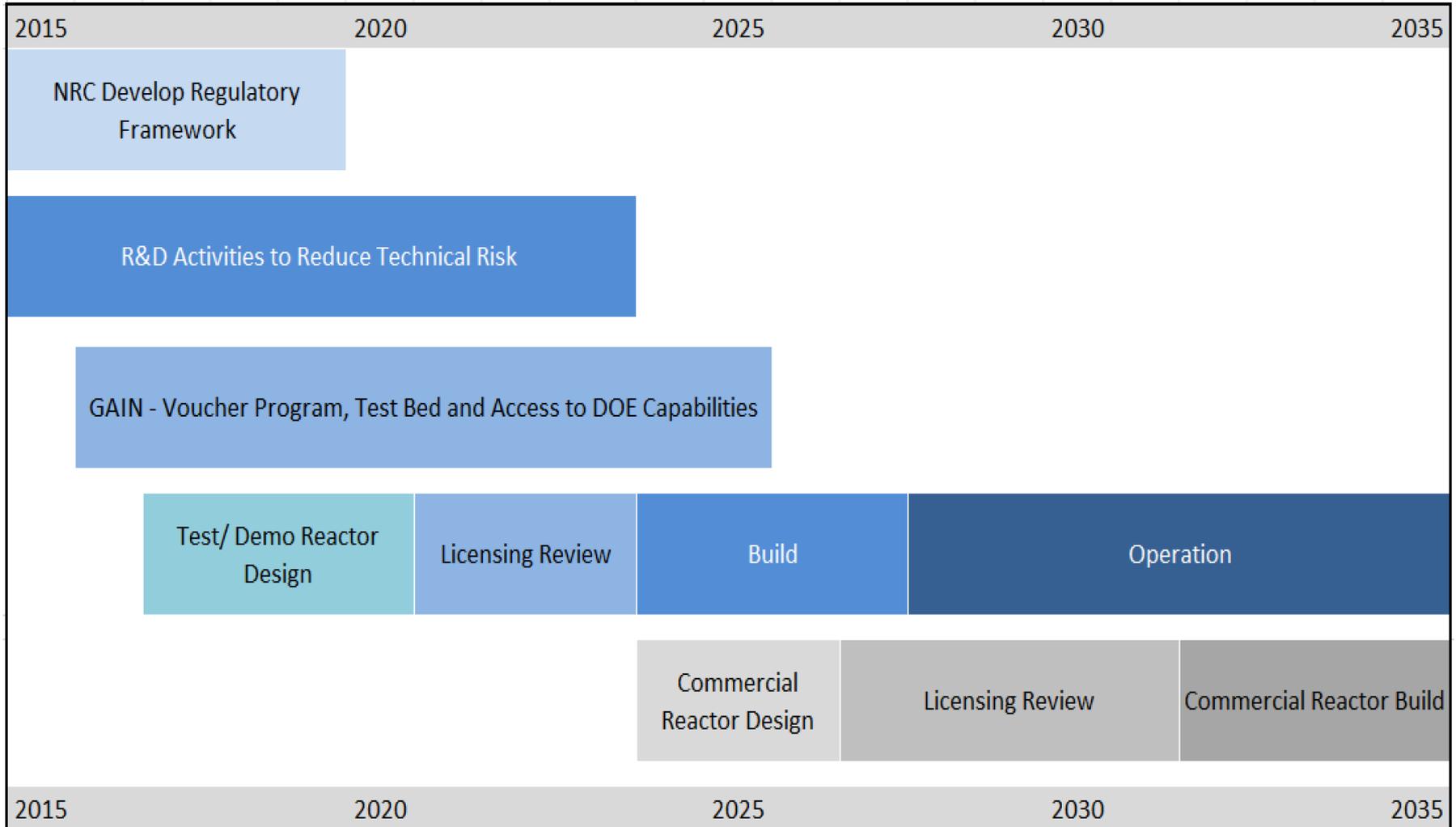


VISION and STRATEGY for the Development and Deployment of Advanced Reactors

DOE Office of Nuclear Energy: Priorities & Focus Areas

- Accelerate deployment of advanced nuclear energy technologies
 - Partner with industry and universities for the development and deployment of advanced and innovative nuclear energy reactors, systems, and technologies
 - Expand transfer of lab-developed technologies to the commercial private sector
- Enable commercial deployment of light water-based SMRs by the mid-2020's
- Enable commercial deployment of advanced non-LWRs by the 2030's

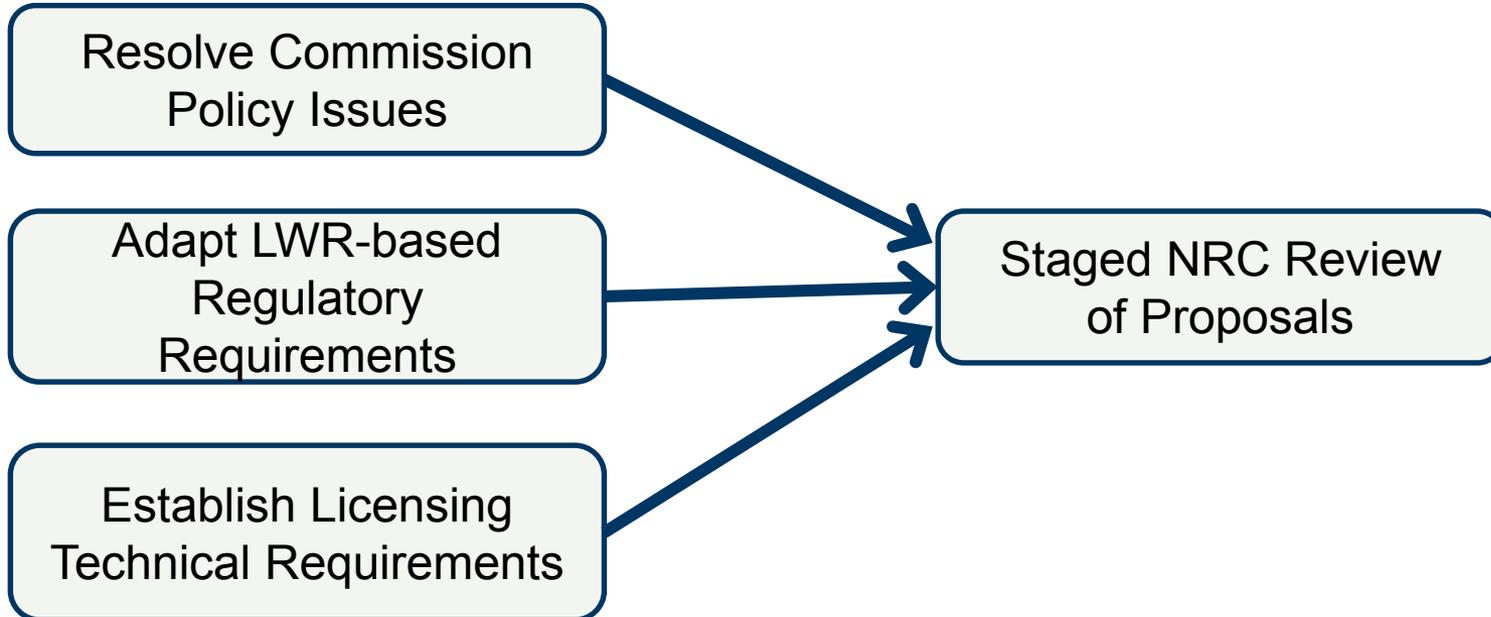
DOE Vision: Sequence Supporting Advanced Reactor Deployment



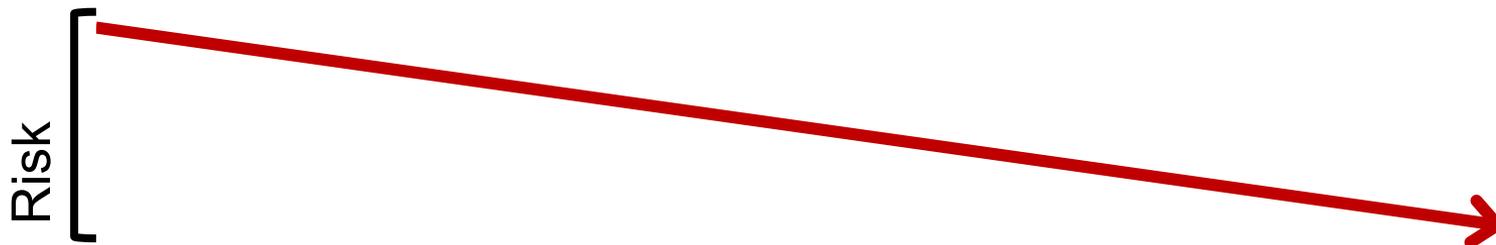
DOE's View of the "Regulatory Framework" Needed to Support Near-Term Deployment

- Elements of the regulatory framework needed to increase regulatory certainty for near term deployment include:
 - **Identify and resolve key Commission policy issues**
 - **Adapt LWR-based regulatory requirements to advanced non-LWRs**
 - Informed by results of DOE's focused R&D activities
 - **Establish Licensing Technical Requirements**
 - Enhanced by development of industry consensus Codes and Standards
 - **Establish staged/phased review processes**
- Near term advanced reactor deployment does not require the establishment of an entirely new regulatory framework (i.e., "Part 53")
- Pilot work by industry, in conjunction with NRC's near term IAP efforts, can inform future, longer term "Part 53" development

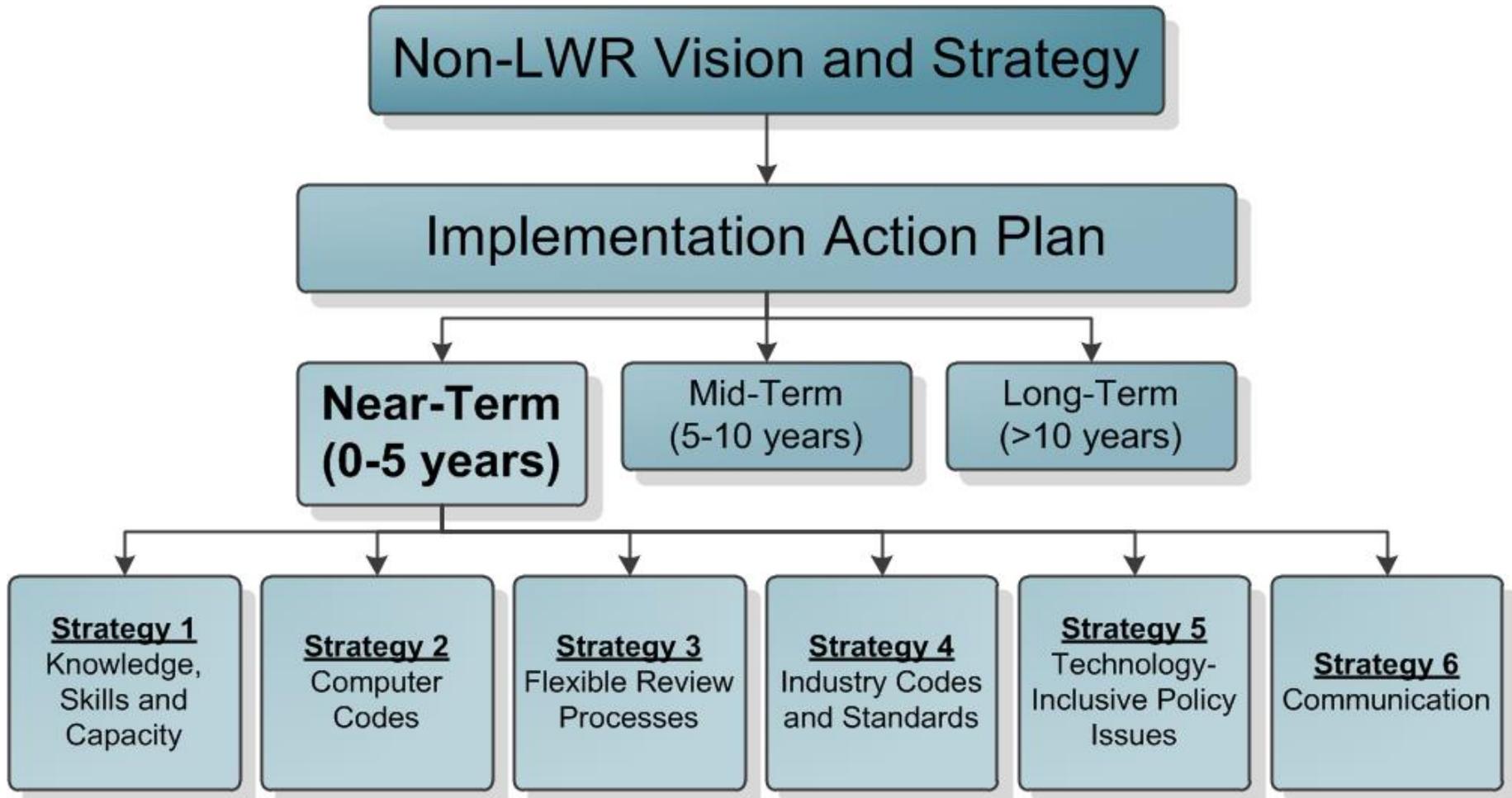
DOE Supporting Focused Retirement of Regulatory Risk



→ Pre-Application Efforts → Application Review



NRC's Near-Term Implementation Action Plans

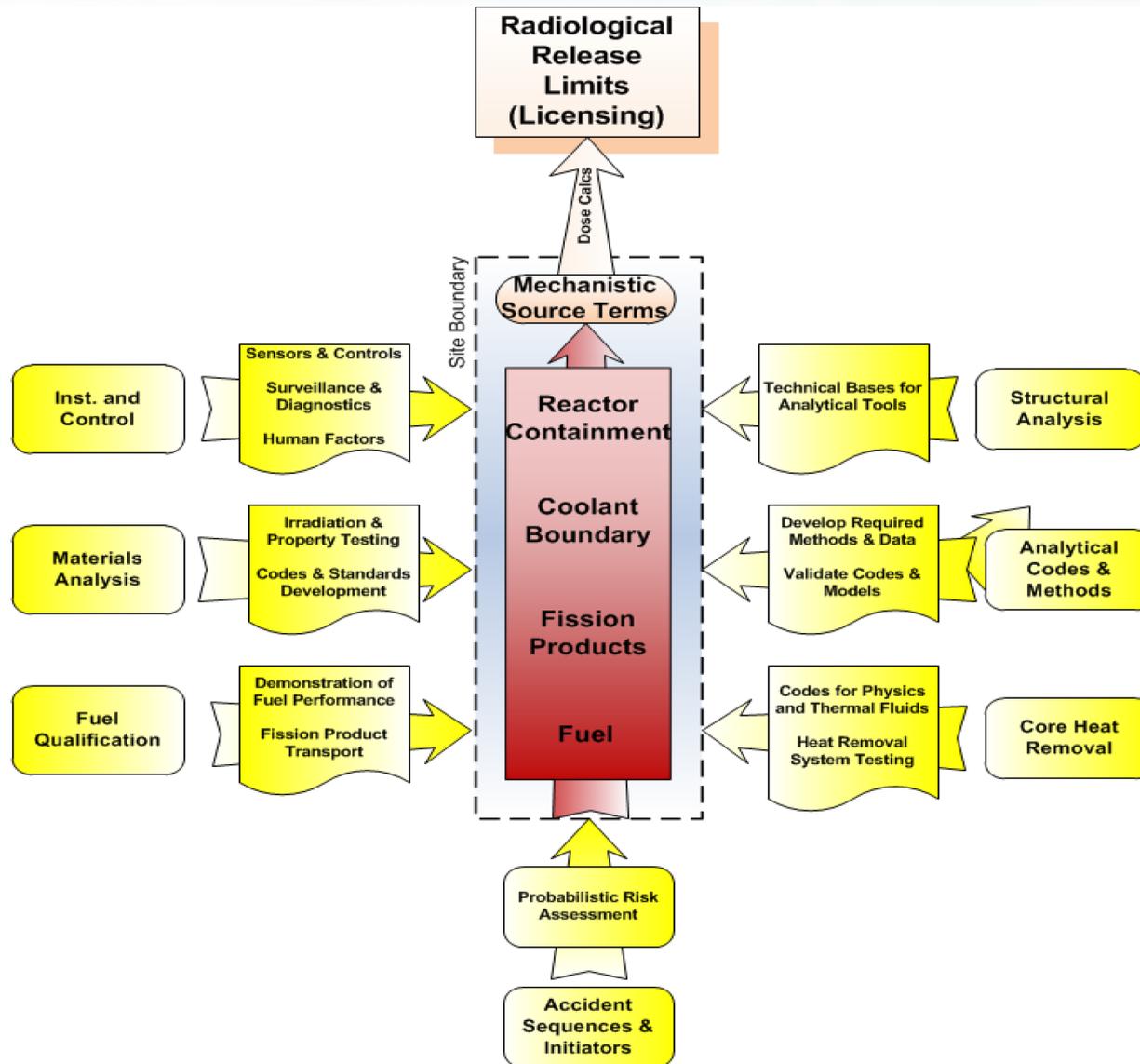


Industry Inputs to DOE

DOE seeks industry input on regulatory framework needs and deployment support priorities from a number of sources:

- Industry insights provided via DOE's GAIN Initiative to increase coordination, collaboration, and access to the national laboratory complex
 - Ex.: GAIN-EPRI Modeling and Simulation workshop (January 2017)
- DOE and national lab team participation in NEI efforts
 - NEI Advanced Reactor Working Group
 - NEI Advanced Reactor Regulatory Task Force
- Nuclear Innovation Alliance interactions
- Nuclear Infrastructure Council interactions
- EPRI and ANS interfaces
- Industry presentations at DOE-NRC Advanced Reactor Workshops
- DOE's Technical Review Panel

Key Inputs for Licensing (Typical)



Resolve Open Commission Policy Issues and Establish Licensing Technical Requirements

- DOE engaged in Commission policy issue resolution
 - Support for utility-led Licensing Technical Requirements Modernization Project
 - Participation in NEI’s Advanced Reactor Regulatory Task Force
- DOE working with industry to develop advanced reactor licensing technical requirements, for example:
 - DOE-NRC joint initiative addressing adaptation of the LWR-based General Design Criteria (10 CFR 50 App. A) for non-LWRs
 - Advanced fuel testing and mechanistic source term development
 - Passive cooling system testing
 - Advanced material testing
 - DOE/national lab team pilot study on potential adaptations of the LWR Standard Review Plan to address advanced non-LWRs (SFRs and HTGRs)

IAP Strategy 5 Feedback: Recent NRC efforts to establish regular public meetings with industry and DOE/lab team in a “working group” format are key to timely and efficient regulatory framework development

Industry-Informed Analytical Tools Development

- NRC IAP approach is to leverage industry collaboration and cooperation in establishing a set of commonly understood and accepted tools
 - Community includes NRC, DOE, vendors, utilities, and international regulatory partners
- DOE national labs have significant capabilities in this area, with additional tools under development
 - Industry, DOE/national labs, and NRC need to efficiently leverage resources and priorities, while avoiding conflicts

IAP Strategy 2 Feedback: Close coordination with industry stakeholders and DOE national laboratories is key to efficient path forward

Industry Codes and Standards

- Industry, DOE, and NRC recognize the lack of consensus standards necessary to support the efficient licensing of advanced non-LWRs
- NRC's IAP indicates that it will work with industry to identify existing gaps, then participate with the Standards Development Organizations in developing codes and standards to address them
- DOE and the national lab teams are currently performing a pilot study to determine how to most efficiently address this critical need
 - Obtain a list of all standards used in the regulatory process
 - Select a few standards for an in-depth review (SFR pilot)
 - Develop estimated timelines for completion based on pilot sample set

IAP Strategy 4 Feedback: Close coordination with industry stakeholders and DOE national laboratories is key to efficient path forward

Staged Regulatory Review Options

- DOE is supporting review options development through its industry group engagement through industry groups
 - Nuclear Innovation Alliance (NIA)
 - Nuclear Energy Institute (NEI)
 - Nuclear Infrastructure Council (NIC)
- DOE is prepared to provide further insights from its staged Critical Decision (CD) process for major projects
 - CD process is briefly summarized in Strategy 3 of NRC's IAP

IAP Strategy 3 Feedback: DOE will continue its indirect support of industry's interactions with NRC to establish staged reactor design review options

Regulatory Improvements in Advanced Reactor Designs

ACRS Meeting On Advanced Reactors Licensing

Jeffrey S. Merrifield, Chairman Advanced Reactors Task Force (USNRC 2007-2012)
David Blee, Executive Director USNIC

U.S. Nuclear Infrastructure Council

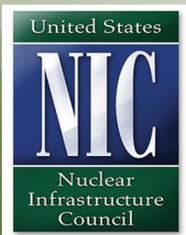
March 8, 2017

United States Nuclear Infrastructure Council



Overview

- The Nuclear Infrastructure Council (“NIC”) commends the Advisory Committee for Reactor Safety (“ACRS”) for convening this meeting
- We appreciate the opportunity to share our views on the matter of Advanced Nuclear Reactors
- NIC serves as a leading advocate for Advanced Reactor technologies representing 14 different Advanced Non-Light Water Reactor developers
- We appreciate the progress the NRC has made on Advanced Reactor licensing and support the progress made on Advanced Reactor Design Criteria
- NIC’s comments today will provide our thoughts about the NRC Advanced Reactor licensing process as well as focus on the December 2016 Vision and Strategy document and the Mid-Term and Long-Term Implementation Action Plans



Timing

- While the maturity of the Advanced Reactor designs vary among our members, NIC believes the deployment of these reactors could occur in the late 2020s
- We remain concerned that DOE remains focused on deployment of Advanced Reactors in the “early 2030s” and underestimates the speed at which these designs are moving
- While NIC appreciates and supports the degree with which the NRC and DOE are collaborating, we remain concerned about the NRC Strategic Goals being tied to the “DOE Non-LWR Vision and Goals Alignment Point” (See Mid/Long Term IAP)
- One NIC member, Terrestrial Energy has indicated that it will be seeking a design review with the NRC in 2019
- Multiple Advanced Reactor designs will seek licensing review in the next few years, and the NRC must be prepared

NRC – No Longer Regulator of First Resort

- NIC is concerned that the increasing complexity and reduced timeliness of NRC licensing actions over the last 10 years has incentivized innovators to seek alternative licensing pathways
- At least four NIC members will seek pre-licensing vendor design review by the Canadian Nuclear Safety Commission (CNNC)
- CNNC pre-licensing vendor design review allows early assessment of a design to surface potential concerns and validate potential licensability – significant benefit to developers
- NRC should adopt a process of pre-licensing review similar to CNNC

Pre-Licensing Vendor Design Review

- The CNNC process allows pre-licensing regulatory feedback on the designs in a defined period of time and under a defined cost
- The CNNC process allows the applicant to understand the licensability of the design – prior to seeking a full-blown design review
- This “licensability” determination provides additional certainty for investors who may wish to invest in these designs
- NIC has urged the NRC staff to consider emulating the CNNC process to spur Advanced Reactor innovation in the U.S.
- NIC is also supportive of additional funding - \$10 million in off-the-fee-base funding in FY2018 to support the development of NRC licensing capabilities for Advanced Reactors

Action Going Forward

- While NIC will provide specific comments on the Vision and Strategy Documents, we believe that overall, the staff is headed in the right direction – particularly on reactor design issues
- NIC has raised its concern that potentially insufficient attention to fuel issues could be problematic
- Many Advanced Reactor designs utilize higher-assay LEU, and the Office of Nuclear Materials Safety and Safeguards (“NMSS”) will need to be actively engaged with a variety of fuel cycle issues
- In reviewing the Vision and Strategy documents, NIC recognizes insufficient attention regarding the timeliness of environmental reviews
- Due to the reduced source term of many Advanced Reactor designs, there is significant potential to reduce the time and expense for environmental reviews – an important opportunity that shouldn’t be missed

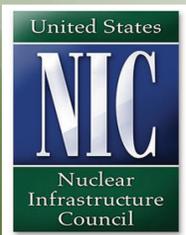
NRC Vision and Strategy December 2016

- On page 1 of the Executive Summary, the staff states that the NRC recognizes that “non-LWR vendors may wish to commence pre-application activities or submit applications for review in the near-term, in advance of DOE’s deployment goal.”
- NIC believes it is positive that the NRC is not tying itself to the DOE deployment goal
- On page 7, the document discusses the use of computer models and analytical resources and indicates that “the emphasis in the staff’s approach is to leverage, to the maximum extent practical, collaboration and cooperation...with the goal of establishing a set of tools and data that are commonly understood and accepted” NIC supports an approach that maximizes collaboration and minimizes cost and duplication
- On page 7, the staff emphasizes the need to identify policy decisions appropriate to govern the acceptability of non-LWR designs and recognizes several of these as well as some which may apply to both LWR and non-LWR designs
- NIC supports the need to readily identify these policy issues and will be working with its Advanced Reactors Technology Owners Group to provide a prioritized roadmap to the NRC staff later this month



NRC Vision and Strategy (2)

- On page 9, NIC appreciates the change in the document recognizing the role that NIC plays in representing the Advanced Reactor community
- However, also on page 9, NIC continues to be concerned regarding the language discussing the prioritization of review and the NRC identification of which “particular technologies are more likely to become ready for the agency’s regulatory reviews”
- NIC continues to believe that the role of the Agency is to establish a set of risk informed performance based licensing requirements that are to the extent practicable, technology neutral and provide a framework for various Advanced Reactor technologies to move forward
- NIC is concerned with this language because it leaves the impression that the Agency may attempt to make a qualitative judgement about various reactor vendors. NIC’s view is that as long as the applicant meets the NRC requirements and pays the applicable fees, it should have the opportunity to have its design reviewed in a timely fashion
- If the NRC needs additional resources to review these designs, the Commission should seek the appropriate funding from Congress and the Trump Administration to cover these tasks

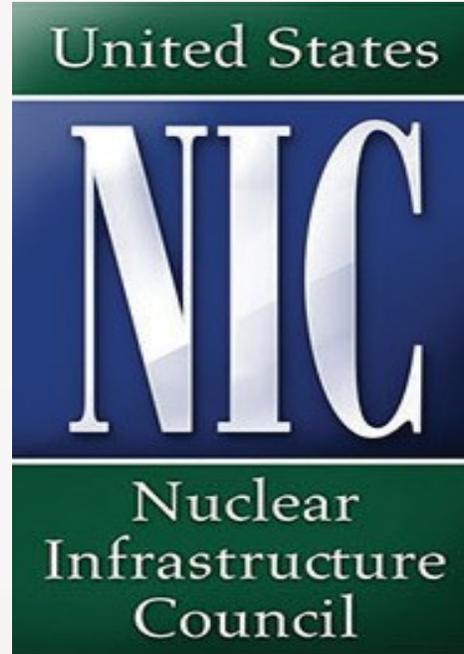


Medium and Long Term IAP

- Overall, NIC believes the Medium and Long Term IAP appear to be a logical framework. Our comments today are general in nature – specific comments will be provided later
- NIC recognizes that the NRC Commission and Staff remain steadfast in their view that the “Agency is Ready to Accept an Advanced Reactor Design for Review”
- Yet, page 3 of the IAP repeats the strategic goal of the NRC “being ready to effectively and efficiently review and regulate non-LWRs by not later than 2025”
- We are concerned about this lack of timeliness and believe the Agency must seek the resources and people to accelerate its readiness
- NIC remains concerned about funding issues associated with Advanced Reactors and continues to support fee relief – off-the-fee-base – to allow more detailed discussions between technology developers and the NRC before fees begin to be imposed
- NIC would welcome the Commission taking a more active role in supporting a change in this specific fee requirement
- We look forward to continuing to work with the Agency to identify ways to enable the deployment of Advanced Reactors through a timely, risk-informed, performance-based licensing process consistent providing adequate protection to the public

Closing

- NIC appreciates the opportunity to participate in this meeting and looks forward to our continuing involvement in these discussions
- We appreciate the progress the NRC staff have made in focusing on these issues and devising a roadmap which will enhance the ability of the Agency to review and license these innovative Advanced Reactor technologies
- As discussed, our main concerns in this process are timing -- we believe this process is moving faster than people think -- and money -- more off the fee based funding is needed to review these designs
- We appreciate the attention ACRS is giving to Advanced Reactor designs and thank you for allowing NIC to testify on these important matters
- Given the speed at which these issues are moving, we believe the ACRS input is useful for what we hope is a near term discussion with the Commission on the matter of Advanced Reactor designs



For more information visit www.usnic.org

U.S. Nuclear Infrastructure Council

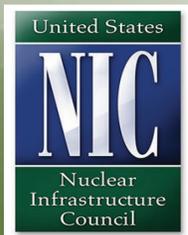
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About the USNIC

- Leading business consortium advocate for increased U.S. nuclear use and global deployment of U.S. nuclear technologies and services
- Represents 100 member companies encompassing wide representation of the nuclear energy supply chain and key movers
- Member of the Civil Nuclear Trade Advisory Committee
- Strongly supports Gen 3+ reactors, small modular reactors and advanced reactors moving in parallel paths
- Organizer of the 2017 Advanced Reactors Technical Summit IV & Technology Trailblazers Showcase which occurred on February 8-9 at Argonne National Laboratory



Industry Comments on NRC's Non-LWR Near Term Implementation Action Plans

ACRS Future Plant Design Subcommittee Meeting
March 8, 2017

Michael Tschiltz

NEI

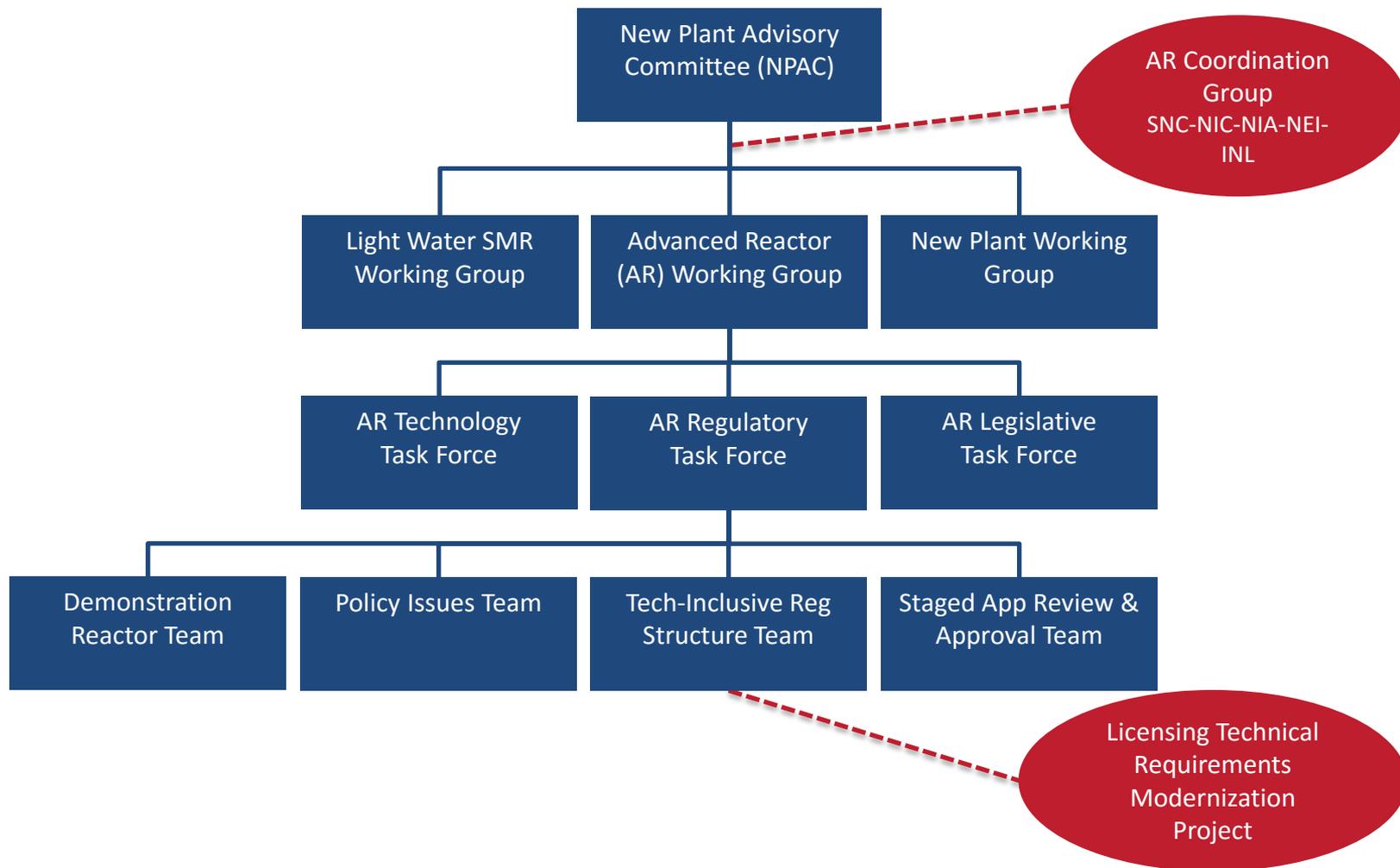
Director of New Plant, SMR and Advanced Reactors

NRC's Non-LWR Vision and Strategy

NRC's non-LWR readiness activities in the near-term Implementation Action Plan (IAP) are an important step to enhance NRC's technical and regulatory readiness for licensing advanced reactors.

- The IAP improves the transparency of NRC activities in support of licensing Advanced Non-LWR technologies.
- Need to utilize the IAP in a manner that results in a more efficient and effective licensing process.
- Need to develop detailed tasks, work plans (Phase 2). NEI/Industry is ready to work closely with the staff to support Phase 2.
 - Phase 2 needs to integrate readiness timelines from different activities to identify critical path activities and allocate resources appropriately.
 - Phase 2 should include the prioritization of efforts necessary to best utilize available resources.
 - Phase 2 needs to address how the IAP will be maintained as a “living plan.”

NEI/Industry Structure for Advanced Non-LWR Activities



Important near-term activities

- **Align design, research and regulatory processes**
 - Identify technology-inclusive policy issues and/or any gaps in the existing regulatory framework early in the process.
 - Place a high priority on the development of technology or design-specific licensing project plans that identify information needed for to support staff findings.
 - Align activity timelines/resources with industry needs.

Comments on Strategy 3

- **Strategy No. 3 – Develop guidance for a flexible non-LWR regulatory review within the bounds of existing regulations...**
 - Contributing Activity 3.1 - Develop Decisionmaking Criteria
 - It is important to identify aspects of non-LWR design where it is possible to satisfy existing acceptance criteria for reaching a safety, security or environmental finding.
 - If new acceptance criteria are identified efforts should focus on establishing technology neutral criteria to address the wide range of non-LWR designs.
 - The Advanced Reactor Policy Statement includes as a goal for *“future plants that security be better incorporated into the plant design.”* The IAP would benefit from NRC clarifying it’s intent to address this goal in the near-term IAPs in connection with the Security Design considerations.

Comments on Strategy 3

- **Strategy No. 3 – Develop guidance for a flexible non-LWR regulatory review within the bounds of existing regulations...**
 - Contributing Activity 3.3 – Identify Gaps in Regulatory Framework
 - Near-term fuel cycle activities should be included that address design and qualification of non-LWR fuel and related issues (e.g., uranium enrichments above 5%, material control & accounting, security and transportation).
 - Contributing Activity 3.4 – Develop regulatory review roadmap
 - expected level of design detail required as part of an accepted design certification application has expanded over time.
 - advanced reactor stakeholders would benefit from guidance that outlines the acceptable level of detail needed at each point of a staged licensing approach.
 - Detailed comments are included in an NEI letter to the staff dated 3/6/17.

Conclusions

- Industry anxious to support meaningful progress.
- Need to continue to use the IAP to identify, document and allocate resources to areas where additional work is needed.
- Need to enhance the regulatory framework through utilizing the efforts of the utility-led Licensing Modernization Project.
- Identify where focused efforts from outside NRC are needed during implementation.

Removing Barriers for Advanced Reactor Deployment Through Modernization of Regulatory Framework

Amir Afzali

Licensing and Policy Director – Next Generation Reactors

Southern Company Services

ACRS Future Plant Designs Subcommittee

March 8, 2017



Southern Company

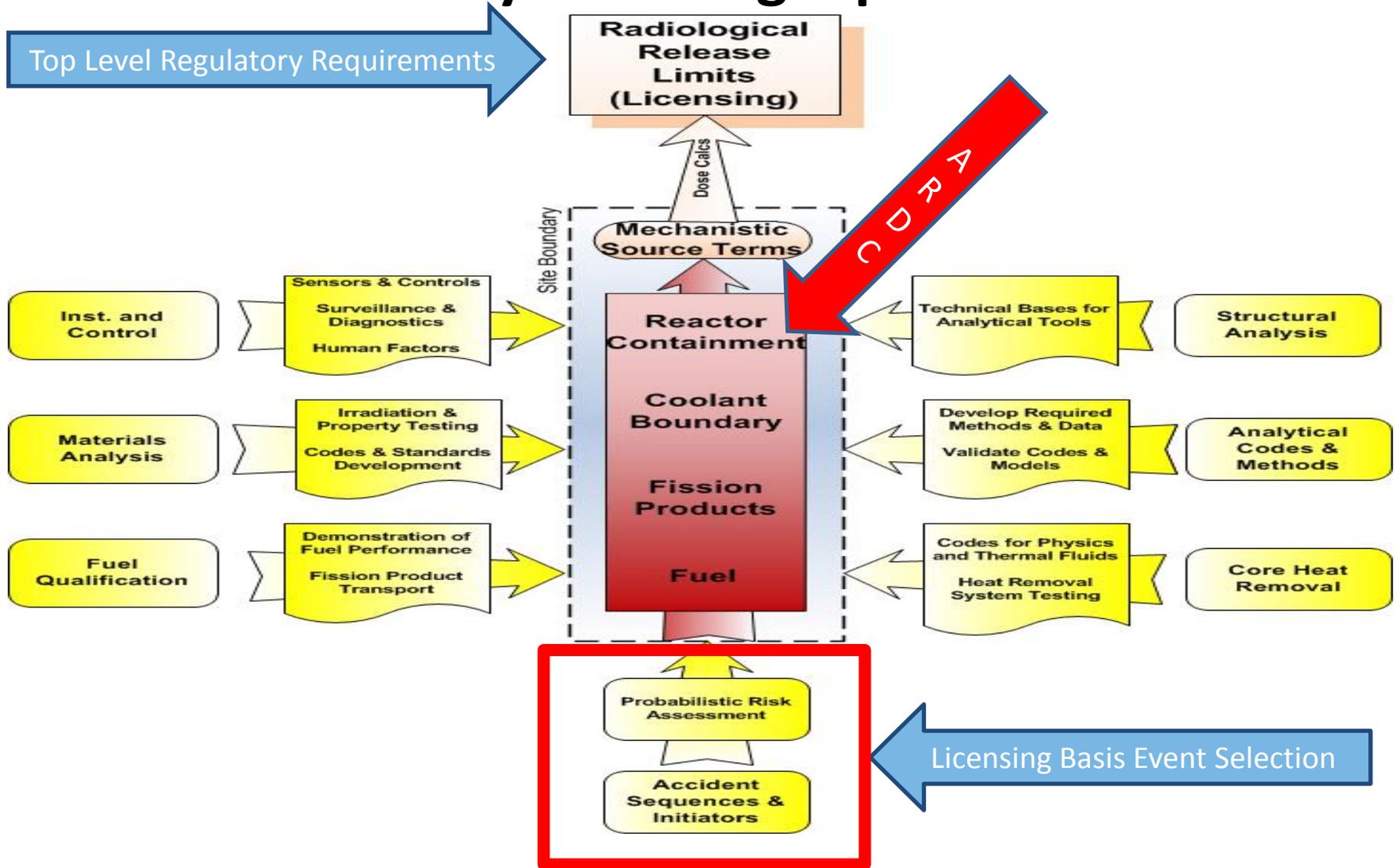
Observations and Recommendations

- Observations:
 - IAPs provide a comprehensive list of needed activities
 - It is not clear that the near term actions reduce licensing risk adequately in a timely manner.
 - The need for a Risk-Informed, Performance-Based (RIPB) licensing structure for advanced non-LWR reactors was identified many years ago (1990s) and has been reemphasized recently (e.g., SECY- 15-0168) yet the NRC projected time lines for developing RIPB are well into the future (2026+)
- Recommendations:
 - Strategies 3 and 5 should be given the highest priority, particularly the Licensing Basis Event (LBE) Selection Process.
 - Staff engagement with the industry to develop a systematic Technology Inclusive Risk-Informed, Performance-Based (TI-RIPB) LBE selection process should be supported.
 - Build on over 20 years of previous work by industry, NEI, and NRC such as NGNP, NUREG 1860, ANS standard ANS 53.1 (“Nuclear Safety Criteria for the Design of Modular Helium Cooled Reactor Plants”)



Southern Company

Key Licensing Inputs



Addressing LBE selection should be top priority because it is the basis for all other licensing inputs

The Key Consideration

- SRP Chapter 15.0 statement:
*“If the risk of an event is defined as the product of the event’s frequency of occurrence and its consequences, then the design of the plant should be such that all the AOOs and postulated accidents produce about the same level of risk (i.e., the risk is approximately constant across the spectrum of AOOs and postulated accidents). This is reflected in the **general design criteria (GDC)**, which generally prohibit relatively frequent events (AOOs) from resulting in serious consequences, but allow the relatively rare events (postulated accidents) to produce more severe consequences.”*
- Conclusion: To meet this requirement LBE Selection has to be RIPB
- Options: Ad hoc RIPB Approach vs. Systematic RIPB Process

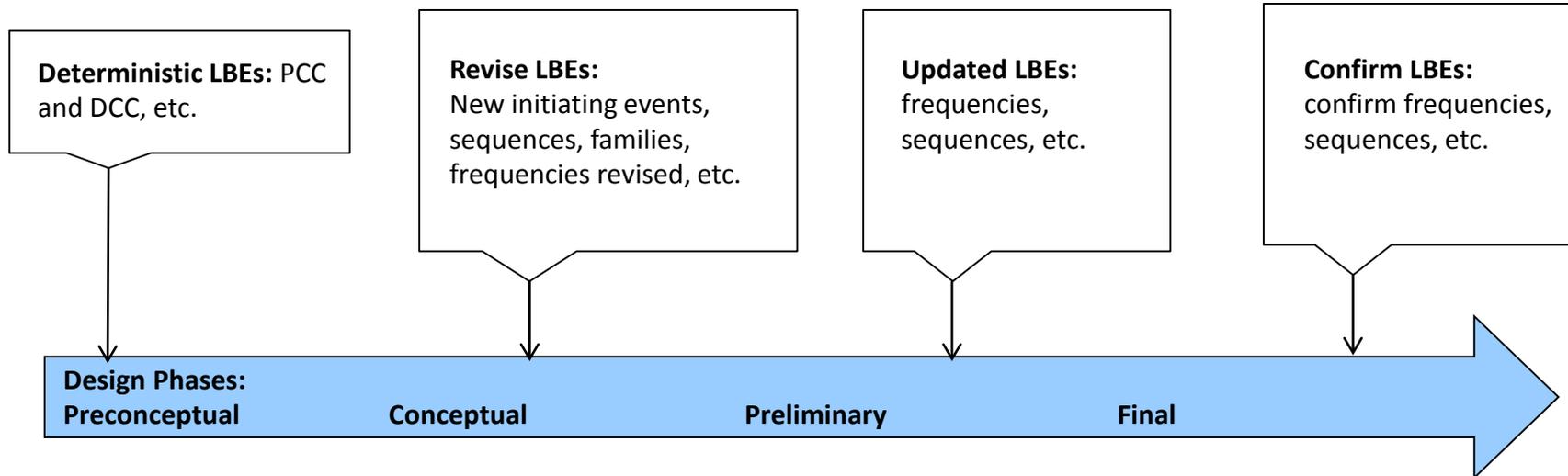


Comparison of Options for the LBE Selection Process

LBE Selection Options	Process	Tools used for identification and consequence analysis	Frequency estimate	Uncertainty Analysis	Technical Adequacy
Ad Hoc RIPB	Events are identified and analyzed based on Engineering Judgment; revised to reflect service experience	Ad hoc approach similar to FMEA; reproducible process to select LBEs for new reactors does not exist	Qualitative based engineering judgment	Not explicitly identified, addressed primarily using conservative assumptions based on engineering judgment.	No consensus standards as the LBE procedures do not exist; rests solely on regulatory review judgments.
Systematic RIPB	Incorporates approaches used in Ad hoc method in a systematic, reproducible PRA procedure.	FMEA, HAZOPs, MLD, PERT, PRA methods for systematic search for initiating events and defining accident sequences	Quantitative based on applicable service experience, engineering judgment and PRA data analysis methods	Explicitly identified and listed via structured PRA process,. Systematically analyzed and accounted for; defense-in-depth approach to capture uncertainties not well represented in PRA	ASME non-LWR PRA Standards, EPRI research, experience with HTGR and LMFR PRAs

Design Development Timeline

LBE evolution by design phase:



Inputs to design phases:

- Initial design concept
- Prior operating experience
- Expert insights
- Basic design
- Initial analyses (FMEA, scoping PRA, etc.)
- Prior operating experience
- Design reqmts.
- Expert reviews
- Updated design
- Detailed FMEAs, etc.
- Initial PRA results
- Expert reviews
- Regulator interaction
- Mature design
- Detailed FMEAs, etc.
- Complete PRA results
- Expert reviews
- Regulator feedback

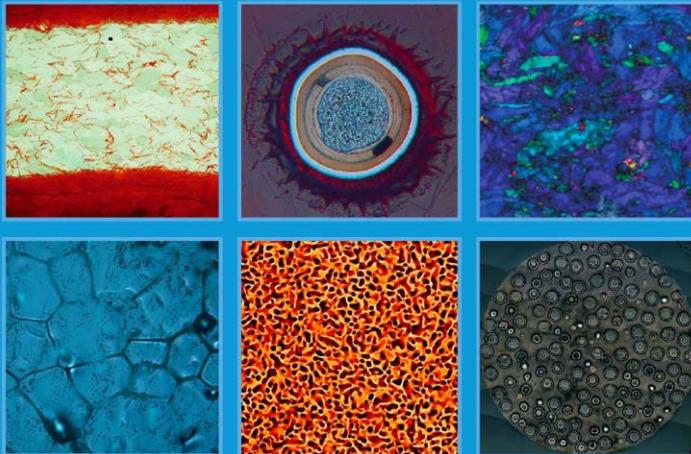


Comments on NRC Non-LWR Vision and Strategy Implementation Action Plans and Staged Licensing

Advisory Committee on Reactor Safeguards
Future Plant Designs Subcommittee

Peter Hastings
08 Mar 2017

Enabling Nuclear Innovation
**Strategies for Advanced
Reactor Licensing**



A Report by the
Nuclear Innovation Alliance

Download the Report at:
www.nuclearinnovationalliance.org

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NRC Non-LWR Vision and Strategy

- Excellent foundation for non-LWR mission readiness
- NIA supports overall direction and most details
- Staged regulatory review should be further developed

Near-Term IAPs

- NIA strongly supports each strategy
 - Acquisition/development of skills within NRC
 - Acquisition/development of computer codes
 - Development of flexible guidance
 - Support for industry codes and standards
 - Resolution of policy issues
 - Appropriate communication strategies
- Strategy 3 guidance should complete within two years
 - Collaborate with industry on detailed contributing activities
 - Accelerate efforts to support near-term guidance

Near-Term IAPs (continued)

- Strategy 5 (policy issues) prioritized for near-term action
 - All work planned for FY2017
 - Coordination with industry
- Strategy 2 (computer codes) should be expanded
 - Enhance modeling and simulation for fuel qualification process
 - Should consider existing fuel information, e.g., within DOE complex
 - May require enhanced use of demonstration/prototype provisions

Staged Licensing Reviews

- Staged regulatory review should be further developed
- Conceptual Design Assessment
 - Can provide more structure and certainty in pre-application interactions
 - Development in FY2017
- Standard Design Approval
 - Developing guidelines to define “major portion”
 - Coordination with NRC staff pending shortly
- Licensing Program Plan (Regulatory Engagement Plan)
 - Important communication tool
 - Establish applicant-staff agreement on path forward
 - Pre-application options
 - Application type
 - Project management expectations

Conclusions

- NIA applauds and supports NRC efforts
- NIA eager to work with staff
 - Continued development of strategic and near-term planning
 - Various aspects of staged licensing
- Mid- and long-term IAPs under review