

UNITED STATES OF AMERICA
U.S. NUCLEAR REGULATORY COMMISSION

BRIEFING ON ECONOMIC CONSEQUENCES

SEPTEMBER 11, 2012

9:00 A.M.

TRANSCRIPT OF PROCEEDINGS

Public Meeting

Before the U.S. Nuclear Regulatory Commission:

Allison M. Macfarlane, Chairman

Kristine L. Svinicki, Commissioner

George Apostolakis, Commissioner

William D. Magwood, IV, Commissioner

William C. Ostendorff, Commissioner

APPEARANCES

External Panel:

Ralph Andersen
Senior Director, Radiation Safety & Environmental
Protection, and Chief Health Physicist, Nuclear Energy
Institute (NEI)

Ed Lyman
Senior Staff Scientist, Union of Concerned Scientists (UCS)

Michael Cass
Vice President and General Counsel
American Nuclear Insurers (ANI)

Stephen Musolino
Health Physics Society

Al McGartland
Director, National Center for Environmental Economics,
Environmental Protection Agency (EPA)

NRC Staff:

Bill Borchardt
Executive Director for Operations

Lisa London
Attorney, Office of the General Counsel

Deborah Jackson
Deputy Director, Division of Intergovernmental Liaison and
Rulemaking

Timothy McGinty
Director, Division of Policy and Rulemaking

Scott Flanders
Director, Division of Site Safety and Environmental Analysis

Richard Correia
Director, Division of Risk Analysis

P R O C E E D I N G S

1
2 CHAIRMAN MACFARLANE: Good morning. I'm Allison
3 Macfarlane, Chairman of the Nuclear Regulatory Commission. I'd like to
4 welcome the public, NGOs, industry, staff, media, and others who are here today
5 for the meeting. Over my first two months I've continued to be impressed by the
6 NRC staff's professionalism and their deep commitment to security and safety.
7 Today's meeting is the next step in a comprehensive look at how the NRC
8 assesses the economic consequences of potential radioactive releases from
9 nuclear power plants. While the NRC has long incorporated aspects, some of
10 the aspects of economic consequences into its regulatory decisions, the
11 Fukushima disaster has cast a brighter light on the true aspects of post-accident
12 issues such as land contamination. In addition, I'd like to note that today's
13 meeting falls on the 11th anniversary of the tragic attacks of September 11th,
14 2001, and it was a day much like today when I was in Boston, perfectly sparkling
15 clear. Those attacks have certainly reshaped the way that the NRC looks at
16 security, and they even are related to today's topic of offsite economic
17 consequences. After all, the concept of portable equipment was initially
18 implemented in the U.S. following the September 11th attacks, and that
19 equipment could be helpful in combating the challenges of an accident like
20 Fukushima.

21 We have a full session today. First, we'll hear from a panel of
22 external groups, including the nuclear industry, the Union of Concerned
23 Scientists, the American Nuclear Insurers, the Health Physics Society, and one
24 of our federal partners, the Environmental Protection Agency. I'd also like to
25 acknowledge that Glenn Paulson, the special assistant --

1 GLENN PAULSON: Science.

2 CHAIRMAN MACFARLANE: Science assistant --

3 GLENN PAULSON: Advisor.

4 CHAIRMAN MACFARLANE: -- advisor to the administrator,
5 Secretary Lisa Jackson, who's also here. After our external panel we'll take a
6 short break, before we hear from the NRC staff, our internal panel, but let me --
7 before we go any further, let me ask whether any of my Commission colleagues
8 would like to make any remarks before we begin.

9 CHAIRMAN MACFARLANE: No? No? Okay.

10 COMMISSIONER SVINICKI: It's a long program:

11 CHAIRMAN MACFARLANE: Yes, it is a long program. Yeah, so
12 let's march through it. Okay, so without further ado then, we will begin with
13 Ralph Anderson, who is the Senior Director of Radiation Safety and
14 Environmental Protection, and Chief Health Physicist of the Nuclear Energy
15 Institute. Mr. Andersen, please.

16 RALPH ANDERSEN: Thank you, Chairman Macfarlane. Good
17 morning and thank you for the opportunity to provide our nuclear industry's
18 perspective on the issue of consideration of economic consequences within the
19 NRC's regulatory framework. I will focus my remarks on the three options that
20 were proposed by NRC staff in addressing this issue, and will try to provide some
21 context for our perspective. Could I have the first slide, please?

22 The consequences of the accident at Fukushima Dai-ichi are
23 having a profound impact on the people in the country of Japan, in particular the
24 deposition of radioactivity from the accident poses great challenges to eventual
25 recovery from the accident, both onsite and offsite. By any measure this

1 condition is unacceptable, which is why we are all actively and urgently working
2 to enhance our capability to prevent fuel damage in our reactors as a part of the
3 NRC's Tier 1 actions. Next slide, please.

4 As we continue to learn nuclear lessons from Fukushima, our
5 industry continues to take actions to further enhance the layer upon layer of
6 protective measures to prevent fuel damage and ensure containment of
7 radionuclides at nuclear power plants. These also serve to minimize the
8 potential for land contamination and the possible related economic
9 consequences. The details of these actions have been discussed at length at
10 Commission briefings heretofore, and will continue to be a topic of discussion in
11 the future. So, I will move directly to our views on the SECY paper that is the
12 subject of this briefing. Next slide, please.

13 In the SECY paper, the NRC staff concluded that the existing
14 regulatory framework, quote, "is sound and affords sufficient flexibility to account
15 for the economic consequences associated with unintended releases and
16 subsequent land contamination," end quote. The same conclusion was reached
17 by the agency's Near-Term Task Force, convened by the NRC shortly after the
18 accident at Fukushima to evaluate lessons learned and related actions. The
19 industry agrees with this conclusion based on our extensive experience in
20 ensuring safety as part of licensing activities related to license renewal, new
21 reactor design certification, regulatory analysis of new proposed regulations, and
22 consideration of possible backfits. A review of some of the rulemakings that
23 involve consideration of economic consequences indicates that although the
24 analyses have been mostly qualitative, the NRC has not been hindered in any
25 way in adopting new requirements, by not having performed a sophisticated,

1 quantitative analysis of economic consequence. Rather, the NRC has been able
2 to justify new requirements, relying in part on a qualitative evaluation of offsite
3 property damage costs. Among these are enhancements to emergency
4 preparedness regulations and power reactor security requirements. In
5 connection with the severe accident management alternative reviews, or SAMA
6 reviews, as part of environmental reviews for license renewal, the level three
7 PRA analyses that have been done are quantitative and explicit in regard to
8 offsite consequences, including economic consequences. Next slide, please.

9 The NRC staff is already pursuing enhancements to the regulatory
10 framework for considering economic consequences. Among them, the agency is
11 evaluating and updating the monetary value per unit of radiation exposure, the
12 costs of replacement power, and the model and computer code for analyzing
13 economic consequences. This is described as Option One in the SECY paper.
14 Option One, therefore, is an action alternative, not a no-action alternative as
15 might be inferred from the characterization of Option One as a status quo
16 alternative. Based on our understanding of the staff initiatives within Option One,
17 the industry is supportive of this option. However, we do encourage a higher
18 level of engagement with external stakeholders, to help inform and improve the
19 initiatives. Option Two in the SECY paper calls for building upon Option One,
20 with an increased allocation of resources to enhance integration consistency
21 within the regulatory framework, and potential additional initiatives that are not
22 well defined. Such an escalation of effort may make sense, but we suggest that
23 more detail is needed and should be sought from the staff. Lacking such further
24 clarification and justification, the industry is not able to express our support for
25 Option Two. On its face, Option Three appears to describe a wholesale

1 reconsideration of the existing sound and effective regulatory framework,
2 entailing a substantial commitment of resources that seems neither justified nor
3 necessary at this point. We suggest the consideration of Option Three should
4 more appropriately be included as a part of setting the scope for a holistic review
5 of NRC's regulatory framework for ensuring nuclear safety that is envisioned
6 within recommendation one of the Near-Term Task Force report. Doing so will
7 also help better inform consideration of Option Three from the coming regulatory
8 reviews and decisions that will be made in regard to filtration strategies,
9 hydrogen control and mitigation, and further enhancements to emergency
10 preparedness capabilities, just to name a few. We believe that addressing
11 Option Three in this manner will help to optimize the net benefit to safety arising
12 from any changes that might ultimately be considered. Next slide, please.

13 We agree with the NRC staff conclusion that the current regulatory
14 framework supports actions to prevent and mitigate economic consequences.
15 We believe this conclusion is being validated in the present, by the recent
16 decisions of the NRC in its response to the Fukushima accident. The U.S.
17 priority is appropriately placed on actions to prevent core damage in the
18 immediate term. We continue to believe that actions aimed at reducing the core
19 damage frequency, which is inclusive of large, early release fractions, and late
20 release fractions is the most effective approach to avoiding economic
21 consequences onsite or offsite. We are also fully committed to learning new
22 lessons in accident mitigation and response, and effectively integrating those
23 lessons into the enhanced level of nuclear safety that we are now creating. We
24 have been and always will be committed to safety as our number one priority, but
25 we also want to continue to exercise care in how we allocate our priorities and

1 resources, to assure that we meet that commitment. Thank you very much for
2 your time and attention, and I look forward to responding to your questions.

3 CHAIRMAN MACFARLANE: Thank you very much for that
4 presentation. Next is Ed Lyman, Dr. Ed. Lyman, senior staff scientist with the
5 Union of Concerned Scientists.

6 ED LYMAN: Thank you, Chairman MacFarlane, the other
7 Commissioners. On behalf of UCS, I appreciate the opportunity to discuss yet
8 another very important issue. May I have the first slide, please?

9 So, you may not be surprised by this, but we have a slightly
10 different recommendation than NEI. We think that Option Three, an aggressive
11 Option Three should be considered, together with examining how Option Two
12 might be also effective in taking into account the economic consequences in a
13 more comprehensive and useful way than they currently are, and we think that
14 simply addressing these through voluntary regulatory analysis guidelines, which
15 have led to a wide, and I would say inconsistent application of accounting for this
16 issue is problematic, and that new requirements may be the way to actually
17 introduce clarity and consistency. Can I have the next slide, please?

18 So, the overarching point I'd like to make is I think that the
19 dichotomy that's been set up between NRC's public health and safety mission
20 and the economic consequences of land contamination is false to some extent.
21 In fact, the reason why there are economic consequences of land contamination
22 is because of extended actions to enforce or enhance public health and safety in
23 the long term through interdiction of land and agricultural products, et cetera, so
24 that they really are two sides of the same coin, and so I think it's fully consistent
25 with the current mandate in the Atomic Energy Act that you take this into

1 account. May I have the next slide, please?

2 I tried to look at this issue analytically, so I wanted to answer the
3 question, or to see if the staff paper actually answers the question, does the
4 current regulatory framework adequately address events that could cause
5 unacceptable land contamination, and I appreciate Mr. Andersen's statement that
6 by any measure, what happened in Fukushima was unacceptable, yet would not
7 result in significant emergency phase exposures and health effects, which are
8 the metrics which are currently the main basis for NRC's regulatory decisions.
9 May I have the next slide, please.

10 So, some of the examples I think need to be looked at in detail that
11 weren't, would be the use of the large, early release frequency, or LERF, rather
12 than a large release frequency over LRF, in risk informed regulation for operating
13 reactors, the issue of the safety analysis of spent fuel storage, the safety analysis
14 for non-power reactors, and also for fuel cycle facilities like the MOX plant, or
15 reprocessing plant that could have the potential for a significant land
16 contamination. Next slide, please.

17 So, on the issue of LERF versus LLRF, and here's another
18 acronym that's Large Late Release Frequency, the control of the Large Early
19 Release Frequency is one of the subsidiary objectives, the quantitative health
20 objectives. That's what's used in Regulatory Guide 1.174, as one of the metrics
21 for assessing changes through the licensing basis, but LERF alone does not fully
22 address the risk of land contamination. Can I have the next slide, please?

23 So, just by way of definition, these come from the draft NUREG-
24 2122, which are the -- it's a glossary of risk informed terms. LERF is really the
25 rapid release of airborne fission products before effective implementation of

1 offsite emergency response and protective actions, such is that there is a
2 potential for early health effects. Now, according to this definition, no large early
3 release arguably occurred at Fukushima. There were no discernible, early health
4 effects period, and even with regard to large exposures of the offsite public within
5 the evacuation zone, they were evacuated pretty much effectively before the first
6 large offsite release occurred. Now, you may, if you look further out in time after
7 two or three days, that assessment is different, but that affected the people well
8 beyond what's considered the conventional evacuation zone. Next slide, please.

9 So, the Large Late Release Frequency is the frequency of late
10 releases that have sufficient magnitudes to cause severe health effects but which
11 occur in a timeframe that allow effective emergency response and protective
12 actions. So in other words, this is after people have evacuated or sheltered,
13 within the evacuation zone, if there's a late release of fission products. So by this
14 definition, a large late release arguably did occur at Fukushima, and I say
15 arguably because the staff's previous analyses of late containment failure
16 generally find that those are what they consider very low and acceptable
17 releases. So, I think that needs to be reevaluated. Next slide, please. So, the
18 LRF just for completion, is the Large Release Frequency, and that's the sum of
19 the early and late release frequencies. So, the next slide.

20 So, I look for examples where there were regulatory decisions that
21 may have been different, if you took late containment failure, treated it more
22 seriously than it was done. So, I looked at combustible gas control, which was
23 logical. In this case, the threat to combustible gasses can occur both early and
24 late in the core damage accident. Early is typically on the order of hours to one
25 day, and that might be from a hydrogen explosion of the containment and vessel

1 breach, and late is on the order of 24 hours to several days, and that could result
2 from over pressure failure explosion from gasses generated by core concrete
3 interactions, or radiolysis. Next slide, please.

4 So, when in 2000, the NRC staff recommended risk informing 10
5 CFR 50.44, they had actually proposed that you should demonstrate that you
6 don't get an unacceptably large LERF or LLRF as a result of combustible gasses.
7 Next slide, please.

8 What the Commission ultimately chose, only to address really less
9 than 24 hour combustible gas control issues through regulation, and left longer
10 term control to industry, versus the SAMGs, and as a result the hydrogen
11 recombiner requirement was eliminated, even though it was acknowledged that
12 they might be useful, especially for Mark I and Mark II BWRs after 24 hours.
13 There was some very crude regulatory analysis, but it was not, in my judgment,
14 very credible. The result was the NRC left recombiners to the SAMGs, and as
15 we know, not very happy result as some of them did not maintain them, even
16 though they were still part of their SAMGs. Next slide, please.

17 So, if there had been an LRF safety goal that is controlling both
18 early and late containment failure frequency, we may not have allowed, let's say,
19 the lapse in recombiner requirements, and we might not have to play catch up
20 now in making decisions such as the need for filtered vents which might be
21 needed after core damage, which could occur fairly late in the accident, but
22 would be useful in controlling land contamination. So, you would think that LRF
23 might be a better metric to incorporate, but the staff has inexplicably proposed
24 that even for new reactors, which are evaluated in terms of LRF and not LERF,
25 but they've suggested -- recommended eliminating LERF -- LRF completely,

1 switching to LERF even for new reactors, which doesn't seem to make sense in
2 this context. And I note that the final Commission word on that isn't out yet, and I
3 recommend that you reject that recommendation. Next slide, please.

4 So with regard to spent fuel safety and security, here's an issue
5 where I would have liked to have seen quantitative analysis is if you limit the
6 individual dose, as most of the safety requirements do, is that adequate for
7 controlling land contamination? In other words, do you not get an unacceptable
8 Fukushima scale release? So, if you look in ISFSI, the requirement, which is
9 based simply on the TEDE at the controlled area boundary, the question is what
10 kind of land contamination patterns might result from that kind of accident and
11 still give you that limit on the TEDE. Are you going to exceed EPA protective
12 action guides, and how far out? I would also note even looking at the siting
13 requirements for design basis accidents in Part 100, that it's not clear at any site
14 boundary dose rate exceeded the limit that would have made it an unacceptable
15 design basis accident at Fukushima. You need to look at that, and I'm running
16 out of time. Next slide, please.

17 So other facilities, the same logic applies. Non-power reactors are
18 again, based on maximum hypothetical accidents. Don't look at the potential for
19 a large seasoned release in a university or urban area, fuel cycle facility is the
20 same. Next slide, please. Now, as far as these MACCS, I appreciate the staff is
21 reevaluating the MACCS economic model and considering others. I don't have
22 time to go into it now, but I would commend the PilgrimWatch comments that
23 were submitted, that really highlights some of the problems with the way MACCS
24 is implemented in backfit analyses and regulatory analyses. For instance, when
25 you average in MACCS, are you fully taking into account unfavorable

1 circumstances like happened at Fukushima, where the wind shifted at the same
2 time that there was the largest release from the site. That was a very
3 unfavorable combination, but when you average, are you washing out that kind of
4 effect? Next slide, please.

5 So in conclusion, we believe that land contamination and its
6 economic and human consequences are very important considerations that are
7 not currently taken into account in NRC's regulatory framework in a consistent
8 and adequate way, and so we believe that more formal changes are required,
9 and that should be supported by further analysis under Option Three. Thank
10 you.

11 CHAIRMAN MACFARLANE: Thank you. Okay. Next we have
12 Michael Cass, who is Vice President and General Counsel of the American
13 Nuclear Insurers. Mr. Cass.

14 MICHAEL CASS: Good morning, and thank you, and on behalf of
15 American Nuclear Insurers, and our member companies, I would like to express
16 our appreciation for the opportunity to present an overview of the financial
17 protection program for the nuclear materials, and production, and utilization
18 facilities. Next slide, please.

19 Briefly, as a bit of background, ANI was established in 1956,
20 following the enactment of the Atomic Energy Act. We are an unincorporated,
21 voluntary, joint underwriting association. Joint underwriting is by multiple
22 insurance carriers, while typically prohibited by antitrust considerations, is
23 permitted under state law, but only for specific lines of insurance. Following the
24 enactment of the Atomic Energy Act and to facilitate the financial protection of
25 the nuclear industry, we sought and were approved to operate as a joint

1 underwriter, and offer our insurance products in all jurisdictions of the United
2 States. The ANI is commonly referred to as an insurance pool, as our member
3 companies effectively pool their insurance capacity as a means to establish
4 insurance coverage limits greater than what an individual company could or
5 would be willing to offer. Today, we have 20 member companies that comprise
6 our association, and these companies offer liability and property insurance, and
7 reinsurance to the global nuclear industry. Next slide, please.

8 As I mentioned earlier, ANI was established as a joint underwriting
9 association to exclusively provide third party nuclear liability insurance protection
10 for the United States commercial nuclear industry. The liability insurance we
11 offer is one of the means of satisfying the financial protection requirements of the
12 Price-Anderson Act. The insurance we provide fills the gap created by what is
13 referred to in the insurance industry as the broad form nuclear exclusion.
14 Through the pooling arrangement and with the state approved nuclear exclusions
15 in their personal and commercial insurance products, our member companies are
16 able to offer their maximum net insurance capacity dedicated to the nuclear risk,
17 without concerns of accumulation of exposure that could occur if multiple
18 insurance policies were triggered by a nuclear incident. Next slide, please.

19 ANI insures all 104 operating nuclear power reactors in this
20 country, with a third party liability insurance policy that satisfies the primary layer
21 of financial protection required under the Price-Anderson Act. We also insure
22 various shut-down and decommissioned power plants as well. In addition, we
23 also provide third party liability insurance protection to all the major fuel
24 fabrication facilities and the enrichment facility operated by LES in New Mexico.
25 We also ensure numerous suppliers to the commercial nuclear power industry,

1 and offer insurance products that meet the risk management needs of their
2 businesses.

3 In addition to the primary financial protection satisfied through our
4 insurance policies, ANI administers the secondary financial protection program.
5 This insurance program is established by the Price-Anderson Act and applies to
6 all power reactors having a rated electrical capacity of 100 megawatts or more.
7 This program operates under a master insurance policy that is held by the NRC
8 staff. All operators of facilities that are required to participate in this program are
9 issued a certificate of insurance granting them coverage under the master policy.
10 Next slide, please.

11 The ANI insurance policy that we provide to all power reactors --
12 actually all reactor operators as well as others insured, provides indemnity for
13 defense of claims for bodily injury, property damage, and environmental cleanup
14 costs, as those terms are defined in the policy. I'll elaborate on the property
15 damage and environmental cleanup costs in a minute, but first I just want to
16 mention that the policy also provides for reimbursement to government agencies
17 for their additional expenses that they would be expected to incur, in responding
18 to an evacuation, in the event of a nuclear emergency. And just for succinctness,
19 I must state that all coverages require a triggering event stemming from the
20 nuclear energy hazard, which is a defined policy term. It is the radioactive, toxic,
21 explosive, or other hazardous properties of nuclear material, if the material is at
22 the facility or has been discharged, or dispersed without the intent to relinquish
23 possession or custody. Nuclear material is broad term. It refers to source,
24 special, or byproduct material. Property damage is defined in the policy as well.
25 It means the physical injury to, or destruction, or radioactive contamination of

1 property, and the loss of use of property so injured, destroyed, or contaminated.
2 The term also includes loss of use of property while evacuated, or withdrawn
3 from use because of the possibility of contamination, or because of imminent
4 danger of contamination. Damage to the insured operator's property on the
5 reactor plant site is not covered under the terms of our policy. That's covered
6 under a different policy that they carry with a different carrier.

7 Covered environmental cleanup costs are also defined by the
8 policy. These costs would include loss, costs, or expense arising out of a
9 governmental decree, order, or directive requiring a person to pay for,
10 monitoring, testing for, cleaning up, neutralizing, or containing environmental
11 damage. Environmental damage is defined as contamination by nuclear
12 material. Now, these environmental cleanup costs are indemnified when they
13 result from an extraordinary nuclear occurrence, or an ENO, which is a defined
14 term under the Act, and it's further defined in your regulations at 10 CFR, Section
15 140.83.

16 All these coverages are outlined in the facility form policy that
17 reactor licensees procure from ANI. Coverage grants continue to apply, inform
18 the basis for coverage under the secondary financial protection program master
19 insurance policy. We refer to that SFP policy as a following form policy in that its
20 grants of coverage and other terms and conditions follow those of the underlying
21 primary insurance policy. So, there's a seamless transition between the
22 underlying primary policy and then the secondary financial protection program.
23 Next slide, please.

24 I would just at this point like to make a couple of points regarding
25 the Price-Anderson Act and the key structural elements of the Act, which are the

1 basis for the nuclear industry's financial protection program. I referred to the
2 terms primary and secondary layers of financial protection. These are two layers
3 of financial protection established by the Price-Anderson Act that all power
4 reactor licensees must provide or subscribe to. The primary layer consists of an
5 amount of financial protection equivalent to the maximum amount of financial
6 protection available at reasonable cost, and on reasonable terms from private
7 sources. To date, the private sources offering this protection has been the
8 commercial property and casualty insurance market.

9 The secondary layer that all power reactor licensees must obtain
10 consists of the SFP or secondary financial protection program. This program is a
11 private liability insurance program funded retrospectively, following the nuclear
12 incident that results in losses that exceed the primary layer. Each reactor
13 licensee is required to contribute these premiums when called for under the
14 terms of the secondary financial protection program master policy. The second
15 point I'd like to make is that the terms of the ANI liability insurance policy provide
16 for economic channeling of public liability to the operator following the nuclear
17 incident. That is all potentially liable parties to the operator -- all potential liable
18 parties from the operator through any supplier of goods and services to the
19 facility are insured under the terms of our policy governing a reactor site. This is
20 referred to as omnibus insurance coverage. This approach facilitates claims
21 handling and ensures the maximum amount of insurance capacity and limits are
22 available to the nuclear plant operator, and ultimately the public. Next slide,
23 please.

24 This slide depicts the third party liability financial protection scheme
25 under the Act, the Price-Anderson Act. The ANI primary insurance policy

1 currently provides \$375 million of limits to the plant operator. Should claims
2 resulting from a nuclear plant incident exhaust the primary layer, the secondary
3 financial protection program then kicks in and currently provides up to \$12.2
4 billion of additional funding for covered claims. The Act establishes the two
5 layers, but more importantly it also establishes a framework for handling claims
6 and acquiring funding for public liabilities that exceed the defined amounts in the
7 two layers. Now, that concludes my prepared marks and I'm looking forward to
8 any questions you might have. Thank you.

9 CHAIRMAN MACFARLANE: Thank you very much. Next is
10 Stephen Musolino, representing the Health Physics Society. Mr. Musolino.

11 STEPHEN MUSOLINO: Good morning Madame Chairman and
12 fellow Commissioners. I represent the Health Physics Society, a professional
13 organization whose mission is excellence in the science and practice of radiation
14 safety. Our activities include encouraging research in radiation science,
15 developing standards, and disseminating radiation safety information. I am a
16 scientist specializing in radiation protection for the past 34 years, at the
17 Brookhaven National Laboratory, and a member of the National Council of
18 Radiation Protection, and Measurements. Since 1981, I have been involved with
19 the Department of Energy Radiological Assistance Program, and was deployed
20 to support the DOE response to Fukushima. Three of the four weeks of
21 deployment were in Japan with the field team who were measuring the
22 environmental contamination. While my work during the crisis was part of the
23 combined efforts of the U.S. government, I am here today as a private citizen and
24 speak solely on behalf of the Healthy Physics Society. Next slide.

25 This is the joint U.S./Japan survey that was published at the end of

1 April. It mapped the contamination on the ground out to 80 kilometers. The two
2 charts you're looking at, one is dose -- on the left is dose rate at one meter, and
3 on the right is caesium ground contamination. The patterns appear slightly
4 different, but this is just due to the choice of the break points between the two
5 charts. They're not inconsistent in that regard. Important is the yellow color.
6 That color is key to the dry response level that was calculated at that time, that
7 corresponded to the relocation protective action guideline, which is an EPA
8 guideline in the U.S., and an international guideline set by the IAEA. So, it's a
9 consensus standard. At the 2011 annual meeting of the Health Physics Society,
10 Mike Noska, from the Public Health Service and Charlie Wu from Argonne
11 National Laboratory presented a calculation that showed a DRL for rice planting,
12 and that number phenomenally corresponds to the green. And that would
13 indicate an area that would be considered habitable, but you'd still be considering
14 embargoing cultivation of fields in that area. Next slide.

15 The government in Japan replicated the joint aerial measurements
16 with soil sampling, and that's on the next slide. This is indicative of an
17 independent measurement that certainly is one of the many ways the aerial
18 measurements were scientifically confirmed. There was over 2,700 locations
19 and five points for locations the soil samples were taken. So, this is just to say
20 we have a very scientifically sound database of information documenting the
21 contamination on the ground. Next slide, please.

22 Inevitable comparisons are made to Chernobyl, between the two
23 events. Just to mention that briefly, these two charts are both to scale to show
24 the 30 kilometer zone around each of the sites. The light red nominally
25 corresponds to approximately the same as the yellow on the U.S./Japan joint

1 survey that corresponds to the relocation protective action guideline of two rem in
2 the first year, minus the emergency phase. One note we really want to make is
3 the magnitude of the contamination in Japan is indicative of the prevailing
4 meteorological conditions at the time, and typically the wind pattern is out to sea.
5 So, if wind patterns had been different, the contamination plot on the ground
6 could have been very different. Next slide, please.

7 This is just, again, to indicate that where Fukushima was not
8 Chernobyl. Chernobyl was a much wider event in terms of land contamination,
9 and be careful looking at this chart, because the color scheme is different. It
10 does not correspond to the previous ones, in that, you know, Chernobyl was a
11 much wider area of contamination, but again, Chernobyl was a reactor that did
12 not have a containment building, and the event was initiated by a reactivity
13 incursion, which caused a highly energetic release that injected large amounts of
14 radioactive material up to 25,000 feet above the reactor, and into the prevailing
15 winds. Next slide.

16 The terrain got a vote in Japan, and affected the ultimate fate of the
17 radioactive material on the ground. Again, looking at this slide, you know, you
18 can get a sense of, you know, had the, you know, the wind patterns been
19 different, you know, there could have been a different evolution of the ultimate
20 pattern, and the prevailing winds in this view were to the bottom of this chart.
21 And the swath of contamination that goes to the left, looking at this slide, is the
22 Fukushima valley that, you know, the winds directed the material again, when
23 they incurred the mountains. Next slide.

24 This is just to bound the contamination. This is aerial surveys that
25 were continued by the government of Japan, after the DOE concluded its mission

1 at the end of May, 2011. They extended the survey out as of this chart,
2 November, 2011, to 450 kilometers, and what you're looking at in the white circle
3 I've indicated on the chart, they are variations from background, but that's natural
4 background. There's no caesium detected in that area. So, you can look at this
5 chart and see that from the aerial surveys, nothing was detected beyond 250
6 kilometers, and again, a caveat that this is a very sensitive measurement. These
7 are small deviations from background. These are not high levels of
8 contamination at these long distances. They're just merely detectable, and to
9 some extent indicative of the low, natural radioactive content of the soil in Japan.
10 Next slide.

11 I just want to make a couple of brief words about the isotopic mix.
12 Next slide. This is just a sequential plot of the caesium-134 to caesium-137 ratio
13 in air filters. So, as the samples were analyzed, they were plotted sequentially
14 on this chart, and the interesting part about it is the consistency of the data, the
15 weighted average of the air samples over the, you know, period of
16 measurements you can see, is essentially one, with very little variation. Next
17 slide.

18 A very -- you know -- a similar pattern was seen in the in-situ
19 gamma soil spectra, where the caesium ratio is also seen as one. So, essentially
20 no matter where you took a measurement, the radionuclide mix, at least for the
21 long lived radioactive materials, was the same, and somewhat surprising
22 consistent. You can also look at this chart, and if you look closely, you can see
23 because of the caesium-134 out, you know, the furthest point in time, you can
24 see a little bit of radioactive decay, where the data falls slightly below the line.
25 Interesting too, the WASH-1400 caesium ratio is 1.6, and the data I saw in the

1 INSAG report on Chernobyl was 0.6. So, Fukushima had its own unique
2 character in that regard. Next slide.

3 An important point I want to make, next slide, is there was no
4 refractory material released to the environment. There were trace amounts of
5 strontium-89 and 90 detected in DOE soil samples. There was no ruthenium-103
6 detected in any of the DOE in-situ gamma spectral measurements, and there
7 was a measurement that -- there was a lot that the Japanese government made
8 on plutonium near the plant, and at the time there was a lot of hyperbole in the
9 press, and the press misreported this measurement that they had detected
10 plutonium in the environment when in fact, they did not. If you look at the right-
11 hand-most column of this, there was natural uranium found in the samples, which
12 is indicative of just typical soil and naturally occurring uranium. Plutonium was
13 below the detection limits of the measurement. And if you look at the radiation
14 dose column, you can see that these soil samples were taken in highly
15 contaminated areas. And, you know, just for reference, you've got to have the
16 boiling points of caesium, strontium, zirconium, plutonium, and ruthenium on the
17 right of that chart. While little strontium was released to the environment, it is
18 possible larger amounts were released from molten core concrete interaction,
19 and carried in the water in the containment, and then into the ocean from the
20 sump overflows. But it certainly was not in the airborne pathway. Next slide.

21 This is just, again, to show the strontium measurements that were
22 made by the government of Japan. The circles of vegetation, the dots are soil,
23 and you can just, you know, look at the, just the magnitude of the numbers of the
24 strontium and caesium, and you see that there's a huge, huge ratio between the
25 two of them, where, you know, what you're saying in essence that only the

1 volatile material was seen in these samples, and effectively no strontium at all.

2 And my final slide, I want to point out that the evacuation is a
3 dynamic circumstance in Japan, and that's certainly an effect that you would
4 expect in any event like this, in that the initial evacuation which is the area -- the
5 entire area beyond that 20 kilometer line, I'm sure the Japanese government just
6 set it by roadways and areas of simple boundaries. It was a very large area, but
7 as time goes on with decontamination and additional field measurements, they've
8 begun to shrink those areas and repatriate zones. So, that will change over time,
9 and now it's broken down into habitable areas, short term occupancies areas,
10 and areas that are still restricted from habitation. That concludes my
11 presentation.

12 CHAIRMAN MACFARLANE: Thank you very much. Okay. Our
13 final panelist this morning is Al McGartland, who is Director of the Science Policy
14 and Analysis Division at the Environmental Protection Agency.

15 AL MCGARTLAND: Thank you, Chairman and Commissioners for
16 inviting me here today. It's certainly a pleasure to be here. In reviewing this
17 work, it was clear that NRC and EPA do face a sort of kind of similar problem, yet
18 with the problem sort of differs of frequency, and scale, and consequences, and
19 even the ease of reversibility. And so while I'm going to touch on a lot of stuff
20 that EPA is up to here, of course the EPA would be pleased to continue a sort of
21 a technical dialogue in the future.

22 CHAIRMAN MACFARLANE: Thank you.

23 AL MCGARTLAND: Okay, so I was asked to sort of think about
24 EPA. I always like to give my first slide, please. It's a sort of, almost what I
25 advised decision makers and stuff, that economists don't say that benefit cost

1 analysis provides the answer for you on what you have to do on a regulation or in
2 your case a decision. It really is one input into the decision making process both
3 at EPA, and that's sort of the general view held by economists more broadly.

4 And so what I'm going to talk about today is sort of the way that economists at
5 EPA and elsewhere go about capturing the benefits and costs of land reuse and
6 cleanup, or the flip side of that, land contamination, and apply it to sort of EPA
7 specific programs. Okay.

8 EPA lays out its sort of economic science and methodologies in two
9 important documents that guide EPA's analysis. The first is the broader EPA
10 guidelines for preparing economic analysis. It's reviewed by our science
11 advisory board, and lays out for the entire EPA and the community on sort of
12 what's expected in the benefit/cost analysis, and it covers all of the different
13 media, the Clean Air Act, Clean Water Act, Superfund, RCRA, and all the other
14 EPA programs. But as we got into this problem of land cleanup or land
15 contamination, we found that there were many unique or really difficult aspects to
16 this problem, and my office in conjunction with the Office of Solid Waste and
17 Emergency Response, undertook the development of a separate handbook for
18 assessing the benefits and costs of land cleanup. And EPA's brown fields
19 provided a sort of impetus for this, because people were asking us sort of what
20 are the benefits of cleaning up these brown fields and getting them back into use
21 in the economy. And the problem kind of attracted a lot of attention. We had a
22 lot of academics help us as well, and that's kind of what I'm going to talk about
23 today.

24 So, we typically, and as the EPA typically does, we started off by
25 thinking about the benefits of land cleanup and reuse in the context of to what

1 are the benefits that we can get from cleaning up, that are sort of the direct
2 benefits, and next slides, please. Sorry. I'm used to having a click. Keep going.
3 Next, these are the guidelines. Next slide. This is the handbook that I just
4 mentioned. Next slide. Okay, this is the beginning of a table that outlines the
5 benefits of what EPA sort of likes to think about, when we think about cleanup of
6 land contamination. The first are kind of the direct health effects of land cleanup,
7 and we can estimate these with sort of standard exposure and risk assessment
8 models, both mortality and morbidity, but we like to think about it more broadly
9 and think about either market products, recreational aesthetic values of the land,
10 and the value of ecosystem services that might be gained if we clean up the land.

11 And last but not least on this table is something called non-use
12 value. Sometimes economists call that existence value, and that is typically the
13 value that we're all -- that many of us place on the environment, even if we have
14 no intentions of using it, and so going back to when I got started in the Exxon-
15 Valdez, there was sort of a large number put on the sort of notion of non-use
16 value. None of us really had an intention to visit Alaska, but we were willing to
17 pay to protect the pristine area of the environment. Next slide, please.

18 Continuing that table, we sort of are getting onto the more
19 interesting and more challenging aspects of this problem, and that is sort of
20 aesthetic improvements, reduce materials damage, and last but certainly not
21 least is the sort of land productivity improvements. As we sort of peel the onion
22 on this last category of land productivity improvements, again, working with some
23 academics as well as in-house economists, we began to realize that there were
24 benefits of cleanup that extend well beyond the gates of the land that's actually
25 being cleaned, or that was previously contaminated. And we've deemed these

1 benefits sort of two separate categories. One is called agglomeration effects and
2 the other are called peer effects. And if you talk to any regional economists,
3 which actually helped us with this, you can see that as you clean up an area,
4 particularly, you know, in brown fields, the most easiest example is an urban
5 core. You can take advantage of the built infrastructure that's already there, and
6 so the land productivity of other facilities get used more, and of course there's
7 sort of the regional equilibrium that's then reached with increased jobs, increased
8 economic activity, et cetera, and so that the impacts and the effects extend well
9 beyond the sort of, the land values that are going up just because of them being
10 cleaned.

11 So, I'm going to sort of give you the punch lines and then I'm going
12 to -- next slides, please, and then we're going to get into some of the empirical
13 applications of what we've done, and where we can need new methods. Since I
14 mentioned that land contamination and land cleanup is an important generator of
15 economic benefits. In the brief work that we've done, we can show that
16 empirically, and it is not enough to simply look at the sort of health and ecological
17 effects, the loss of land productivity. And on the benefit side with the cost of
18 cleanup, on the cost side, there's simply more to the problem that economists
19 need to get a handle on, and so when assessing benefits, we want to look at sort
20 of the agglomeration effects, and the other effects that occur offsite. We find that
21 actually they are potentially much larger than even the direct impacts from
22 cleaning up the site itself. Next slide, please.

23 It's worth pointing out that these agglomeration effects are sort of
24 detailed more in that handbook that I mentioned previously, and this also was
25 peer reviewed by a group of academic economists, and they were very --

1 reinforced the notion that these offsite effects are very important, yet very difficult
2 to capture. Next slide.

3 I'm going to turn now to sort of what is EPA doing empirically to try
4 to get at some of these things, and we have sort of two methods in our tool kit to
5 use to dominate these approaches -- estimate these approaches. The first are
6 the property value studies. Sometimes you hear economists call them hedonic
7 property value studies, hedonic in a sense that if it works, do it. So, it's sort of a
8 way to look at market data to try to tease out what people might be willing to pay
9 to benefit from the cleanup of these lands, and the other is a survey or a stated
10 preference technique, which I'll get to last. Okay, and the property value
11 techniques, these capture benefits that accrued to property owners only.

12 And again, if you look at the literature, next slide, please. If you
13 look at the literature, the focus has been on Superfund sites and residential
14 properties. They're easier to capture. So, when a home tends -- the home
15 values tend to decrease when a site is declared a Superfund site, because then
16 the world sort of then knows that there's sort of contamination around the site,
17 and again, these are decreases in properties offsite. So, it's off the contaminated
18 land, but there's sort of an effect on these properties as well. So, a number of
19 studies that EPA has funded, including the Kiel and Zabel and elsewhere, does
20 depend on the flow of information. There's a lot of variables that affect this, and
21 so -- and how people perceive those risks, but in general their most recent
22 evidence suggests that with a 30 kilometer of a Superfund cleanup, property
23 values could increase at least 18 percent after the cleanup for the lowest decile.

24 More recently, we've been working at property value studies for
25 other EPA programs. That includes both underground storage tank cleanups

1 and brown fields, and two EPA studies. One was done with a professor at Tufts
2 and the others with brown field study was done with professors at Duke
3 University. We found fairly consistent evidence of a persistent property value
4 increase, again on property values that were offsite of the cleanup lands of
5 somewhere in the neighborhood of 12 and 5 percent increases in a broad area.
6 And again, all of these studies also conclude that the flow of public information
7 definitely affects how those property values are going to be affected. Next slide,
8 please.

9 The other sort of method in our tool kit is something called state of
10 preference studies. These are very sophisticated survey techniques that look at
11 hypothetical markets, and use survey methods to elicit from respondents how
12 they might benefit by land cleanups in nearby areas. So, a lot of these surveys
13 that deal with land issues sort of try to mimic, try to elicit what people might be
14 willing to pay for a housing bid. So, they pretend that you're bidding on the
15 market, and in the end they find very significant improvements and willingness to
16 pay for properties of 18 to 33 percent. And Anna Alberini of the University of
17 Maryland did a study just recently in Italy, where she looked at people's
18 willingness to pay to avoid Superfund contamination or cleanup, and you could
19 tease out based on the risk numbers that she calculates, that the value of a
20 statistical life, might be a concept that people are familiar with, is around \$8
21 million.

22 So, I want to wrap up in conclusion that just simply focusing on the
23 cost of cleanup for EPA's on the cost side, or just the benefits that you get from
24 putting that land back into reuse from the value of the land that's being cleaned
25 up is not sufficient. It doesn't count for these regional offsite benefits, which are

1 regional in nature. The regional benefits can be extremely large. We have a
2 limited toolbox to capture them. We at EPA are working with regional
3 economists and other environmental economists to expand that toolbox, and
4 building more regional models, and we hope to make further progress in the
5 future. Thanks.

6 CHAIRMAN MACFARLANE: Thank you very much. Okay. We
7 reached the questions part of the panel, and I will begin to lead off with
8 questions. So, let me start back on the left here with Mr. Andersen. Perhaps
9 you're familiar with the ASME Presidential Task Force's Report forging new
10 nuclear safety construct?

11 RALPH ANDERSEN: Yes, ma'am.

12 CHAIRMAN MACFARLANE: In which they say that the major
13 consequences of severe accidents at nuclear power plants have been socio-
14 political, and economic disruptions inflicting enormous cost to society. So, I am
15 interested in what your thoughts are about that.

16 RALPH ANDERSEN: In the very initial days following the accident
17 at Fukushima, it's interesting that in our discussions with the industry, we
18 appreciated after the releases from Unit 2, which apparently are responsible for
19 the contamination footprint around Fukushima, that the long range consequences
20 would be the most significant, and the most important. And actually, we've
21 considered to invest a certain portion of our response resource to tracking the
22 types of actions that are being taken to interact with the Japanese, and
23 understand their philosophy, and their strategy for dealing with those issues. But
24 I certainly can't disagree with the statement that's made in that report.

25 CHAIRMAN MACFARLANE: So that sort of segues me into

1 another question I have, which I want to direct to both Dr. Lyman and Mr.
2 McGartland, and that has to do with where you draw the boundary in this kind of
3 analysis. You know, how do you deal with the larger economic effects? You
4 know, clearly we see with Fukushima, they basically lost at least temporarily all of
5 their nuclear fleet, and the larger effects on society, industry, et cetera. So,
6 where do you draw a line here? Ed, why don't you go first?

7 ED LYMAN: Okay, thank you. Yeah, that is a difficult question.
8 Obviously, you need to set some sort of boundary. I don't have -- I haven't
9 thought about it, but I would suggest that at least you look at those aspects which
10 are not currently well treated in the NRC analyses of starting with are you even
11 appropriately taking into account the way property losses are accounted for, and
12 these indirect costs on adjacent properties that we just heard about from the
13 EPA. I don't think that -- there are certain aspects that you simply can't quantify,
14 but you should probably need to at least address them in a qualitative fashion.
15 And that I would put into the category of these larger effects that are really
16 incalculable.

17 AL MCGARTLAND: Well, the economist in me wants to say that as
18 long of you sort of can show there's a sort of positive willingness to pay on the
19 part of the community or the affected party to avoid this impact, I think it's
20 germane to the issue. I know that's --

21 CHAIRMAN MACFARLANE: We can go beyond just Japan, right,
22 because this will affect the larger global economy. So, there's a point in which --

23 AL MCGARTLAND: Right. I definitely agree --

24 ALLISON MCFARLANE: Becomes rather uncertain.

25 AL MCGARTLAND: EPA's -- as I say, our scales are very different,

1 right. We're looking at a region sometimes, but nothing on the scale that you
2 guys are. So, I haven't thought about it in this large view context, but that's sort
3 of the guiding rule for us, is sort of when you can identify a benefit or a cost in
4 that context, that you could sort of show that there is a positive notion that's
5 actually going back into the 1940s in economics. Sir John Hicks wrote about it.
6 If there's a willingness to pay for something then there's a benefit or a cost.

7 CHAIRMAN MACFARLANE: Right. I mean there may be benefits
8 too that come out of this --

9 AL MCGARTLAND: That's correct.

10 ALLISON MCFARLANE: -- that we have to try to calculate as well.

11 AL MCGARTLAND: In fact, that's the fair thing to do, is to look at
12 both sides.

13 CHAIRMAN MACFARLANE: Right. Right, okay. Thank you. Mr.
14 Cass, what was the American Nuclear Insurer's reaction to the Fukushima
15 disaster? Did it prompt you to consider changes in your policy, and do you think
16 there are changes needed in Price-Anderson?

17 MICHAEL CASS: Fukushima got our attention since we reinsured
18 the Japanese nuclear pool, and the question was immediately from every one of
19 our member companies, do we have a loss here? I won't get into the specifics of
20 that, but we have been in the process -- what we have done, there's a couple of
21 things that have caused us to take some additional actions, some of which were
22 already in process after Deepwater Horizon, the Gulf of Mexico oil spill, we were
23 -- had been in the process of upgrading our emergency response capabilities.
24 One of our primary purposes in life is to address the immediate needs of the
25 public in the aftermath of an accident. Their immediate needs, should they be

1 evacuate for food, lodging, and other immediate needs much as we did after the
2 Three Mile Island accident, which was a much smaller scale event than
3 Fukushima. So, we were in the process of upgrading that, and Fukushima
4 caused us to accelerate that, and we've done quite a bit in that regard, so that
5 we're in a better position to respond should something happen here domestically.
6 As far as our policy coverages go, we don't think -- at this point, we don't see any
7 need to really change anything there. We think they're fairly comprehensive, and
8 seem to cover certainly all the consequences that Fukushima and the
9 surrounding areas experienced.

10 Now, there were some in the Japanese insurance market, there
11 were reasons why those weren't covered by insurance because of the nature of
12 the country and its seismicity and the fact that an event caused by a seismic or
13 tsunami is not covered in that country. That's not necessarily the case here. We
14 don't have those exclusions in our policy. So, an event similar to Fukushima
15 would have been covered here in the United States. So we don't see a need
16 there, and as far as your point about the amount of insurance of the Price-
17 Anderson Act, that's certainly a matter for the Commission. We don't necessarily
18 have an opinion as to what the appropriate amounts of insurance are. I can say
19 that our primary layer of insurance protection following the Three Mile Island
20 accident was not even exhausted. So we didn't even get into the secondary
21 financial protection program following that accident. Certainly that isn't a
22 Fukushima-type event, but it is the only data point we have in this country with
23 our technology and the risks that our plants have experienced.

24 CHAIRMAN MACFARLANE: Okay, thanks. A couple of technical
25 questions for you, Mr. Musolino. Your slides, can we go back to the slides? Is

1 that possible? Slide eight. No. Okay. Slide eight was the extent of
2 contamination?

3 STEPHEN MUSOLINO: Yes.

4 CHAIRMAN MACFARLANE: I mean you can look at your own
5 slides, even if nobody else can. I'm just curious. The main contamination, the
6 predominant contamination was a northwest/southeast direction.

7 STEPHEN MUSOLINO: Yes.

8 CHAIRMAN MACFARLANE: But then there was another
9 subsidiary contamination that went down to the -- more to the southwest, and
10 then there was a spot closer to, I guess, Tokyo.

11 STEPHEN MUSOLINO: Right, you can see that on slide seven.

12 CHAIRMAN MACFARLANE: And that is caused because of
13 topographic features mostly or...

14 STEPHEN MUSOLINO: I can only speculate. My assumption is
15 these were multiple source terms under multiple meteorological conditions. So
16 the material that went to the south was just a different weather condition. I was
17 watching the NERAC smoke plots that were being put out on a daily basis and
18 those typically tend to, you know, go completely around the circle. So, you could
19 get a day with the wind blew in, you know --

20 CHAIRMAN MACFARLANE: Right.

21 STEPHEN MUSOLINO: -- 360 degrees around the compass. So
22 the material that went down the Fukushima valley, in my view, was the material
23 went to the northwest that encountered the mountains and then was bent around.

24 CHAIRMAN MACFARLANE: Are there people doing studies on
25 this particular -- these phenomena and how they occur? I mean, it's important to

1 try to understand.

2 STEPHEN MUSOLINO: Yeah, I know anecdotally that NERAC has
3 been reanalyzing this and you'd have to consult with them directly on exactly
4 where they stand with those analyses.

5 CHAIRMAN MACFARLANE: Okay, and the other one is, my
6 question is on slide 15. You have area two and area three. And I'm just trying to
7 understand what the difference is between those two.

8 STEPHEN MUSOLINO: Area --

9 CHAIRMAN MACFARLANE: They're not permitted to live --

10 STEPHEN MUSOLINO: Yeah, area --

11 CHAIRMAN MACFARLANE: -- any time, ever?

12 STEPHEN MUSOLINO: I mean, area three, which is the red, is
13 evacuated area.

14 CHAIRMAN MACFARLANE: Right.

15 STEPHEN MUSOLINO: There's no occupancy. The orange
16 colored area -- any areas where their government is permitting short-term
17 occupancy.

18 CHAIRMAN MACFARLANE: Okay, that -- I guess on my slide it all
19 looks yellow.

20 STEPHEN MUSOLINO: Oh, I'm sorry the --

21 CHAIRMAN MACFARLANE: Okay, up there it looks more orange,
22 okay, I see. And so, but it says that --

23 STEPHEN MUSOLINO: They're not -- yeah, the orange on the
24 bottom is still part of the evacuated zone.

25 CHAIRMAN MACFARLANE: Right, but --

1 STEPHEN MUSOLINO: The yellow below is still evacuated. I'm
2 assuming the red they're identifying, these are higher levels of contamination
3 where the area's restricted, and above that in the orange is short-term
4 occupancy.

5 CHAIRMAN MACFARLANE: Okay, okay, all right. That's it for my
6 questions. On to Commissioner Svinicki.

7 COMMISSIONER SVINICKI: Thank you Madame Chairman, and I
8 want to thank all of our presenters for their presentations this morning and just
9 their involvement in these issues, which I know we gave each of you 10 minutes
10 to cover. This is a tremendous topic with a lot of tentacles into other issues, so
11 thank you for honoring the time restraints that we placed on you. Mr. McGartland
12 I might start with you. I know you referred to two very key EPA documents, the
13 first of which I think I have it in my office, it was so big I didn't want to bring it, it's
14 the other one. I noticed you brought the handbook. The guidelines are about --

15 AL MCGARTLAND: I brought the handbook.

16 COMMISSIONER SVINICKI: -- this thick, but interestingly, I
17 wanted to raise something that is right in the purpose of the handbook. It
18 indicates here, I'll just quote this sentence, "The knowledge base for estimating
19 the benefits, costs, and impacts of land cleanup and reuse is still in its formative
20 stages." And so, if I step back and think about the fact that EPA has been very
21 engaged on this topic and would still put forward a cautionary note that a lot of
22 the individual analytical tools or our understanding is imperfect in some areas, I
23 think formative stages is, you know, is a pretty key descriptor to me. It means
24 that there probably is a lot more definitional and other work to be done here, and
25 I actually look at the piece that EPA is looking at and saying it doesn't even pose

1 some of the complexities of what NRC is analyzing here today. I don't mean to
2 dismiss the complexity of the problems you all are dealing with, but you're
3 looking at land that is already contaminated and what might be the benefits
4 versus the costs of putting that into purposeful reuse. So I think we're looking at,
5 you know, accidents that haven't occurred, perhaps of lower probabilities, and
6 we're trying to decide on cost and benefit evaluation there, which is a pretty
7 difficult thing to do. Is there -- I know you're really looking as an economist at this
8 issue and this handbook is for a broader community of practitioners, but is there
9 anything that you would share about that notion of it being formative? What are
10 the key areas where there is a lot of work yet to be done?

11 AL MCGARTLAND: Thank you so much. You articulated well, I
12 think, the state of our ability to do this, and I absolutely agree that your problems
13 are in some sense even more complicated or more difficult. So, I think EPA has
14 historically, I mean we're a science-based agency and, frankly, economists or
15 social scientists are still in the minority. So, we've typically have attacked these
16 issues with hard science, right? So we have fate and transport modelers to
17 model a contamination through the groundwater and how that might affect
18 human exposure, and we have toxicologists or epidemiologists to think about
19 dose response or the health risk concerns. And then economists, almost
20 historically, have come on in the end and tried to sort of wrap that all up and say,
21 what's it worth, or what's the value of statistical life, or a cancer case, et cetera?
22 What we're doing now though, and is in fact thinking more broadly about the
23 regional economy; and that's, in fact, the difficult area. So, when we met with a
24 bunch of academic economists, one of the economists quipped, well, you could
25 give me a grant and that's something I could work in the next 10 years for and

1 ease into retirement, becoming an expert on it. And it's still in that embryonic
2 stage of sort of thinking about how the regional land development, regional
3 economies and, you know, regional welfare of the people in that region would be
4 affected by these changes and land either contamination or land, you know,
5 clean up. So, I think that's the missing --

6 COMMISSIONER SVINICKI: I appreciate that. I know that in some
7 instances some of these contaminated sites are a discrete, perhaps industrial
8 facility fenced off. But I had some experience in EPA's consideration of the
9 legacy of hard rock mining in North Idaho, where it was almost the entire
10 northern panhandle of the state that was under evaluation. So, I have maybe
11 some firsthand understanding of the complexities of what you're talking about.

12 AL MCGARTLAND: Also a good point, it goes beyond just land
13 usage. If you, you know, whether it's a water body that can become
14 contaminated, it can have the same kinds of effects, or any natural resource,
15 so...

16 COMMISSIONER SVINICKI: Thank you, and that's a good segue.
17 I wanted to turn to Dr. Lyman because I appreciated that you covered a little bit
18 of your view of some of the perhaps inadequacies of the computational, the
19 analytical tools, or our application of MACCS and things like that. I know that
20 was getting towards the end of your presentation and you were short on time.
21 You did indicate the averaging and you thought that that was maybe smearing
22 some effects. Were there any other specific points or examples that you wanted
23 to share about that, since I know you were running out of time?

24 ED LYMAN: Thank you. You know, I mean the way that MACCS2
25 does these calculations, and I've done a few of them, is just very crude because

1 it, you know, it essentially subdivides an area into units, looks at the average
2 property values, or the average value of agriculture in each unit, and then does
3 this very crude calculation of whether or not, you know, you can decontaminate
4 that area so it's habitable or usable for agriculture; and, if so, how much does it
5 cost and then compare it to the cost of the value of the land itself. And the -- it
6 depends so much on the values you input for decontamination for example. And
7 I know that when the code was first written, there is a sample problem that was --
8 had default values for all these things circa, you know, the early 1990s, and I
9 think a lot of these -- a lot of the applications by licensees have just taken a lot of
10 these values, haven't even discounted them or anything. And so, you really do
11 need to do I think a thorough reassessment of whether these make sense. You
12 could get differences, you know, 10 or 100 times different in, you know, some of
13 these values, so...

14 COMMISSIONER SVINICKI: Okay, thank you for that. Mr. Cass, I
15 perhaps missed it in your presentation. You talked a lot about nuclear facilities
16 that you insure. Do you insure nuclear materials in transport, or would that be a
17 different insurance framework?

18 MICHAEL CASS: The answer is yes.

19 COMMISSIONER SVINICKI: Okay.

20 MICHAEL CASS: Actually the policy that a power reactor
21 purchases would also cover shipments from that power reactor --

22 COMMISSIONER SVINICKI: Okay.

23 MICHAEL CASS: -- and then we also provide policies to shippers
24 and transporters who might be shipping from, you know, a site before it gets to
25 the power reactor, but it is covered, yes.

1 COMMISSIONER SVINICKI: Okay, thank you. And on your slide
2 five, you talked about the reasonable additional expenses that would be incurred
3 by states, counties, and municipalities from postulated nuclear hazards. I'm
4 wondering, and this is on the theme of -- I've talked to the other panelists about
5 analytical tools and other estimating tools and the state of our knowledge on
6 those things. Are there tools that you're aware of that would allow you to assess
7 those types of expenses? Because this is a little bit like Chairman Macfarlane's
8 question of looking at the rings of consequences here as you go out, and that
9 struck me as something that, as we move away from the nuclear facility itself,
10 we're getting into the costs incurred by others. Or would it be more something
11 post event, simply these -- whatever these expenses are would be categorized
12 and calculated at that time?

13 MICHAEL CASS: I think it's the latter point. We would rely on the
14 additional costs that these agencies would incur, state, county, and local police
15 department, fire, first responders, that kind of thing that would assist in the
16 evacuation, and basically would file a claim. The procedure would be they would
17 file a claim against their policy holder and we would handle that claim --

18 COMMISSIONER SVINICKI: Okay.

19 MICHAEL CASS: -- for those additional costs.

20 COMMISSIONER SVINICKI: Thank you. And Dr. Musolino, I
21 wondered if you would have specific knowledge of -- this is the same slide that
22 you had where it showed habitability determinations are being made in the area
23 of initial evacuation is slowly being kind of cut like puzzle pieces, and areas are
24 receiving different treatment. Are you aware of -- I'm assuming that the
25 Japanese government is looking at various factors that affect habitability, not just

1 the radiological hazards. So the chart that would show that, you know, people
2 have been allowed to re-inhabit certain areas, is that also influenced by, you
3 know, issues like infrastructure in the area and other devastation that was
4 caused by the tsunami? Or is it -- are the re-habitability or allowing people in an
5 area, is that's principally driven by the radiological hazard at this point?

6 STEPHEN MUSOLINO: My understanding is that chart is based
7 purely on radiological levels.

8 COMMISSIONER SVINICKI: Okay.

9 STEPHEN MUSOLINO: And that is not a tsunami impacted area.

10 COMMISSIONER SVINICKI: Okay, thank you. And the other
11 question I had, I appreciated your presentation and there was a lot of data that
12 allowed me to see some of the more current information or things that were
13 done, and more recently I was following a lot of the mapping of contamination
14 immediately in the months following the event. But I drew one very -- as
15 someone who's not a day-to-day health physics practitioner, I drew at a high
16 level one of the statements that you are making was that Chernobyl -- you did
17 contrast Chernobyl and Fukushima, but were there any other kind of high level
18 observations about economic consequences as it relates to the radiological
19 issues that the Health Physics Society looks at? Were there any other high level
20 conclusions that you were making in your presentation that I might have missed?

21 STEPHEN MUSOLINO: I would say that the Society really hasn't
22 delved very deeply into the whole economic --

23 COMMISSIONER SVINICKI: Okay.

24 STEPHEN MUSOLINO: -- aspect of it at this point, and I don't think
25 we really can until things settle out in terms of this secondary evacuation. And

1 you can see from that chart it's a dynamic situation and I think once you really
2 know what the real long term picture of that's going to be and I think, you know,
3 we could ponder --

4 COMMISSIONER SVINICKI: Okay, no, that's --

5 STEPHEN MUSOLINO: -- from that standpoint.

6 COMMISSIONER SVINICKI: -- entirely fair, thank you. Madame
7 Chairman.

8 CHAIRMAN MACFARLANE: Great. On to Commissioner
9 Apostolakis.

10 COMMISSIONER APOSTOLAKIS: Thank you Madame Chairman.
11 For Mr. Lyman and then maybe other panelists may contribute. The way we take
12 costs into account now is, in general, when there is a change. Change in the
13 regulations or a backfit. Now, you argued that we should use the large release
14 frequency rather than the early release frequency. Would you still then leave the
15 regulations as they are? Namely, yeah, use the large release frequency but only
16 when there is a change in regulation or backfit, because you argued -- well, you
17 recommended Option Three, which is very broad. It includes rulemaking, it
18 includes safety goals. So, basically the question in my mind is, when should
19 costs come into the picture? When there is a change, or something else?

20 ED LYMAN: Well, I guess the alternative is that you do a
21 wholesale reevaluation of every operating facility, and I don't think we're
22 recommending that. But, I know there are some implications that, you know, the
23 licensing basis turns out to be like the example I used of the design basis
24 accident. I don't know what the answer is. But, if it turns out that you can get
25 significant contamination patterns that would make you -- that would give you

1 pause, but even for plants that satisfy, you know, Part 100 criteria, then I think
2 you'd have a real problem, but I don't know what the answer is. I mean -- but I
3 think my bottom-line conclusion is that the paper that you got just doesn't provide
4 enough analysis to really understand, you know, these issues well enough. And
5 so I think, part of our recommendation is that you do need more information to
6 make these kinds of decisions; and, we did say Option Three may be necessary
7 if exploring Option Two, you know, existing processes can just be modified is
8 adequate. But I don't think we're recommending at this time that you do a
9 wholesale reexamination of the licensing basis. There may be certain outliers
10 that you may want to look at more carefully. But, another issue is going ahead in
11 the future, and licensing new facilities. You know, there's probably a
12 philosophical difference between licensing a facility so that you have some
13 allowable offsite contamination, or I think some countries might say, the objective
14 is to have no, you know, allowable offsite contamination. That might be a
15 consideration for licensing new facilities in the future that might influence your
16 decisions.

17 COMMISSIONER APOSTOLAKIS: Okay, so Option Three is very
18 broad, of course. It says, you know, policy statement or rulemaking, so --

19 ED LYMAN: Yeah, I mean the staff raised the issue, do you need
20 to modify the language? You know, does adequate protection of public health
21 and safety have to be amended with -- for reactor licensing with a focus on land
22 contamination? You know, that might help. But that, again, is a very broad
23 change. Things like a change to the backfit rule that would explicitly require, you
24 know, a quantitative assessment of land contamination and that evaluation might
25 be something, you know, that could be required by regulation.

1 COMMISSIONER APOSTOLAKIS: Well, I mean the fundamental
2 question in my mind is whether we -- I'm sorry, did you finish?

3 ED LYMAN: Yeah.

4 COMMISSIONER APOSTOLAKIS: Whether we should consider
5 cost, or including land contamination only when there is a change either in the
6 regulations or in the design -- the licensing basis of a plant? Or should there be
7 something that says, no, you're going to do it now and tell me, you know, what --
8 how much you contaminate and maybe you should do something about it. That
9 would be a significant change in the regulations and I don't claim I have the
10 answer, but that's -- I mean, improving the methodology isn't a big deal. I mean,
11 okay, finally stakeholders and our staff will agree that we have to draw the line,
12 as the Chairman said somewhere, and include those things. In fact, the staff
13 says the methodology is sound. So the question is really, when do you use it?

14 ED LYMAN: Well, let's put it this way. You are making changes
15 now. I mean, you have an entire suite of post-Fukushima recommendations that
16 are addressing severe accidents and this issue. So, in that context, it is a
17 change but it is a kind of a rather sweeping change, and the question is are you
18 making the right decisions now or are you using the right tool kit to make the best
19 decisions with regard to the post-Fukushima requirements? For instance, like
20 filtered vents, which might be a different answer. And, again, the issue I raise
21 which is hydrogen control, which is now a Tier 3 issue. But, you know, I think the
22 conclusions could be a lot different depending on how you treat that late
23 containment failure.

24 COMMISSIONER APOSTOLAKIS: Any comments from others on
25 this?

1 RALPH ANDERSEN: I would just suggest that our initial focus
2 appropriately is on what actually happened, rather than what might have
3 happened. And looking at hydrogen control, for example, the issue was not that
4 the significant release produced land contamination came from hydrogen control
5 issues. Filtered vents is another example. By the best data we have available,
6 we were looking at a containment bypass, not a release out through a controlled
7 vent. So, it seems to me that the NRC's actions to increase the regulatory
8 footprint to include the SAMGs, the presence of the B.5.b actions that we have in
9 place, which the Japanese did not implement -- they have no like-type system
10 like that -- as well as requiring the hardened vents, appropriately are the frontline
11 priorities that will serve to prevent land contamination, because they probably
12 would have served to prevent the release from Unit 2. So, I think it's a matter of
13 priorities, which is why our suggestion is to put Option Three in the context of a
14 broader, more holistic evaluation. Not to take it off the table, but to put it where it
15 belongs in terms of priorities and sequence. I think we'll learn a lot when we look
16 at the next set of issues about how the framework works in terms of decision
17 making on those issues.

18 COMMISSIONER APOSTOLAKIS: That was my next question. I
19 was thinking about Option Three, and it seems to me -- as you know, next year
20 we will have two milestones, so to speak. One is in February, when the staff will
21 come back and give us recommendations regarding the Fukushima Task Force's
22 recommendation one. And the staff also has a tasking memo six months later --
23 roughly six months later, so in the September, October, November timeframe to
24 come back with an evaluation of the Risk Management Task Force
25 recommendations. These -- both of these are much broader proposed,

1 potentially proposed changes of the regulations. So, I'm wondering whether we
2 should wait until we settle on how we want to look at the regulations based on
3 the staff's evaluation next year, two times, and then, revisit some of these issues,
4 like Option Three and maybe others. And that way, perhaps, we'll avoid the
5 infamous patchwork. At the same time, of course, you know, improving the way
6 we do the cost benefit analysis is something that we have to do anyway or
7 rethink about it. But the broader issues, it seems to me, would be better to wait,
8 or does anyone have a sense of urgency that perhaps we should take action
9 now? I guess Mr. Andersen, you probably agree with me from the way you
10 spoke a minute ago. Ed?

11 ED LYMAN: Well, I think since some of these issues are -- have
12 larger implications for the whole framework, that it would make sense to fold it
13 into the recommendation one revision. So, I guess that paper is still early in its
14 development, and some of the analyses that I referred to might be used to inform
15 that. Actually, a lot of this discussion on LERF and LRF came from earlier work
16 on, you know, risk informing the regulations, some of which is being drawn on
17 now to rethink -- you know, think about recommendation one. So, I certainly
18 think that that could be profitably incorporated in the staff's analysis for
19 recommendation one.

20 COMMISSIONER APOSTOLAKIS: Thank you Madam Chairman.

21 CHAIRMAN MACFARLANE: Commissioner Magwood?

22 COMMISSIONER MAGWOOD: Thank you, Chairman. Let me
23 also thank you for your comments this morning regarding September 11, 2001.
24 You know, for those of us who were working for the federal government at that
25 time, it has a special resonance of, you know, personal responsibility that I think

1 many of us, you know, continue to carry.

2 And I think that, you know, in this conversation it reminds me of my
3 last visit to Japan where I had the sense that many people in Japan were having
4 the same kind of feeling of responsibility and sort of the same kind of emotional
5 response that we had to 9/11, their response to Fukushima. So I think many of
6 these issues resonate with people in Japan for that reason. And, for me, I look at
7 these issues in somewhat the same context, having also gone to Fukushima and
8 been through the evacuated areas and seen firsthand, you know, what the effect
9 of widespread contamination is.

10 So it's something that has a lot of resonance with me. But it also is
11 one where, as Commissioner Apostolakis was discussing with Dr. Lyman, it's a
12 very, very complex matter. You know, it's not one where it's easy to simply have
13 an emotive reaction and want to do something and take an action. There are -- I
14 think someone used the word tentacles. There were many tentacles to this sort
15 of decision process. And I do think that -- I guess I would say that the musings
16 that Commissioner Apostolakis expressed about whether we should try to pull
17 some of these decision processes together, as opposed to dealing with them
18 piecemeal, makes a great deal of sense, because I think we are on a path to
19 make a lot of -- to create a framework through the back door. You know, we're
20 making policy level strategic decisions. One small decision at a time, and we
21 may end up adding -- it may all add up at the end to some coherent policy, and it
22 may not. But it's something, I think, we really have to think about because as we
23 charge forward with these individual actions, with this -- we have a spent fuel
24 analysis that the staff is working on. We've a filtered vents paper that'll be
25 coming to us. We're making that large strategic, philosophical framework

1 decision one piece at a time, and I do think we have to -- we ought to take a step
2 back and think about how we're making that decision.

3 In that respect, a couple of things because there were a couple of
4 things that resonated with me as we were -- as I was listening to the
5 presentations this morning, by the way, all which were excellent. I think it was
6 Mr. Andersen, made a very passing but complimentary mention of a Level 3
7 PRA, and it isn't -- I don't hear people from the industry talk much about Level 3
8 PRA. But it is something that, you know, if we had Level 3 PRAs in place and
9 obviously we don't have that tool refined in all instances. It would inform this
10 conversation in a very profound way. Give me your thoughts on that. Where do
11 you think the industry is, insofar as its ability to begin developing Level 3 PRAs
12 on a site-specific basis?

13 RALPH ANDERSEN: I won't be able to directly answer your rod
14 question because that's slightly outside my expertise. This is where I claim to be
15 a health physicist, rather than an engineer. But, I am our lead on the
16 environmental reviews for license renewal; and, as such, get intimately involved
17 with the analyses that people are doing. The 12 to 18 months significant efforts
18 to satisfy the requirements for the severe accident management alternatives;
19 and, in fact, that's actually the major piece of work involved in developing the
20 environmental report for license renewal. So there's a tremendous amount of
21 attention and resource that goes into that; and, additionally, there's a tremendous
22 amount of interaction between the staff and the licensees in terms of RAIs. And
23 now, actually, the staff has implemented actual site audit visits to validate their
24 own assessment of the parameters and inputs that are being used. And
25 notwithstanding the previous comments about the adequacy of MACCS2, it's

1 probably one of the best tools that are around. At least, I've not seen a better
2 one. Its problems are not in the code. Its problems are making decisions about
3 the inputs that are used, which then dictate the outputs that you get. But
4 nevertheless, my view is it represents a very sophisticated analysis of the
5 consequences that is, as I understand it, a very good analog to what one would
6 expect from Level 3 PRAs. So I would just offer that, that there's a huge body of
7 work, with the number of plants that have already undertaken to renew licenses,
8 that's available to look at and draw assessments about broader applicability of
9 that technique.

10 I also wanted to make one other point on the larger socioeconomic
11 questions. I assume that the agency's aware of and engaged in the wide area of
12 recovery and resiliency program being undertaken by the federal government,
13 which precisely focuses on these broader socioeconomic issues, these decisions
14 about national energy policy and recovery of the nation, albeit driven by terrorist
15 events. Nevertheless, its applicability certainly is to circumstances such as
16 these, and I've been trying to work my way through the mounds and mounds of
17 paper coming out of that program -- there's a lot in there and a lot of analyses
18 being done, that the agency ought to take a look at. I noticed it was absent from
19 the staff paper, but I certainly would have pointed to that as what other
20 organizations are doing.

21 COMMISSIONER MAGWOOD: Appreciate that. Let me ask Mr.
22 Musolino to follow up on that a little bit. I don't know if you work in the -- you
23 think about PRA issues at all, but I know the people at Brookhaven do engage in
24 that. Do you have a thought about how Level 3 PRA might be used to consider
25 things? For example, your slide seven pointed out something that was quite

1 interesting, that there was clear terrain influence to where the path of
2 contamination took. And one subject that comes up from time to time, and when
3 we think about emergency planning, for example, is whether we have the right
4 emergency planning zones. And several organizations have advocated we
5 should have larger emergency planning zones. One might argue, looking at your
6 chart, maybe it's not so much larger emergency planning zones. Maybe you
7 have smarter emergency planning zones that take into account local effects such
8 as terrain and local meteorological effects. Do you have any thoughts about
9 that?

10 STEPHEN MUSOLINO: I'll preface my remarks that I don't have
11 expertise in PRA. I have a general list on that subject. Having said that, I think
12 the best way to answer your question is to say the Fukushima posed real world
13 events, real world conditions, real world meteorology, and we don't normally
14 exercise that. Now, I'm not criticizing our exercise process because they have
15 very different endpoints, and they serve their purpose to test systems. But I think
16 it does prove out that our systems that we plan for do work because we adapt to
17 the real conditions when they happen. And the general principles of evacuation
18 and protection of the public all seemed to work well in Japan, despite the fact that
19 it was a real world of events with complexities no one could imagine in a PRA
20 analysis.

21 COMMISSIONER MAGWOOD: Let me also give you a chance to
22 comment, if you have any thoughts about the MACCS computer code, and
23 whether that's an adequate tool to be using in these circumstances and, you
24 know, Mr. Andersen obviously thinks it is, others have may have different
25 comments.

1 STEPHEN MUSOLINO: I can't comment on that particular code,
2 per se. I'm not familiar with it.

3 COMMISSIONER MAGWOOD: Okay. I appreciate that. Few
4 minutes left. Let me go to Dr. Lyman. You made some interesting comments
5 regarding the LRF metric versus the LERF metric, which we currently rely on. I
6 actually thought Commissioner Apostolakis was going to go in this direction but
7 he didn't quite move to that. But one thing I got from your comment was that if
8 the agency were to require, not just for new plants but for all plants, LRF, that
9 there would be natural decisions that would come out of the use of that analysis
10 that would drive decisions that were focused much more on containment integrity
11 as opposed to protection after early releases. I want to make sure I understood.
12 Were you suggesting that that, in and of itself, would lead to decisions on filters
13 and things of that nature? It doesn't occur to me that it would, but I want to see if
14 you were thinking it might.

15 ED LYMAN: That was just one example of, you know, a way to
16 address certain problems. I didn't do a comprehensive review of all the
17 regulations and how this problem might be addressed -- that was really just one
18 example. And of course it doesn't address the non-power reactors, fuel cycle
19 facilities and other facilities that could have potentially large land contamination
20 effects. But my reading of the history of the way this issue has evolved is that by
21 not considering the containment failure, the agency is not protecting against this
22 kind of Fukushima release pattern where, you know, the evacuated areas, you
23 know, the what might be considered emergency planning zone in Japan were
24 long gone by the time the largest releases occurred, and you really do need to
25 evaluate in that context whether that way of thinking actually makes the best

1 decisions. But I'm not saying that would be the total solution itself.

2 COMMISSIONER MAGWOOD: All right. Thank you very much.
3 Thank you, Chairman.

4 CHAIRMAN MACFARLANE: Thank you. Okay. Commissioner
5 Ostendorff.

6 COMMISSIONER OSTENDORFF: Thanks, Madame Chairman. I
7 add my thanks to those of my colleagues. I think this has been a very stimulating
8 discussion by your presentations. I'm going to start off by tagging on to
9 Commissioner Apostolakis and Commissioner Magwood. I think they've hit on a
10 very critical point in this discussion. And I'm going to start up by addressing my
11 questions to Dr. Lyman, but I ask others that have viewpoints to please add their
12 thoughts.

13 And I think my colleagues were talking about other actions that the
14 agency is undertaking in the context of the Fukushima Task Force, and perhaps
15 other action items that in the net -- at the end of the day would likely have some
16 impact on -- will hopefully have some impact on further enhancing safety of
17 reactors. So I'm going to put aside Dr. Lyman for a minute spent fuel pools and
18 Brian Sheron and Eric Leeds have a body of work between research and NRR
19 on spent fuel pool safety. Just kind of park by the side and focus just on reactor
20 safety.

21 Before Fukushima happened, the staff had prepared an emergency
22 planning rule update, and that rule's being implemented now. Since Fukushima
23 we have the Bill Borchardt-directed task force that Marty Virgilio now, Mike
24 Johnson's leading. It has a whole host of actions. We've issued orders for
25 mitigating strategies for reliable hardened vents, spent fuel pool instrumentation.

1 You know, put that aside. We have other seismic and flooding hazard walk
2 downs and evaluations underway. We have an ANPR for station blackout and a
3 whole host of issues that will increase, perhaps not in some measurable form,
4 but will increase reactor safety and would likely decrease our numbers for core
5 damage frequency.

6 So I guess the question I get to is do we need to have some type of
7 a quantitative analysis from these other activities outside this SECY paper on EC
8 in order to analytically frame an approach for economic consequences? Do we
9 need to have some enhanced quantitative analysis of the aggregate effect of all
10 these other safety measures? I'll be interested in your thoughts and the second
11 piece I'll ask of you is if the Commission were to decide to defer decision making
12 of economic consequences pending all these other Fukushima issues and
13 Commissioner Apostolakis' risk informed task force and the body of work on the
14 task force recommendation one, would there be any downsides to deferring that
15 type of a decision on economic consequences?

16 ED LYMAN: Thank you for your question. On the first issue, I think
17 my point was that there may be phenomenon that aren't captured by the current
18 procedures and that the emphasis on reducing core damage frequency, which is
19 really what FLEX is addressing, may not be adequate in all cases to address the
20 possibility of long-term containment integrity, so -- and you can't just get it
21 reducing core damage frequency. That in itself may not solve this problem, but I
22 -- you know, I haven't had time to really review the whole scope of everything. I
23 would really say though that I don't think you have enough information at this
24 point from that SECY paper to evaluate that, and that's why I suggested some
25 other calculations and thought experiments you might consider just to make sure

1 or to see if you are capturing everything you need to. But -- so I would say it's
2 really premature to make that decision.

3 On the second part, I do think that, you know, February is not that
4 far away and along, you know, in NRC time scales, so that this could perhaps be
5 combined with the Recommendation 1 analysis without, you know, any kind of
6 major safety gap, but it should be addressed, you know, certainly on that time
7 scale because it is -- I think there are issues that are -- the public is not, perhaps,
8 getting adequate protection today because of some of these gaps. So I wouldn't
9 recommend delaying beyond, you know, a few months to address.

10 RALPH ANDERSEN: I'd just make an observation. Last week I
11 attended the National Academy of Sciences committee on the response to
12 Fukushima, in which there were some very excellent briefings by Tokyo Electric
13 Power Company and by the Institute of Nuclear Power Operations. For me, the
14 most telling takeaway was the notion that we still have so much to learn about
15 what happened. We have not even gotten into the plants to observe the
16 condition and lineup of valves and so forth to really appreciate that. And offsite,
17 clearly, we are still on the very front end of the learning curve of the full
18 ramifications and recovery from the land contamination.

19 So, you know, I would just suggest that one consider this overall
20 issue as an issue not requiring urgency but just requiring a continued priority to
21 take on board new lessons that we learned and see if it affects the answer to
22 your question, which is should the priority change? Or is it reasonable to let the
23 priority play out as part of these two major initiatives for the wholesale of the
24 regulatory framework. I neglected to mention the risk informed aspects, but I see
25 both of those as very large busses that are on the horizon, and I hate to see any

1 effort get started and then basically just get run over by much larger activities
2 coming along. They should be planned and integrated into those.

3 COMMISSIONER OSTENDORFF: Thank you. Anybody else in
4 the panel want to offer any comments on that? Okay.

5 Let me go to Mr. Cass for a minute. On your Slide 5, you'd talked
6 about the covered environmental cleanup costs and the property damage, et
7 cetera. Can you just talk for a minute at a high level about, you know, how the
8 ANI policy coverage would affect somebody who has lived in the Fukushima
9 evacuated area for the last 18 months, had to move out, take their wife and kids,
10 shut down their business. Just kind of the basic things, the considerations that
11 would be applicable to providing coverage in that kind of scenario. And
12 Commissioner Magwood was getting to that with his comments on Fukushima.
13 I'd appreciate if you could talk about coverage in that kind of scenario.

14 MICHAEL CASS: Sure. Well, the immediate needs of that family
15 would be taken care of. Their lodging, medical costs, food, shelter, clothing, that
16 kind of thing, since they were displaced from their home. Ostensibly because
17 either the home was contaminated or at risk of contamination, and they were
18 within an evacuation zone that was declared by the government or some -- in this
19 case, would be the local government that would declare protective actions that
20 would be required. Following that, the next -- so, first you have the immediate
21 needs taken care of. Then the next step would be if they worked at an
22 establishment that was also affected by the evacuation order or was
23 contaminated or potentially contaminated, then we would address their lost
24 wages. If they were a business owner, we would address their lost business --
25 the economic losses from their business.

1 Longer term, that's where things -- depending on the nature of the
2 accident, the level of contamination, the recovery that's anticipated. If their
3 property was -- let's take their home. If their home was contaminated, we would
4 either respond by cleaning it up. If it was pre-habitable, then that would be the
5 end of their loss, theoretically. If it was not to be cleaned up, then there would be
6 some payment for the value of that property, and that would, theoretically, solve
7 their claim for their lost property. They would be made whole for that property,
8 based on some economic evaluation of the value of that property -- pre-accident,
9 of course.

10 If it looks as though the consequences of the accident are going to
11 exceed this level of protection that we have available right now of \$12.6 billion,
12 then it would be up to ANI or, potentially, the NRC to file a petition with the court
13 to come up with a compensation plan for the entire population and economy that
14 was affected by this accident. If it looks like the funds are not going to be
15 adequate to cover it, then we have to come up with a plan, and a plan for both
16 compensating the various constituents that are affected, how much they're going
17 to be compensated for, whether additional compensation needs to be --
18 additional funds need to be acquired through some other mechanism besides
19 what's currently structured in Price Anderson.

20 And there was a plan, a skeleton of a plan put together, I believe it
21 was in 1990 timeframe following the Three Mile Island accident that tends to form
22 a framework that we would -- that would be a beginning point that we would use
23 and then attempt to put some additional details into that plan. But, you know,
24 that's essentially how it would work.

25 COMMISSIONER OSTENDORFF: Thank you very much. Thank

1 you Madam Chairman.

2 CHAIRMAN MACFARLANE: Thank you. Thank you all,
3 gentlemen, for an excellent set of presentations this morning. We will now take a
4 five-minute break and reconvene to hear from the NRC staff.

5 [break]

6 CHAIRMAN MACFARLANE: Okay, I think we will get going again;
7 otherwise we're going to be going deep into the afternoon. So now we will hear
8 from the NRC staff, and I will turn it over to Bill Borchardt, the Executive Director
9 for Operations.

10 Bill Borchardt: Good morning. Well, the accident at Fukushima
11 Dai-ichi Nuclear Power Station caused the NRC, and, in fact, all nuclear
12 regulators around the world, and nuclear operators, to perform extensive lessons
13 learned assessments and to implement safety enhancements to the plants.
14 However, in addition to the onsite impacts, severe accident resulted in significant
15 offsite impacts to areas around the plant. And although we understand that the --
16 from a radiological perspective, the public was safely evacuated. The
17 radiological releases that occurred as a result of that accident resulted in
18 significant contamination of land.

19 It goes without saying that a severe accident is unacceptable to the
20 NRC. An important objective of the NRC licensing, inspection and oversight
21 programs is preventing a severe accident from occurring in the first place.
22 However, since the probably of an accident cannot be entirely eliminated, we
23 also must take measures to ensure that measures are in place for the mitigation
24 and emergency response to those events.

25 While the NRC safety goal policy statement focuses on the health

1 risk to the public from a nuclear power plant operation, it does not explicitly
2 establish the goals for socioeconomic impacts or offsite property damage.
3 However, as part of our authority, the NRC staff does take offsite property
4 damage into consideration in a number of our regulatory processes. In
5 accordance with our authorities, the regulations and guidance use the term
6 "property damage" to cover the broad range of offsite economic impacts resulting
7 from severe accidents, including the loss of use and damage to property,
8 relocation costs and business disruption.

9 A multi-office working group has prepared a notation vote paper for
10 the Commission exploring the NRC's current consideration of economic
11 consequences and providing options for future regulatory approach. We believe
12 that economic consequences are considered in appropriate manner in our
13 regulatory processes. As such, Option One is to maintain the status quo, with
14 some improvements and coordination and prioritization of activities. Option Two
15 would more systematically update and enhance our regulatory framework. This
16 option would also better harmonize the regulatory guidance across the agency
17 and the major programs of our responsibility. And Option Three would explore
18 changes to the framework to specifically address offsite property damage. It
19 should be noted that options two and three are not mutually exclusive. Of
20 course, each option has its pros and cons, and that will be the subject of the
21 staff's presentation.

22 So now I'll turn the presentation over to Lisa London from the Office
23 of the General Counsel.

24 LISA LONDON: Good morning, Chairman. Good morning,
25 Commissioners. I'm here today to talk you to a little bit about the NRC legal

1 authorities concerning offsite property damage.

2 The Commission's primary duty under the Atomic Energy Act is to
3 ensure that the agency's licensing and regulatory actions provide for common
4 defense and security as well as adequate protection of the health and safety of
5 the public. In carrying out this duty, the Commission relies on the technical
6 judgments made by the experienced professionals at the NRC. And those
7 technical judgments provide the building blocks for the health and safety findings
8 vital to these regulatory actions. And in ensuring adequate protection, cost has
9 not entered the equation.

10 Currently, however, the NRC does actually require licensees
11 undertake measures that, while aren't necessarily aimed at preventing offsite
12 property damage, but they actually have that intended effect. And one such
13 example would be found in 10 CFR 20.1501, which states that licensees must
14 conduct surveys to determine concentrations or quantities of radioactive
15 materials and potential radiological hazard. Next slide, please. We're actually on
16 Slide 3.

17 When we discuss offsite property damage, we are actually talking
18 about unintentional releases from an NRC licensed facility. And that would either
19 be by accident or malicious act. The Atomic Energy Act uses the term "property"
20 rather than "economic consequences." And we actually interpret that term to
21 refer to a wide spectrum of items: everything from land to business interests such
22 as loss of rental income.

23 Even if measures are not required for adequate protection,
24 however, the Commission has the discretionary authority to consider such
25 measures. In doing so, the Commission can look at the cost of these measures,

1 but if the Commission does decide to go ahead and require measures based on
2 considerations other than adequate protection, a backfit analysis would be
3 required. Next slide.

4 Any NRC action to impose requirements on licensees must be
5 based on those authorities given to the agency by the AEA, the Atomic Energy
6 Act. One example that illustrates the Commission's wide discretion is actually
7 found in Section 103 of the AEA, which deals with commercial licenses and
8 contains language directed towards minimizing danger to property. That section
9 actually specifically states, "The Commission can issue licenses to persons who
10 agree to observe such safety standards to protect health and to minimize danger
11 to property." Similar language can actually be found throughout several sections
12 in the AEA and the Office of General Counsel can provide you with a listing of
13 those sections if you'd like. Next slide.

14 Congress enacted a regulatory scheme for the Atomic Energy
15 Commission, now the NRC, with the aim of providing flexibility and broad
16 authority to deal with a variety of issues that could arise, but the Commission's
17 authority is not unbounded. A radiological harm should be linked to damage -- to
18 the damage the Commission seeks to prevent. There's actually some case law
19 out there that speaks to this conclusion, and again, the Office of General Counsel
20 can provide you with a summary of that case law if you'd like. Next slide.

21 To recap, consistent with Congress' intent, the Commission has
22 broad discretion to require steps be taken to prevent offsite damage to property,
23 but such measures should have a nexus to radiological harm or injury. In
24 considering the scope of these measures, however, the Commission may
25 consider factors, such as resource limitations, and where most impact from use

1 of resources can actually be obtained. The over-arching point we're seeking to
2 deliver to the Commission today is that the Commission actually has wide
3 discretion in this area. Thank you. If you have any questions, I'll pass it on to
4 Deborah Jackson.

5 DEBORAH JACKSON: Thank you, Lisa. Good morning, Chairman
6 and Commissioners. My name is Deborah Jackson, and I'm the deputy director
7 of the Division of Intergovernmental Liaison and Rulemaking in FSME. DILR
8 staff performs rulemaking for FSME and NMSS. Next slide, please.

9 My presentation will summarize the agency's general approach
10 performing regulatory and backfit analysis, and I'll briefly discuss the scope of
11 material's activities addressed by the staff and our experience in evaluating
12 offsite property damage. Next slide, please.

13 A regulatory analysis, or an RA, is a structured evaluation of a
14 proposed requirement with estimates of benefits and costs in constant dollars to
15 the fullest extent possible. Regulatory analyses are used to ensure that NRC
16 decisions are based on adequate information concerning the need for, and
17 consequences of, the proposed requirement that appropriate alternatives are
18 identified and analyzed, that clearly no alternative is available, and that proposed
19 actions subject to backfit are properly documented. We also use regulatory
20 analysis to promote transparency in modeling the financial impact of proposed
21 actions on stakeholders. It is not uncommon for a provision and a final rule to be
22 changed based on comments that we received on the regulatory analysis for the
23 proposed rule.

24 The staff prepares regulatory analysis for proposed and final rules.
25 All offices follow the agency guidance in NUREG BR-0058 entitled the

1 Regulatory Guidelines for the United States Nuclear Regulatory Commission,
2 and NUREG BR-0184, Regulatory Analysis Technical Evaluation Handbook.
3 These guidance documents identify 18 attributes that a proposed action could
4 affect. Each attribute represents an economic consequence. One of these
5 attributes, offsite property damage, or OPD, is a primary focus of our briefing
6 today.

7 Offsite property damage is typically modeled as a change in
8 accident frequency multiplied by the property-related consequences of an
9 accident. OPD includes the cost of evacuation and relocation, decontamination
10 and clean-up, losses due to contaminated food disposal, temporary interdiction,
11 and permanent interdiction when lands are condemned. Next slide, please.

12 For backfitting, the staff follows agency guidance in NUREG-1409
13 entitled Backfitting Guidelines. This was published in 1990, and they also follow
14 the guidance in NUREG BR-0058, which was previously mentioned. In general,
15 a backfit is an addition or modification to the licensee's facilities or procedures
16 after the license has been issued. The NRC's backfit requirements have been
17 adopted by the Commission as self-imposed restrictions on agency action and
18 are defined in 10 CFR Parts 50, 70, 72, and 76. For new reactors under Part 52,
19 backfitting is called issue finality and is analogous to the backfit regulations in 10
20 CFR Part 50.

21 The regulations provide three exceptions from backfit analysis if a
22 proposed action is necessary to bring a facility into compliance, ensure an
23 adequate level of protection, or define and redefine adequate protection.
24 Statutory mandates and other nondiscretionary additions or modifications, such
25 as reporting or information gathering, are also exempted from backfit analysis.

1 If no exception applies, the regulations require a two-part test to
2 determine if a proposed NRC action is a cost-justified substantial safety
3 enhancement. This will be further discussed in the next presentation by Mr.
4 McGinty.

5 To date, NMSS and FSME have not had a rulemaking subject to
6 backfitting. Thus, we have not been required to perform a backfit analysis. Our
7 rulemakings rarely involve an issue that would affect offsite property. Since
8 1989, offsite property damage has been identified in six regulatory analyses that
9 would support material rules. Next slide, please.

10 The 1989 rule on emergency preparedness for fuel cycle and other
11 material licenses had a regulatory analysis where offsite property damage was
12 quantified. This regulatory analysis analyzed accident histories, source terms,
13 and doses from airborne releases of radioactive materials and hazardous
14 chemicals, and determined that emergency planning would minimize adverse
15 effects from a severe accident.

16 Offsite property damage was also considered in the regulatory
17 analysis for amendments to Part 70 requiring integrated safety analysis, or ISAs,
18 for special nuclear material licensees authorized to possess more than a critical
19 mass. The RA for the Part 70 rule in 2000 did not quantify the benefit of any
20 expected reduction in the risk of offsite property damage. The RA instead
21 reviewed accident histories with offsite releases of uranium compounds and
22 hazardous chemicals at fuel fabrication facilities, and determined that requiring
23 ISAs would reduce the risk of accidents and implicitly offsite property damage at
24 these facilities.

25 The regulatory analysis for the Part 40 rule, which is now under

1 Commission review to require ISAs for major uranium conversion and de-
2 conversion facilities is modeled after the regulatory analysis for Part 70, and
3 evaluated offsite property damage qualitatively as well. This regulatory analysis
4 also reviewed accident histories with offsite releases at these facilities, and also
5 determined qualitatively that requiring ISAs would reduce the risk of accidents.

6 A final rule amending 10 CFR Part 73 was recently approved by the
7 Commission. This final rule provides physical protection of spent fuel in transit.
8 This rule reduces the risk that offsite properties would be affected by radiological
9 releases resulting from sabotage, and the RA reflected this benefit qualitatively.
10 The 2000 rule on industrial devices containing by-product material had a
11 regulatory analysis that quantified offsite property damage. Prior to the rule,
12 improperly discarded, transferred, and melted devices had contaminated steel
13 mills and scrap metal recycling facilities and the RA used clean-up data cost to
14 justify requiring device registration.

15 Lastly, the regulatory analysis supporting the final rule providing
16 physical protection of by-product material, the new Part 37, recently approved by
17 the Commission, evaluated property damage qualitatively.

18 Thank you for your attention, and I'll turn it to Tim McGinty.

19 TIMOTHY MCGINTY: Thank you, Debbie. Good morning. I'm Tim
20 McGinty. I'm the director of the Division of Policy and Rulemaking in the Office of
21 Nuclear Reactor Regulation. My staff does regulatory analysis and backfitting
22 analysis for operating reactors. We do it for several types of regulatory actions,
23 including rulemakings and orders. Similar analysis is done for new reactors. The
24 10 CFR 52.63 issue finality requirements are analogous to the 10 CFR 50.109
25 backfitting requirements.

1 I'll start with an explanation of the relationship between regulatory
2 analysis and backfitting, how they interact, and I'm going to focus on backfitting,
3 because Ms. Jackson just covered regulatory analysis and it's very similar for
4 operating reactors.

5 Next I'll go through a couple of examples of regulatory actions
6 under the backfit rule as they're related to the main backfitting decision points.

7 And finally, I'll discuss 10 CFR 50.63, the station blackout rule from
8 1988. It should be a good illustration of the detailed backfitting analysis that is
9 used to satisfy the backfit rule. Next slide, please.

10 I'd like to use this diagram to compare backfitting requirements with
11 regulatory analysis guidance for operating reactors. First to note, for regulatory
12 analysis offsite property is always considered. This is not always the case for a
13 backfit analysis. So up in the upper left-hand corner under the backfit side of the
14 column, the first decision point is, is it a backfit? As an example, is it a facility
15 modification as a result of a new staff position? Or is it a statutory mandate
16 without NRC discretion? Otherwise, if backfitting protection applies we move
17 down further into the blue section of this where we now determine whether the
18 regulatory action is an exception to doing a backfit analysis, and Debbie already
19 covered the exceptions, compliance, providing adequate protection, defining or
20 redefining adequate protection. If no exception applies, then a backfit analysis is
21 required. The backfit analysis typically pools significant amounts of information
22 into it from the regulatory analysis.

23 Moving down, the first part is that the determination is whether or
24 not a substantial increase to public health and safety is under consideration.
25 That does not consider onsite nor offsite property, and usually that typically

1 involves a safety goal screening analysis. Then the second part of the backfit
2 analysis, at the bottom left, considers the direct and indirect costs of
3 implementing the rule. That is, is it cost justified?

4 On the right-hand side is the regulatory analysis that was covered
5 by Ms. Jackson. A good way of thinking of and remembering regulatory analysis
6 from this perspective is that it considers all the costs, all the benefits, all the time.
7 Next slide, please.

8 This table illustrates a couple of examples of how backfitting has
9 been applied to a few of our regulatory actions. For the first one, the risk
10 informed categorization rule of 2004 that was determined to not be a backfit due
11 to the voluntary nature of the rule. On the next example the 2012 orders for
12 reliable hardened vents, the adequate protection exception allowed an exemption
13 to the backfit analysis requirements in that case. And finally, the station blackout
14 rule of 1988 is an example where the Commission approved a cost-justified
15 safety enhancement, and I'm going to go into more detail on that now. Next
16 slide, please.

17 Part of the reason I chose the station blackout rule was that the
18 Commission asked for comments during the preparation of the final rule. We
19 asked whether the backfit analysis properly implemented the backfitting rule. We
20 also asked did it establish a substantial increase to public health and safety, and
21 we got a significant amount of feedback from interested members of the public
22 with respect to that. Some of the feedback that we received were that the factors
23 used for cost justifying the safety enhancement were not properly considered,
24 and we also got feedback that we shouldn't consider cost when we consider
25 doing rules.

1 With that said, the station blackout rule was considered beyond
2 adequate protection, because at the time of the rule, there was not an undue risk
3 to public health. So based on the station blackout's core damage frequency,
4 which was at 4.17 times 10 to the minus fifth per reactor year before the rule, the
5 staff published its regulatory and backfit analysis as NUREG-1109, and that
6 determined that by implementing the rule, core damage frequency decreased by
7 2.6 times 10 to the minus five per reactor year. So that met the backfit criteria of
8 a substantial safety enhancement.

9 The other thing I'll note is that commenters pointed out during the
10 final rule that the risk for station blackout was high for some plants and low for
11 some plants, and so there was concern that in the aggregate it would turn out
12 that the risk would be treated low for plants in the aggregate. In response, the
13 staff changed the rule language so it was on a plant-specific basis and
14 implemented that via a regulatory guide. Thus, because the station blackout rule
15 was not needed for adequate protection, the staff performed a detailed backfitting
16 analysis. Next slide, please.

17 For the first part of the two-part backfit analysis, the staff had to
18 determine whether it was a substantial increase to health and safety. For this
19 determination, the staff only evaluated the benefit to public health, not onsite
20 property, nor offsite property. We did this by multiplying the expected release per
21 accident, which includes early fatalities, injuries, and late cancer fatalities, by the
22 change in probability for the accident by imposing the rule. The results were that
23 the total averted dose to the public from offsite release of radioactive material
24 was 145,000 person-rem. Therefore, that's a substantial increase to public
25 health and safety and thus we moved on to the second part of the backfit

1 analysis. Next slide, please.

2 The second part is the consideration of benefits and costs, and
3 used results calculated in the regulatory analysis. In determining quantified costs
4 and benefits, all the public health benefits, including averted dose to public and
5 site workers, and all the costs, including industry and NRC implementation and
6 offsite and onsite property, were compiled. The results show that the benefits
7 exceeded the costs, which justified imposing the station blackout rule. However,
8 the station blackout backfitting analysis also used qualitative risk assessments to
9 assess benefits. Next slide, please.

10 The staff determined that the station blackout rule also met the
11 qualitative safety goals and, because of large uncertainties of containment
12 performance regarding the probability of failure following severe accidents at that
13 time, it was not possible to ensure that the accident would occur less than one in
14 one million reactor years of operation, and thus for Defense in-Depth purposes, it
15 was also qualitatively confirmed that the station blackout rule should be
16 implemented, and so it was, as a cost-justified substantial safety enhancement in
17 1988. Next slide.

18 Finally, I'd like to reiterate two observations. First, within backfitting
19 if inadequate protection exception applies, then the NRC does not consider
20 offsite property. We would impose the rule or order without further analysis.
21 Second, backfit analysis considers offsite property damage as an averted cost.
22 That is, the substantial increase in safety part of the evaluation is only based on
23 public health and safety. Offsite property is only considered in the cost-justified
24 part of the analysis. And with that I'd like to turn it over to Scott Flanders from the
25 Office of New Reactors.

1 SCOTT FLANDERS: Thank you, Tim. Good morning, Chairman,
2 Commissioners. My name is Scott Flanders, and I'm the director of the Division
3 of Site Safety and Environment Analysis in the Office of New Reactors. One of
4 my division's responsibilities is to support the development of environmental
5 impact statements for new reactor license reviews. Today I'm going to discuss
6 how the staff considers economic consequences, or as discussed earlier, offsite
7 property damage in environmental reviews for operating reactor license renewals
8 and for new reactors. Can I have the next slide, please?

9 During my presentation I will briefly discuss the evolution of NRC's
10 current approach to accident consideration under the National Environmental
11 Policy Act, typically referred to as NEPA. I will describe how the staff's
12 environmental impact statement discusses offsite property damage potentially
13 resulting from severe accidents, and how the staff considers economic
14 consequences and severe accident mitigation alternatives analysis. Can I have
15 the next slide, please?

16 The scope and approach the staff currently uses to discuss
17 accidents in NEPA documents for reactors are based on an evolution of
18 Commission policy and other factors. This slide cites a few major milestones. In
19 1971 the NRC proposed to amend Appendix C to Part 50 to include an annex
20 that describes how accidents should be addressed in an environmental impact
21 statement. This initial guidance excluded consideration of severe accidents on
22 the basis that although the consequences could be large, the likelihood of a
23 severe accident is so small that the risk is extremely low. This initial guidance
24 also required the staff to use assumptions as realistic as the state of the art
25 allows when estimating the likelihood and consequences of accidents.

1 This practice remained in effect until 1980 when the Commission
2 issued a new policy statement that withdrew the 1971 proposed amendment and
3 stated that severe accidents should be considered in environmental impact
4 statements. The Commission also indicated the staff should discuss
5 consequences in probabilistic terms when the probability of the accident
6 occurring has been estimated, and to discuss socioeconomic impacts, as well as
7 radiological exposure. The Commission also directed the staff to identify
8 additional cases that might warrant early consideration of either additional
9 features or other actions that would prevent or mitigate the consequences of
10 severe accidents.

11 The 1989 Limerick decision is also noteworthy. In that case the
12 court ruled that NEPA requires that the environmental impacts of an agency
13 action be given careful consideration and that the public be informed. The court
14 concluded that the Commission's decision to exclude severe action mitigation
15 design alternatives for the Limerick environmental impact statement, based on a
16 1985 policy statement on severe accidents, rather than through careful
17 consideration was not consistent with NEPA. Can I have the next slide, please?

18 Today the staff's environmental impact statements for new reactor
19 applications considers the impacts of severe accidents. For license renewal
20 applications, the environmental impacts of severe accidents were analyzed
21 generically in NUREG-1437, the generic environmental impact statement for
22 license renewal of nuclear power plants, and codified in Appendix B to part 51 as
23 a small impact; however, it's considered a Category II impact for license renewal
24 and the staff -- what that means is that the staff would consider any new and
25 significant information and determine whether or not they need to further

1 consider severe accidents in their NEPA review.

2 In evaluating the environmental impacts of severe accidents for
3 new reactors, staff considers offsite property damage. The staff's analysis
4 considers internal and external events and presents the cause as probability
5 weighted consequences or more simply as the environmental risk. The staff
6 uses specific information and state of the art modeling methods to estimate the
7 environmental risk. Can I have the next slide, please?

8 This slide shows an example of how offsite property damage risks
9 are reported in an environmental impact statement for new reactors. This
10 example is taken from the final environmental impact statement for the VC
11 Summer combined license. It should be noted that the slide shows only a portion
12 of the actual table that is included in that Summer final environmental impact
13 statement. The actual table contains additional information including human
14 health environmental risk and the core damage frequency for each accident
15 release class presented.

16 The mean offsite property damage risks are reported in dollars per
17 reactor year. The offsite costs are estimated costs of early protective actions for
18 emergency response and for long-term protective actions taken offsite. This
19 includes evacuation and relocation, including food and lodging costs,
20 decontamination costs for property that can be returned to use if
21 decontaminated, economic losses for temporary interdiction and/or
22 decontamination, economic losses for contaminated food disposal, and economic
23 losses for condemnation of land. Can I have the next slide, please?

24 Consistent with the 1980 policy statement, the staff examines
25 possible actions that could be taken to further reduce offsite property damage

1 and other consequences resulting from severe accidents. These actions can
2 include design modifications, changes to procedures, or training. To identify
3 possible actions and assess the relative merit of implementing an action, the staff
4 performs a systematic review referred to as a severe accident and mitigation
5 alternatives analysis. Can I have the next slide, please?

6 Severe accident mitigation alternatives analyses are considered in
7 new reactor environmental impact statements in a license renewal supplemental
8 environmental statements if, in the case of license renewal, if a SAMA analysis
9 was not previously considered for that facility. The staff has a systematic
10 approach to the analysis. Some of the significant steps are identifying leading
11 contributors to risk, identifying candidate mitigation alternatives, estimating risk
12 reduction and implementation costs, and determining potentially beneficial cost
13 mitigation alternatives. Can I have the next slide, please?

14 The severe accident mitigation alternative cost-benefit evaluation
15 considers offsite property damage costs and the methods for performing the
16 cost-benefit evaluation is similar to that used in regulatory analyses and in
17 backfitting, as discussed earlier by Debbie and Tim. The staff uses the same
18 guidance documents as those mentioned earlier as well.

19 The net value of a specific mitigation alternative is the difference
20 between the averted cost or the benefit and the cost of implementing the change.
21 The averted cost is related to the consequences avoided by adopting the
22 mitigated alternative. So in the case of offsite property damage, it would be the
23 change in offsite property damage estimate as a result of implementing the
24 mitigation feature.

25 In conclusion, I would like to leave you with a few final thoughts.

1 Essentially, from the time federal agencies were required to evaluate the
2 environmental impacts of their actions, the NRC recognized the need to address
3 environmental consequences of accidents including economic costs. The
4 approach the staff uses is consistent with Commission policy. Specifically, the
5 offsite property damage, like other environmental consequences, are discussed
6 in reactor EISs as probability weighted consequences.

7 The staff evaluates and discloses alternatives to mitigate severe
8 accidents and in doing so considers offsite property damage. And the staff uses
9 the state of art methods to estimate the likelihood and the consequences of
10 severe accidents, as well as other actions that could possibly mitigate them.
11 And, Chairman, Commissioners, I would like to thank you for your time and
12 attention. And now, I'd like to turn it over to Mr. Rich Correia.

13 RICHARD CORREIA: Thank you, Scott. Good morning, Chairman
14 and Commissioners. My name is Richard Correia, director of the Division of Risk
15 Analysis in the Office of Research. My role here is I was tasked to develop the
16 economic consequence SECY paper. Next slide, please.

17 As the EDO mentioned the recent SECY paper, SECY-12-0110,
18 the staff focused on the NRC's current processes for considering economic
19 consequences and based on the analysis of these processes concluded that the
20 NRC's regulatory framework for considering outside property damage is sound
21 and affords sufficient flexibility to account for offsite economic consequences
22 associated with unintended radiological releases and subsequent offsite property
23 damage. However, within this framework the staff identified improvements to the
24 related implementation guidance and provided two options for updating and
25 enhancing guidance in this area. The staff also recognized that the current

1 Commission safety goal policy statement and backfit rule provisions do not
2 expressly include minimization of the offsite property damage as one of the
3 objectives.

4 Therefore, the staff also developed a third option that would explore
5 potential ways to revise the regulatory framework. My presentation will provide
6 an overview of these three options and participant feedback from two public
7 meetings. Next slide, please.

8 In Option One currently staff is pursuing activities to update its
9 regulatory analysis guidance associated with values and parameters used in
10 cost-benefit analysis. Option One would maintain the status quo with regard to
11 both this practice and routine updates. The updates would continue at their
12 current schedule and frequency. To ensure that the various program offices
13 proceed with updates in a coherent and consistent matter under this option, the
14 staff plans to improve coordination and prioritization of these activities. This
15 option does not result in a fundamental change in the regulatory framework in
16 that there would be no new or revised policy statements, changes in regulatory
17 requirements, or revision to the cost-benefit analysis methodology.

18 Primary advantages to this option are that it maintains a regulatory
19 stability, would have minimal impact on budgeted resources, and would be more
20 responsive to the specific regulatory and licensing needs of an individual office.
21 An additional advantage is this option is consistent with Near Term Task Force
22 reports conclusion that the NRC's approach to the issue of land contamination
23 from reactor accidents is sound.

24 Primary disadvantages of this option are that it does not ensure the
25 guidance updates or given priority and thus may not be conducted in a timely

1 fashion or consistently across programs. Furthermore, although the staff
2 currently has sufficient flexibility to address offsite property damage within the
3 current regulatory framework, these evaluations are typically performed on a
4 case by case basis, which can result in sudden inefficiencies. Additionally, this
5 option may not address possible stakeholder concerns or the current methods for
6 considering offsite property damage. Next slide, please.

7 In Option Two the staff would systematically update and enhance
8 regulatory guidance in a comprehensive, integrated, and coordinated fashion.
9 However, the pace of scheduling these activities may be moderated when
10 considering other ongoing activities, such as Near Term Task Force
11 Recommendation 1. Updates would include currently planned for parameters
12 already pursued in Option One. In addition, the staff would identify potential
13 areas to develop new guidance as needed for other regulatory applications such
14 as materials, fuel cycle facilities, security, and emergency preparedness.
15 Moreover, the staff would improve guidance for estimating offsite economic costs
16 based on up-to-date data, and recent and future advancements, and accident
17 consequence assessment knowledge, such as the state of the art reactor
18 consequence reactor consequence analysis insights, lessons from the current
19 Level 3 Probability Risk Assessment project, and Fukushima follow-up activities
20 such as Recommendation one. Such activities have not received budget priority
21 under status quo.

22 Similar to Option One, this option does not result in fundamental
23 change in the regulatory framework. No new or revised policy statements, no
24 changes of regulatory requirements, and no revision to cost-benefit analysis
25 methodology. Staff anticipates that this option would result in better clarity of

1 guidance and more consistency across the agency. Advantages of this option
2 are that they would provide a systematic approach to updating guidance and
3 addressing agency-level needs rather than at an office level, while providing a
4 stable and predictable regulatory process and would provide more
5 comprehensive guidance for parameters that are currently available. As such,
6 this option would lead to better harmonization in applying regulatory analysis
7 guidance across the agency, and integration among offices and projects, and
8 promote better prioritization of guidance update activities. As with Option One,
9 this option is consistent with Near Term Task Force report's conclusion that the
10 NRC's current approach to the issue of land contamination from reactor
11 accidents is sound.

12 Primary disadvantages of this option is that it would require more
13 resources than Option One. These resources would be associated with
14 implementing updates and developing new guidance. And this option may not
15 address possible stakeholder concerns with current methodologies used
16 considering outside property damage. Next slide, please.

17 The staff recognizes that the current Commission safety goal policy
18 statement and backfit rule provisions of the reactor materials regulations do not
19 expressly include minimization of land contamination and offsite property
20 damage as one of its objectives. As such, the staff developed Option Three,
21 which would explore the merits of potential changes to the regulatory framework.
22 For example a risk and foreign policy statement on offsite property damage could
23 be considered. The alternative would involve developing a policy statement for
24 offsite property damage that parallels the design and structure of the policy
25 statement on safety goals for the operation of nuclear power plants. If

1 implemented such a policy statement could be used to support guidance
2 development and future regulatory enhancements for consideration of offsite
3 property damage.

4 Other possible changes to the regulatory framework could include
5 rulemaking. This alternative would consider several regulatory changes or
6 additions. For instance, these changes could include adding licensing
7 requirements, addressing offsite property to reactor regulations similar to those
8 found in materials regulations. This alternative could also explore changes to the
9 backfit regulations to expressly address offsite property damage in applicable
10 reactor material regulations and the new reactor finality provisions in Part 52.

11 Another possible change could involve changes to the analysis
12 methodology. For example, a change in the policy to conduct generic backfitting
13 analysis on a site by site basis using facility specific offsite economic values
14 could result in backfitting only specific subset of facilities under consideration.
15 Any actions taken under Option Three would have to be coordinated with
16 ongoing initiatives such as Near Term Task Force Recommendation 1, and staff
17 activities to evaluate recommendations in NUREG-2150, a proposed risk
18 management regulatory framework.

19 Advantages to this approach are that it would provide a clear
20 Commission statement on the importance of outside property damage as a
21 consequence of severe accidents, which could be used to support guidance
22 development and future regulatory enhancements. This approach would also
23 promote transparency of agency decision making, as there would be likely many
24 opportunities for stakeholder engagement.

25 One disadvantage for this option is the potential perception of

1 increased regulatory uncertainty, a perception that may accompany any change
2 to the regulatory framework. Another disadvantage is that the staff would be
3 developing options for addressing offsite property damage in the regulatory
4 framework and parallel to other potential regulatory changes that might arise
5 from Near Term Task Force or risk management task force follow-up activities.

6 This option would require close coordination with these other
7 activities, increased complexity of tasks, and potentially divert or dilute limited
8 resources from high priority Near Term Task Force follow-up activities. In
9 addition to the resources associated with options one or two, this option is
10 estimated to require significant staff resources. Next slide, please.

11 Two public meetings were conducted, one on May 24th, one on
12 August 29th. They both had significant participant interest. The May 24th
13 meeting was conducted to inform the public of staff activities underway on the
14 economics consequence tasking. The meeting had limited feedback given the
15 staff was still developing the SECY paper.

16 The August 29th meeting was conducted to provide the public
17 information on the contents of SECY-12-0110 and to answer their questions.
18 Several participants expressed interest and support for Option Three, offered
19 comment on current staff practices, and a desire for more transparency on how
20 outside property damage is considered in regulatory analysis. Last slide, please.

21 In conclusion, the staff recommends that the Commission approve
22 Option Two. The staff has determined that this option would provide a coherent
23 framework for needed updates to guidance documents integral to performing
24 cost-benefit analysis. The staff does not recommend Option Three because it
25 believes that current Commission policies and regulations are sound and

1 adequately consider the economic consequences resulting from the unintended
2 release of radioactive material. Thank you.

3 BILL BORCHARDT: That completes the staff's presentation.

4 CHAIRMAN MACFARLANE: Great, thank you very much. So I will
5 start again with the questions. And let's start just where we left off, and Richard
6 or Bill feel free to jump in on this one. So, you know, in looking at the three
7 options, I guess I was a little surprised to learn that Option Three was to explore
8 the merits of potential changes. Wasn't that the purpose of the paper? You
9 know, I was hoping for something a little more concrete.

10 RICHARD CORREIA: The tasking, Chairman, was to look at
11 current practices and to what extent would the staff recommend changes to the
12 practices and to further explore possible changes to the regulatory framework; so
13 it was both look at current practices and consideration of changes to the
14 framework.

15 BILL BORCHARDT: I think, from my perspective, with the
16 exception of some of the experts sitting with me on this side of the table, this
17 area is not broadly and well understood by the staff and I think the public as a
18 whole. One of the first things we wanted to do was get a baseline understanding
19 of what the current practices were and then some ideas of how we might move
20 forward. We're not in a position to dedicate a significant amount of resources
21 given all of the other Fukushima Near Term Task Force activities that were going
22 on, as well as our normal day-to-day responsibilities for the oversight of the
23 current licensees. So this was, although not an insignificant amount of work, we
24 didn't want to create a very large resource burden without engaging the
25 Commission. So this was a first step.

1 CHAIRMAN MACFARLANE: Okay. And just to go a little further
2 here. It seems in my view it's sort of hard to disagree that exploring the merits of
3 future changes to the regulatory framework was worthwhile and appropriate. So
4 I want to push you a little bit further. You sort of said -- gave one explanation of
5 why you didn't recommend Option Three, but it seems that it could be worthwhile
6 to do and I want to understand a little bit more, if you have any more explanation
7 of why you didn't pursue that. And then why wouldn't you try to sort of suggest a
8 timeline? If you don't think it's appropriate to do now because it diverts
9 resources, you could say it could be appropriate in the future kind of thing.

10 RICHARD CORREIA: Well, likely, Chairman, one of the reasons
11 we probably didn't recommend Option Three, we believe the Commission
12 already has the flexibility to make decisions based on economic consequences
13 today, as Lisa mentioned. Also, this is something that prior Commissions have
14 visited as early as the early 1980s. And for various reasons decided it wasn't
15 necessary to include a policy statement or something discreet in the regulations.

16 So in retrospect we were thinking well, is it necessary to go back
17 and revisit all that to come to the same conclusion, or in light of Fukushima, has
18 something changed? Do we need to do something different? So we left it as a
19 possible area for further exploration with the concern that it would take significant
20 resources to develop changes to policy or regulation.

21 BILL BORCHARDT: I think the point made in the first panel about
22 the linkage to Recommendation 1 in the Near Term Task Force is a good one.
23 Obviously, there's nothing off the table under Recommendation Number 1. This
24 would be a factor in it, a possible path forward. But even that is in early next
25 year, I think because February is when we owe the first paper. That's not going

1 to provide endpoints or answers. It's really a plan for moving forward and what
2 kind of issues have been identified in a general approach. So this might be one
3 of those items that would be in Recommendation 1. We thought given all of the
4 discussion about the land contaminations at Fukushima and in Japan after that
5 event that this deserved a little bit of a baselining early.

6 CHAIRMAN MACFARLANE: Okay. The other issue that occurred
7 to me, as I was reading this, is I felt I didn't have adequate context to understand
8 this issue. And so some of the context I was looking for and, you know -- any of
9 you jump in -- is how do other countries handle implementation of these kinds of
10 requirements? Do they have something similar to our backfit rule? Do they --
11 and how do they consider this larger issue of economic consequences? That
12 was one question. Have you looked into that?

13 BILL BORCHARDT: I don't have a very good answer of how they
14 consider economic consequences. I will say that as far as the backfit rule is
15 concerned, we're one of a very small number of countries that have any such
16 requirement. They are much more inclined to develop a regulatory requirement
17 and impose it and that's the end of the discussion.

18 CHAIRMAN MACFARLANE: Well, I'd be interested. I think it
19 would be worthwhile for the staff to explore what other countries do especially in
20 terms of economic consequences just so we can have this in context. And then,
21 furthermore, for further context I was, you know, it sort of occurred to me that --
22 how do other federal agencies that are similar regulatory agencies handle these
23 kinds of questions of economic consequences? Did you guys look into that at
24 all?

25 RICHARD CORREIA: We did in a limited way, Chairman. I think

1 what we heard from EPA today was probably some of the better thinking on
2 economic consequences that at least EPA considers. I'm not certain what other
3 agencies do or don't do personally.

4 CHAIRMAN MACFARLANE: Well, I would, again, urge you guys,
5 you know, to think about that and add some context to this so we know where we
6 fit as an agency as well. That's all I have, Commissioner Svinicki?

7 COMMISSIONER SVINICKI: Thank you, Chairman. And I do
8 thank the staff for their work on this. When I go early in the questioning
9 sequence, I listen carefully to the questions of my colleague for the earlier panel.
10 And as I heard my colleagues talk about the connection and asked questions of
11 the external panel on any nexus, I think I was the one who used "tentacles" --
12 maybe I shouldn't be using that term -- on any connection between
13 Recommendation 1 of the Near Term Task Force. Of course Commissioner
14 Apostolakis had his risk task force and now the staff has a tasking there to come
15 back to the Commission. I think Commissioner Apostolakis said that was mid
16 next year.

17 You know sometimes early in our career when we learn something
18 it's -- we learn it in such a vivid way that we never forget. And when an
19 analogous something happens 25 years later, you hear the voice of that person
20 who taught you a lesson. Someone was -- I was not associated with NRC. They
21 were explaining to me NRC's licensing process for Part 71, spent fuel cask
22 packaging, and again, this will sound basic. I was very early in my career and I
23 did not really understand the NRC. They said, "Well," and they were very
24 indignant, I don't remember what I said, but the answer I got was so indignant
25 that I never forgot it. It was, "Well, you can't go to NRC and say here's the lid

1 and will you license this lid?" And then come back six months later and say,
2 "Here are the impact limiters. I want you to license these impact limiters."
3 Because it's a little bit like Commissioner Magwood said, at the end then NRC
4 would have a whole package when really we evaluate package performance.
5 We would've approved every component and then they would say, "Well, you
6 approved this thing." Well, what if, as a package, it didn't perform the right way?
7 And again, I know that sounds very basic, but as I think about the very
8 comprehensive issues that the Commission is trying to tackle with
9 Recommendation one with Commissioner Apostolakis' task force work and what
10 the staff might bring back to us on that.

11 When I read the economic consequences paper it did strike me a
12 little bit like a lid. I don't know if there was any thought to having it come as an
13 information paper. This was not a Commission requested paper, and I
14 appreciate that one of the things that you just put forward in your presentations in
15 responding to the Chairman's questions is that there was a perception growing
16 six or eight months ago. Statements were being made that NRC did nothing in
17 the area of economic consequences. And believe me, I feel as righteous as all of
18 you do that having that impression taking root, we needed to have a public
19 engagement and communication that that is, as a factual matter, simply untrue.
20 And hopefully through your presentations today you certainly have exploded the
21 myths that we don't consider this at all because that was just a flat out incorrect
22 statement that was, you know, in a troubling way perhaps taking root in some
23 quarter.

24 So I think that, you know, the paper and your initiative in bringing it
25 forward, I do view the options as the classic way that options are structured for

1 decision makers. You have a, “stay with what you’re doing,” you have a, “we’ll
2 do a whole lot and be really, really ambitious,” and then you have a middle thing
3 that’s, you know, “updates and guidance and do some stuff,” which frankly, you
4 guys don’t need Commission direction to update models and guidance. So you
5 really don’t need us to tell you to do that.

6 But I will say from this side of the table, you know, when we ask for
7 papers, I think we do try to really think about at that moment in time when I get
8 that and have to make a decision, what are the component elements I’m going to
9 need to make a thoughtful decision. And we have a lot of other moving parts.
10 So having heard me said all that and this is -- well, this isn’t really for Rich. I
11 mean he got a tasking to do a paper so he did a paper. My question is at a
12 higher level, you know. Can you see now, based on some of the Q-and-A that
13 you’ve heard what we’re struggling with over here? And could you see this as it’s
14 kind of difficult for us to choose these options? You know it was interesting,
15 there was a statement that said, you know, Option Three would have to be
16 coordinated with ongoing initiatives such as Recommendation 1 and the risk task
17 force. And so I think that extends to the decision itself in this paper is that it
18 needs to be coordinated enough that even the decision needs to be coordinated
19 with those items, not just make the decision and the implementation will be
20 coordinated with those items. So, Bill, I’d like your reaction to that.

21 BILL BORCHARDT: Well, I believe Option Two is mostly the
22 activities we have under our own control, these are things that we can do. And in
23 some degree I think what we’re asking for is just the Commission’s agreement
24 that this is a reasonable path forward. It makes some improvements. It
25 recognizes that we have the Recommendation 1 issue, which is much broader

1 and much more holistic view of the regulatory approach. And that would be our
2 recommended path forward. So did it really need to be a notation vote paper?
3 Probably not, but, you know, this gives -- because it had so many previous years
4 ago Commission decisions related to this topic, we wanted, in an effort to be
5 open, let the public and the Commission know how we view it.

6 COMMISSIONER SVINICKI: I will say that the primer was very
7 helpful and I, maybe I just envisioned it as more of a, you know, to prepare the
8 Commission informationally for these broader decisions. But I would, as a
9 personal matter, share, I guess, some of this perspective and feedback with you,
10 which is that well, we sit here on the anniversary of 9/11, which is so interesting
11 that I've been thinking of it this way not realizing that this meeting would occur on
12 this day. But, you know, with all due respect to the Herculean efforts of both the
13 Commission on 9/11 and the staff. And that was an area where we needed to
14 move at a pace on things that was, you know, the outside world wasn't going to
15 wait for us and there were immediately effective decisions and then there was
16 more thoughtful regulatory analysis that occurred later.

17 But when I look at what they did, which was a really historic period
18 for regulatory changes in the security arena. When I think about a
19 Recommendation 1 paper or perhaps what the staff might bring back about
20 beyond design basis and historic pivots away from all these previous
21 Commissions that did look at things like economic consequences and they drew
22 a line at a certain place. And what we're contemplating now is redrawing a line.
23 I mean Recommendation 1 is revising the regulatory framework. I mean is there
24 -- I don't know what more broad issue a member of the Commission over the
25 history of NRC could be asked to vote on that would have a bigger impact than

1 that.

2 So what I would say to you, and Miss Jackson gave such a
3 thoughtful dissertation on regulatory analysis and it says, "It's used to ensure that
4 decisions are based on adequate information concerning the need and the
5 consequences for the proposed requirement that appropriate alternatives are
6 identified and analyzed and that there's no preferable alternative." And I could
7 go on, but the Commission needs at least that much as we look at something
8 that has, I think, a more significant potential to change safety and security
9 regulation in this country, principally safety, but we know there's an nexus on a
10 going forward basis more broadly than anything I think since Three Mile Island
11 and perhaps more so.

12 So I hope that as you approach the coming SECY papers, this is
13 just my personal view, really, I hope you realize that the tremendous, you know,
14 weight of the decisions that the Commission is contemplating and maybe don't
15 approach it as you would a typical SECY paper where Option One is to just stay
16 where Option Three is to do maybe too much, and you know, the one in the
17 middle. I think we try hard, you know, to give direction to the staff that is going to
18 equip us to make the decisions that we need to make. We didn't engage with
19 you on this one so I sit here and say maybe an Info paper, the Chairman says,
20 you know, you should have taken Option Three and fully developed it. And that's
21 what happens when we don't engage with you on a paper that we're going to get.

22 So, I appreciate you listening to that. That being said, you know,
23 you've achieved something with this paper, with this meeting, with the public
24 meetings that you've held as you've done this work, to at least dispel this notion
25 that the Commission, it's never occurred to them that theirs offsite damages from

1 a severe accident. You know, whether or not we need to chart a new course, I
2 don't know, but -- so please don't interpret any of this as being that you haven't
3 invested in something very meaningful. I think that this has been good, whether
4 or not, when I stitch all this together, it presents enough for me to really make a
5 decision on this right now, I don't know. That'll be the deliberative process that
6 we'll engage in. And I don't know, based on all I've said, if there's any of you that
7 would like to just -- if there's anything that you want to make sure I understood
8 about what the staff's done or presented, please -- please so indicate. And
9 nobody is, okay. Nobody has anything to say. Thank you, Chairman.

10 CHAIRMAN MACFARLANE: Thank you, Commissioner Svinicki.
11 On to Commissioner Apostolakis.

12 COMMISSIONER APOSTOLAKIS: Thank you, Madam Chairman.
13 I do agree with everything Commissioner Svinicki said. I really don't know what
14 to do with this paper. I'll do something with it.

15 [laughter]

16 On Slide 28, Mr. Flanders told us that the SAMA/SAMDA analysis
17 is systematic, and it's searching for potentially cost beneficial enhancements to
18 further reduce risk, correct? That's what it says.

19 SCOTT FLANDERS: Yeah.

20 COMMISSIONER APOSTOLAKIS: That's correct. And yet, a few
21 minutes before you, we heard Mr. McGinty go through the SBO rule, and the cost
22 benefit analysis. And a question comes to me. How come your systematic
23 analysis did not catch SBO? And it had to be caught by a PRA later.

24 SCOTT FLANDERS: I would just say this. The staff in terms of
25 doing SAMA analysis, they do that for a site specific consideration. And in doing

1 the site specific consideration, you're looking at and considering alternatives to
2 mitigate severe accidents for a particular facility.

3 COMMISSIONER APOSTOLAKIS: Station blackout is a severe
4 accident, and yet, SAMA did not catch it. And that's only one of several that
5 contributed to the patchwork. So, my question then is, obviously, SBO and
6 maybe ATWS and others, were caught because we did a PRA after the plant
7 was built, correct?

8 SCOTT FLANDERS: Possibly. I mean, you have to keep in the
9 context of, with a SAMA review, when it's done, it's done as a part of the
10 environmental review, which is -- the outcome of which, and I don't know the
11 history of what those EISs showed in those analyses in terms of whether or not
12 they showed that such an action could have been cost beneficial, but in NEPA
13 space, it's more of a disclosure responsibility as opposed to an action.

14 COMMISSIONER APOSTOLAKIS: Yeah, maybe you
15 misunderstand me. I'm not really blaming the SAMA for anything. I think the
16 difference is that you don't have all the information when you do the SAMA
17 analysis. SBO was identified later, when people had information and they did a
18 risk analysis of the plants. So the question is then, which is maybe not of today,
19 but should we have a SAMA kind of analysis after we have the plants built and
20 we do the PRAs?

21 SCOTT FLANDERS: I would --

22 COMMISSIONER APOSTOLAKIS: In other words have a
23 systematic search for potentially cost beneficial enhancements.

24 SCOTT FLANDERS: Yeah, I better understand your question and I
25 thank you. So, if you look at an approach for new reactors, one of the things

1 that's done as a part of the design certification is consideration that severe
2 accident mitigation, as a part of the early DC review, and that also is informed by
3 a probabilistic risk assessment, which is the guidance that came out of the 1985
4 policy. So, I think the other approach is more -- mirrors more what you're
5 describing.

6 COMMISSIONER APOSTOLAKIS: But the plant has not been built
7 yet.

8 SCOTT FLANDERS: That's correct.

9 COMMISSIONER APOSTOLAKIS: So that may come a little
10 closer, but it's not really --

11 SCOTT FLANDERS: Keep in mind we also required for them to
12 send in a site specific PRA prior to fuel load and for new reactors as well.

13 COMMISSIONER APOSTOLAKIS: Anyway, that -- it just occurred
14 to me as I was reading this that maybe we should do it twice. One is during the
15 licensing process and one is afterwards when we have more complete
16 information that would justify something like the SBO, and we wouldn't end up
17 with a patchwork again.

18 TIMOTHY MCGINTY: I would say that with respect to existing
19 methodologies that the staff has for identifying and coping with issues that are
20 identified after a plant is built, we have the operating experience program, the
21 generic issues program, that are -- I would say are the benchmark. And the
22 inspection program as a whole, for identifying those kind of issues. And then to
23 apply risk insights to them to determine what regulatory action would be
24 appropriate.

25 COMMISSIONER APOSTOLAKIS: But we don't have a systematic

1 search. That's a difference.

2 TIMOTHY MCGINTY: Noted.

3 COMMISSIONER APOSTOLAKIS: Thank you very much, Madam
4 Chairman.

5 CHAIRMAN MACFARLANE: Thank you. Commissioner
6 Magwood?

7 COMMISSIONER MAGWOOD: Thank you, Chairman. Let me
8 approach -- I had questions but I think some of them have been obviated by
9 some of the conversations we just had. First, let me associate myself with
10 Commissioner Svinicki's comments. I think it was well put and appreciated,
11 particularly the fact that she highlighted the fact the staff today has presented a
12 pretty healthy portfolio of the consideration of offsite contamination effects in our
13 regulatory structure and I think it's very important. And also, Commissioner
14 Svinicki, you can talk about tentacles any time you want.

15 COMMISSIONER SVINICKI: [laughs] The thing is, I don't eat
16 calamari or anything. You think it would come from that but it doesn't.

17 COMMISSIONER MAGWOOD: Neither do I. I don't eat tentacles.
18 Don't eat things with eyes. Lots of things like that.

19 [laughter]

20 I wonder, Bill, sort of after hearing this conversation today, we had
21 some indication of that even in the first panel, is there a path forward that
22 perhaps the staff would like to think about? Because, you know, the Chairman
23 had some other questions that could have been fleshed out in another paper. Is
24 there -- what do you think the right path is at this point?

25 BILL BORCHARDT: Well, other than Option Two, which I think the

1 staff has the authority to make the improvements, if the Commission didn't object
2 to that approach. I think that's the way we would proceed, to try to get a little
3 more harmonization. That's one internal improvement that we think is
4 worthwhile. Then, I think having this issue be part of the grander issue of
5 Recommendation 1, would be a longer term activity but it would be a more
6 holistic approach for moving forward.

7 COMMISSIONER MAGWOOD: So, I hear -- so your thought is,
8 take on all this discussion you've heard today, bring it into recommendation,
9 Recommendation 1 paper, whatever that looks like. I guess then you -- I'm not
10 sure if I'm clear. Do you need approval from the Commission on Option Two? I
11 guess we have a paper so we have to react to the paper. So whether we react to
12 the paper or not, you would move forward with Option Two and then take the
13 substance of what's really Option Three and bring that into consideration with
14 Recommendation 1. That's kind of the path forward you envision.

15 BILL BORCHARDT: Right, and I don't really think, in my view, that
16 I need much Commission guidance in order to include it in Recommendation 1,
17 because that, and many other topics are included in Recommendation 1 already,
18 which the Commission has given us direction to do.

19 COMMISSIONER MAGWOOD: I think that's right. I think it's
20 something else that we also -- I would certainly like to see -- is have ACRS views
21 on you know, this topic and certainly Recommendation 1 before we are in
22 position to make a judgment on it. So I think what, Chairman, might be the best
23 approach would be to include some reflection of the EDO's path forward in the
24 meeting record, just to memorialize it. To make it clear that that's the path we're
25 talking. And we can, you know, get into the specifics of what exactly that says in

1 the SRM process, but I mean, I think what Bill's recommending is a reasonable
2 path and you know, we'll just to think a little bit about exactly what that looks like,
3 but I think that's a rational path forward, so we'll look forward to -- I do have one
4 specific actually. I'd wanted -- and Mr. Flanders's presentation. On Slide 26, you
5 made some mention of intermediate and late containment failure in the analysis
6 that we performed, what are those based on? What are those numbers based
7 on? What analysis do you --

8 SCOTT FLANDERS: So, under slide -- this is the one with the
9 table.

10 COMMISSIONER MAGWOOD: Yeah, Slide 26.

11 SCOTT FLANDERS: The way in which we work with the -- in doing
12 that analysis is looking at severe accidents, we work with the safety side that
13 does in Chapter 19 Risk assessment, probabilistic risk assessment. And we get
14 the accidents, severe accident sequences from them, and get the core damage
15 frequency from them. And then from there -- as well as the source term -- and
16 then you take that source term, and those core damage frequencies, and use the
17 MACCS2 code to estimate the offsite consequences. So, that information comes
18 from -- as inputted we coordinate with the safety review to get those.

19 COMMISSIONER MAGWOOD: Is this related to the LRF analysis
20 that the applicants have to provide to the agency?

21 SCOTT FLANDERS: I believe it is, as a part of the Chapter 19
22 analysis, but I can -- I'm just looking for it. Confirmation, yes, that's correct.

23 COMMISSIONER MAGWOOD: Okay. So this is the kind of
24 information of what we'll get from an LRF analysis, and Mr. Lyman was
25 advocating that we do for essentially everything. I don't know, Bill, give you a

1 chance to react to the LRF conversation. I know the staff, this has been pretty
2 clear that it's happy with the -- with LERF as a path forward, but what kind of
3 thought -- what kind of discussion has the staff had about LRF over time?

4 BILL BORCHARDT: I actually don't want to take that question on,
5 so let me see if Charlie Ader is here.

6 COMMISSIONER MAGWOOD: I've already heard what he says.

7 [laughter]

8 I'm always hearing from you. This is like the third time in --

9 CHARLES ADER: Third, fourth time now. Could -- if you could
10 restate your question and make sure --

11 COMMISSIONER MAGWOOD: Yeah, I was just -- I was looking at
12 this -- Slide 26. And wondering, we had -- we heard from Dr. Lyman today that
13 he believes that we should use LRF as a means of understanding containment
14 integrity over the course of the life of the severe accident, and these -- the values
15 that were in Slide 26 sort of bolster that case a bit, because it gives you
16 information that -- about a potential severe accident in a new plant in the context
17 of an application that we wouldn't have for an existing plant if we were looking at
18 a severe accident. I'm just wondering what, as the staff thinks about that kind of
19 information, and when you made the recommendation we should stay with LERF,
20 and to not go to LRF, you know, what are we leaving behind, and why isn't that
21 important?

22 CHARLES ADER: For the record, I'm Charles Ader, Office of New
23 Reactors. I could probably have a three hour discussion on the history of LRF,
24 LERF. LRF as we've used it in the new reactors has been a metric to see the
25 plants have met a certain, you know, probability of not having a large release. In

1 the NEPA context, the late containment failure, along with early containment
2 failure, no containment failure, are all considered in the Chapter 19, in the PRA,
3 in the applicant's -- what Scott, their draft environmental report? So, we're still
4 looking at late containment failure. We're not abandoning that. That is part of
5 the NEPA. It'll be part of looking at are there cost beneficial severe accident
6 mitigation alternatives. So it factors in that fashion.

7 We also have in new reactors some deterministic, like, 24 hour no
8 containment failure for 24 hours post-severe accident, so we also have alternate
9 containment performance objectives that go beyond the LERF. The other paper
10 you have in front of you, 12-0081, is putting LRF, LERF in the context of the
11 current risk informed licensing process, 1174. There, we were staying, you
12 know, following Commission guidance on that paper, to try to use the existing
13 framework. We did recommend supplementing that to continue to address long
14 term containment performance as part of the other considerations in 1174.

15 COMMISSIONER MAGWOOD: I appreciate hearing that for the
16 third time.

17 CHARLES ADER: And I hope we told it to you the same way.

18 COMMISSIONER MAGWOOD: But again, I think when I see --
19 when I see Slide 26, I see information that in the NEPA context obviously, but
20 with the information that we wouldn't have in the context of reviewing the safety
21 performance of existing reactors, and I just wanted to understand more what the
22 staff -- what we're leaving on the table by not having that type of analysis. Is the
23 reason not to do it is because we've made a policy decision that LERF gives us
24 the information we need to protect public health and safety in the context of
25 emergency preparedness, and therefore we don't need this other information.

1 Or, is this other information difficult to calculate and unreliable? I just want to
2 understand why we would you know, resist Dr. Lyman's call for the use of LRF
3 for existing reactors.

4 CHARLES ADER: Well, I don't think we're leaving late containment
5 failure information on the table. It's still considered in the PRAs, it's considered in
6 Chapter 19. For new reactors, we're going to require an update of the PRA prior
7 to fuel load and then I think it's every three years after that they need to update.
8 And that would be part of a Level 2 analysis, is the longer term containment
9 performance. So we have the information available. The context we were
10 talking and the risk framework in the 12-0081 paper that's in front of you was how
11 we implement the risk informed licensing approach, like Reg Guide 1174, which
12 is risk informed changes. There, the standards have LERF; there is no common
13 definition of LRF. We spent three years back in the early 90s trying to come up
14 with a definition that was in the context of the current safety goal and found it to
15 be an impossible task at that time. It was over constrained.

16 COMMISSIONER MAGWOOD: Okay, I don't believe an impossible
17 task, but --

18 CHARLES ADER: It was over constrained.

19 COMMISSIONER MAGWOOD: I suspect we'll be talking about this
20 again, so my time is up, so thanks again.

21 CHARLES ADER: I'll be back a fourth time if you'd like.

22 COMMISSIONER MAGWOOD: We'll see you the fourth time.

23 [laughter]

24 CHAIRMAN MACFARLANE: Thank you. Commissioner
25 Ostendorff.

1 COMMISSIONER OSTENDORFF: Thank you, Madam Chairman.
2 I want to start out by joining my colleagues in their support of Commissioner
3 Svinicki's comments. I thought that Commissioner Svinicki, your articulation of
4 the challenges of Commission decision making in this -- not just post-Fukushima
5 but also about history of the agency, I thought that was extraordinarily helpful.
6 So thank you for that very clear statement and trying to put it in perspective. Not
7 a criticism of the staff at all. I think, quite frankly, we see this paper as a very
8 positive catalyst to help us be in a position to have this discussion, which, I think,
9 is very, very useful. So I -- I don't think anything Commissioner Svinicki said was
10 critical to the paper at all. I think it was all just sharing, hey, this is a tough issue,
11 and it's also interconnected with lots of other tough issues here. So I think we're
12 all better off for having received the paper, irrespective of how the Commission
13 comes out on it.

14 I just have one quick question for the EDO and one quick comment.
15 One, the question, Bill, for you, is when Mike Johnson and the -- and Dave
16 Skeen looking at the steering committee and JLD type issues, were framing the
17 time period for the filtered vent paper to come up here in November. Was there
18 some expectation that we would take a particular action on this SECY paper on
19 EC, to enable the staff to finish this work on the filter recommendation or not?

20 BILL BORCHARDT: I see Mike wants to answer.

21 MICHAEL JOHNSON: Thanks for your question, Commissioner
22 Ostendorff. I think the short answer is that we certainly didn't want to predict how
23 long it would take the Commission to consider an answer based on what we
24 were laying out in terms of the options for this important issue. But, we wanted
25 you to have that -- this issue that -- information about this issue, in your hands at

1 the time when you were considering the filtered vents paper.

2 COMMISSIONER OSTENDORFF: Thanks, Mike, I appreciate that.

3 The only other comment I'm going to make is just a personal opinion. In the
4 paper, under Option Two discussion, the staff lays out including SOARCA
5 insights. I'll just make the personal comment that I continue to see examples
6 where I'm not sure as an agency we are effectively taking into account the
7 SOARCA study results or integrating its insights into various matters that come
8 before the Commission. It's not a criticism, but I don't think the SOARCA study
9 has gotten sufficient visibility for the agency in some of the papers and policy
10 positions coming to us. Others may disagree, but I just wanted to share that as a
11 personal viewpoint here. So I'm going to stop right there. I really appreciate the
12 briefs today, and thank you, Madam Chairman.

13 CHAIRMAN MACFARLANE: Thank you, Commissioner
14 Ostendorff. Let me just check and see if any of my fellow Commissioners have
15 further comments. No? Okay, great, so we will shortly call this to a halt.

16 I would like to thank very much the staff for their presentations and
17 all their hard work on this issue. And just say that you know, this is obviously a
18 very complex issue, as Commissioner Ostendorff said. And I think, obviously,
19 the accident at Fukushima highlighted this. And my fellow Commissioners and I
20 will continue to engage on this issue and work through it. And we do appreciate
21 all your help and the input from the external panel as well. And with that, we will
22 call the Commission meeting to a halt. Thank you.

23 [whereupon, the proceedings were concluded]