

MINUTES OF THE
BLUE RIBBON COMMISSION ON AMERICA'S
NUCLEAR FUTURE
MEETING OF
MAY 13, 2011 AT THE
RENAISSANCE DUPONT CIRCLE HOTEL
1143 NEW HAMPSHIRE AVENUE, NW, WASHINGTON DC

MEMBERS PRESENT:

LEE HAMILTON, Chair
MARK AYERS
VICKY BAILEY
ALBERT CARNESALE
SUSAN EISENHOWER
JONATHAN LASH
ALLISON MacFARLANE
RICHARD MESERVE
ERNIE MONIZ
PER PETERSON
JOHN ROWE
PHIL SHARP

ALSO PRESENT:

TIM FRAZIER, Designated Federal Official
LAWRENCE KOKAJKO, US Nuclear Regulatory Commission
JENNIFER UHLE, US Nuclear Regulatory Commission
GLENN PODONSKY, US Department of Energy
JAMES O'BRIEN, US Department of Energy
MARY WOOLLEN, consultant to the Commission

PUBLIC COMMENTERS PRESENT:

ROBIN READ, NWFL
TOM COCHRAN, NRDC
DAN BROWN, Securad, Inc.
JUDY TREICHEL, Nevada Nuclear Waste Task Force
ARJUN MAKHIJANI, IEER

KATHERINE FUCHS, Alliance for Nuclear Accountability
GEOFF FETTUS, NRDC
KARA COLTON, Energy Communities Alliance
MICHELE BOYD, PSR
MICHAEL McLAY, MJM Ocean Industries
MICHAEL CONLEY, Thorium Energy Alliance
ROBERT ORR, JR., Thorium Energy Alliance
BRYAN L. BENNET, formerly of the USAF
PARKER GRIFFITH, Thorium Energy Alliance
DIANE D'ARRIGO, NIRS
ALEX CANNARA, Thorium Energy Alliance

Tim Frazier called the meeting to order at 9:01 a.m.

Chair Hamilton thanked those assembled for having come. He noted **Chair Scowcroft**'s absence due to illness, wishing him godspeed in recovery. The day's meeting served two purposes: to cover reviews being conducted by the federal government in response to the natural disaster and resulting nuclear accident at the Fukushima Daiichi plant in Japan, with an eye to what steps are being taken to review the safety of domestic nuclear facilities in light of events in Japan, second, to hear presentations from the Chairmen of the Commission's subcommittees describing the recommendations resulting from their work. Comments from members of the public would be entertained at the end of the day's meeting, and those wishing to speak could sign up any time prior to 2:00 p.m. that day. The amount of time granted to commenters would depend on how many signed up.

Chair Hamilton commented on "the tragedy that has struck our friends in Japan." **Commissioners Ayers, MacFarlane, Peterson** and **Chair Scowcroft** visited Japan in February, a few weeks before the earthquake and tsunami. Those Commissioners were impressed by the hospitality of their Japanese hosts. Some of these hosts are now struggling to gain control on the situation and minimize the public health impacts of the accident. "Our hearts go out to them, to those who perished in the earthquake and tsunami, and to those whose lives have been forever changed by that disaster."

Lawrence Kokajko, Acting Deputy Director of the Office of Nuclear Materials Safety and Safeguards at the US Nuclear Regulatory Commission, was asked to share information that has come out of an ongoing NRC-Commission-directed investigation of plant safety in the US. Mr Kokajko also serves as the Division Director for the Division of High-Level Waste Repository Safety in the Office of Nuclear Materials Safety and Safeguards at the NRC. The earthquake off the coast of Japan was one of the largest recorded. The reactors shut down as they were designed to and diesel generators were activated. The station was then inundated by a tsunami that disrupted power into the station. Battery stocks were depleted, leading to a much more serious situation. The historical record of events at the station is incomplete but may fill in as work continues there.

NRC began monitoring events at the station on March 11, 2011 (effectively the day following the earthquake in Japan) in its Operations Center. The group working there provides advice to the US government and the US embassy in Japan, as well as the government of Japan. NRC sent experts in reactor operations and protective systems to Japan to assist in efforts there.

NRC issued an Information Notice on March 18 to the operators of US plants, providing a discussion of pertinent regulatory requirements on Station Blackout and Advanced Accident Mitigation. Two Temporary Instructions were issued to NRC resident inspectors. The first advised them to provide an independent assessment of the adequacy of actions taken by licensees, to inspect their capability to mitigate conditions beyond Design Basis, and to conduct additional fact-gathering in case future regulatory actions are necessary. The second set of instructions called for resident inspectors to determine whether plants' Severe Accident Mitigation Guidelines were available, the status of their maintenance, and the extent of their implementation in training and exercises.

More, the NRC released its first Bulletin since 2007, requiring actionable response from licensees. NRC seeks comprehensive confirmation that licensees are maintaining equipment and strategies to maintain and restore core-cooling and containment of spent fuel pools following explosions or fires. Satisfactory responses are due to NRC within 30 days of the Bulletin's release. Licensees have 60 days to respond to a list of questions pertaining to maintenance, testing and availability of equipment relied on for mitigation, updates to mitigation strategies, and availability of off-site support. NRC formed a senior-level task force to review information on the events in Japan. The task force will determine whether additional improvements to NRC's regulatory system should be made and will work to assess the adequacy of US plants to withstand a broad range of external events and the ability of plants to mitigate the effects of beyond-design-basis events. The task force's findings will be made available to the public. As of the task force's 30-day update, no issues have yet been identified that would undermine confidence in the continued safety of the US commercial nuclear power plant fleet.

Member Sharp asked whether the dry cask storage system at Fukushima Daiichi had sustained damage. Mr Kokajko replied that about 400 casks were present at the site, located further back from shore and at a higher elevation than the plant. The casks were impacted by the tsunami, though they do not seem to have been damaged.

Member Meserve asked whether the NRC's release of a Bulletin had resulted from what had been found in early inspections following the natural events at Fukushima Daiichi. Mr Kokajko replied, yes. The Commissioner asked for comment on NRC's understanding of the situation at Unit 4 of the plant, especially with regard to the risks associated with spent fuel pool under accident conditions. **Jennifer Uhle**, Deputy Director, Office of Nuclear Regulatory Research at US NRC, replied that, as of the time of the meeting, her answers would be surmising. There was initial concern that the Unit 4 spent fuel pool had suffered a drain-down (either partial or full was unknown). The

Japanese are concluding that there was no fuel damage, and, if there is damage, it would be mechanical in nature, rather than radiologic. Photographic records indicate that the pool is full and the fuel intact. NRC having conducted several studies into spent fuel pool accident progression, they have a very good understanding of the progression in a drain-down event.

Member Peterson emphasized the value of having an independent as well as a scientifically and technically capable regulatory agency available in this situation. He asked what lessons are being learned with respect to the capacity to measure things going on inside the plant, especially water level in spent fuel pools, also with respect to the capacity to move portable equipment where it would be needed to recharge batteries, inject water, etc. Mr Kokajko replied that much of the information is still being learned. He said some lessons have been learned with respect to proper siting of equipment. The robust training of operators is essential. Ms Uhle replied that, with respect to instrumentation capability at US plants, several regulations have been put in place, including NRC GDCs 13, 19 and 64, RG 1.97, and 10 CFR 50.34(f), requiring instruments to be available in various scenarios. Instruments are designed to withstand conditions beyond Design Basis.

Member MacFarlane asked about the current status of Spent Fuel Pool 3 and “if you could also say something about if you have any thinking on why these pools seem to run into trouble earlier than expected.” Mr Kokajko replied that the plants shut down and diesels came on-line as expected following the earthquake. Pressures inside containment were alarming to observers. The pools were designed toward refueling operations, rather than storage. SFP4 had contained fresh used fuel, possessing a higher heat load than older fuels, and some of this fuel, prior to the accident, had been moved to dry cask storage. The several pools did experience water loss. The Commissioner asked if all recommendations from the National Academies’ report (possibly Safety and Security of Commercial Spent Nuclear Fuel Storage) had been implemented. Mr Kokajko replied that spent fuel pools may or may not be safety-related in a given plant. Assessments are ongoing. The Commissioner asked why low-density racking isn’t mandatory. Mr Kokajko replied that this is being considered.

Member Moniz asked how the investigation might affect license-extension considerations. Mr Kokajko replied that license-extension may be changed, pursuant to recommendations from the Task Force. What the Task Force recommends may impact the current fleet, regardless of the plants’ renewal statuses.

Member Lash asked, compared to that in US plants, how densely packed the fuel at Fukushima Daiichi was packed, and how important fuel-pack density is to survivability in accident scenarios. Ms Uhle replied that the density is presently unknown. Density is important, especially with regard to heat transfer. NRC has conducted numerous studies and required licensees to re-rack their fuel. Portable spray systems are required. The Commissioner hopes to receive further information on the interplay of decay heat, interim storage and fast-tracking fuel storage, as is done in Sweden.

Member Rowe asked for comment as to NRC's efforts to regulate Beyond-Design-Basis plant response. Ms Uhle replied that risk studies have been implemented to help understand different accident scenarios, especially WASH-0740 and -1400. Obviously, models do not include unanticipated scenarios. The Station Blackout rule was implemented to mandate the availability of emergency diesel generators during LOOP and Loss of AC Power accidents. ATWS (Anticipated Transient Without Scram) events, due to their high potential consequences, withstand-able. Efforts to regulate plant response in the event of aircraft impact are ongoing. Pursuant to NRC Generic Letter 88-20, plants have reviewed their respective risk profiles with respect to external events. NRC has determined that no plant is causing undue risk to public health and safety. The results of the SOARCA analysis should be released next year. External risk-contributors are necessarily site-specific.

Chair Hamilton noted that the results of NRC's investigation were still tentative two months after the accident, appropriately so. Has the NRC reached any clear conclusions that nuclear power plants need to be safer? Mr Kokajko replied, "we do not have any information that would cause us to doubt the safety of the current operating fleet." Analysis is ongoing.

Member Rowe shared the Chair's sense that the response was unnecessarily tentative. The NRC, and the AEC before it, has always been willing to take into account new information to study and impose new requirements. The NRC has stated its belief that the plants are safe, but continues to look for ways to make them safer.

Member Carnesale asked when NRC might feel confident about its understanding of the accident sequence at Fukushima, since it is bound to affect how the Commission's recommendations will be understood. Mr Kokajko replied that the Task Force will address the NRC Commission on June 19th and their address made public in that month.

Member Moniz said that "crisper" response from the NRC may avert further investigations being mandated by Congress.

Member Meserve said it may be a year or two before the information is available necessary to have a complete understanding of what happened at Fukushima Daiichi.

Member Peterson said the most important action for US plants, that of ensuring the availability of portable cooling and power equipment, has already been taken.

Glenn Podonsky, Chief Health, Safety and Security Officer at US DOE, is coordinating DOE's review of the safety of DOE nuclear facilities in light of the events at Fukushima Daiichi. His office unique, given its independent review of the effectiveness of the Department with respect to the environment, safety, health, safeguards, security, emergency management and cyber security. DOE is reviewing its policies, standards and practices to ensure a robust culture of safety. "DOE cannot succeed in its mission without first protecting our workers, the public and the environment." A graded safety approach has been adopted to provide a higher degree protection for high-consequence facilities. DOE's Nuclear Safety Policy has been revised to ensure adequate protection of workers, the public and the environment of the life-cycle of a nuclear facility.

DOE owns or operates nearly 200 nuclear facilities throughout the US. It's important to understand that DOE nuclear facilities are very different from commercial nuclear reactors. The vast majority of DOE sites are Hazard Category 2 or lower, incapable of causing an off-site release of radiation. The Secretary and Under Secretaries are ultimately responsible for ensuring implementation of nuclear safety requirements, supported by the Office of the Chief of Nuclear Safety and the NMSA Office of Chief of Nuclear Safety, and the Defense Nuclear Facility Safety Board. Numerous changes have been made to strengthen DOE's independent oversight of nuclear facilities, including a new site-lead prioritization approach to safety, conducting targeted inspections, changed inspection-selection practices to increase oversight at higher-hazard facilities, implementing a safety tracking and monitoring system, adding nuclear engineers, improving the National Training Center's programs, increasing transparency and public accessibility. The Department is reassessing its nuclear safety metrics to increase performance, monitor trends and share best practices. A Nuclear Safety and Security Council has been convened.

Within 12 days of the external events at Fukushima Daiichi, Secretary Chu issued a Safety Bulletin, an instrument usually issued by the Chief Health, Safety and Security Officer, in order to highlight the Bulletin's importance. This Bulletin required higher-hazard facilities to perform a self-critical review of their safety analyses. Facility responses have been returned, checked, and are being re-checked by DOE headquarters staff. DOE will decide whether to implement changes at specific sites, and whether global changes to the complex are needed. A workshop to be held on June 6 and 7 is intended to look at the events in Japan and develop recommendations for the US complex.

Member Peterson asked how DOE is supporting the efforts of NRC, NISA and others in mitigating the events at Fukushima Daiichi. Mr Podonsky replied that a nuclear command control center had been stood up and radiological teams dispatched to monitor the area. Acting Assistant Secretary Pete Lyons (a former NRC Commissioner) is in contact with the NRC to support and coordinate efforts.

Member Ayers said "DOE is the best friend that construction workers have, that maintenance workers have, and operations and security workers have." It seems that Japanese nuclear response workers have been placed at very significant risk. He commended the report of StoneTurn Consultants, which had been hired by BRC staff, to the attention of the Commissioners. The main risk to nuclear workers comes about from inexperience in dealing with external conditions and their dependent operational failures, as well as overconfidence in technologies and Probabilistic Risk Assessment. The report recommends greater labor-management collaboration to reduce the effects of deleterious human factors. Mr Podonsky replied that worker health and safety is a priority at DOE. The position he occupies was created to better coordinate safety across the complex.

Member MacFarlane asked why certain facilities in the DOE complex had not been placed in a higher risk category. **Jim O'Brien**, Director, DOE Office of Nuclear

Safety, replied that waterborne radiological contamination is not of as immediate concern as airborne. Beyond-Design-Basis vulnerabilities are being assessed at those sites.

Member Moniz asked why large aqueous reprocessing plants would not be in the highest risk category. Mr Podonsky replied that that decision is being assessed. Mr O'Brien added that the protections in place at Category 1 and 2 facilities are essentially the same. The Commissioner asked if the presence of other independent review bodies was helpful to the DOE. Mr Podonsky replied, yes. The Commissioner asked for comment about the Fukushima response team assembled by the President. Mr Podonsky replied that it was a good assemblage of experts both inside and outside of government. He does not know if there are going to be any specific outputs.

Member Eisenhower asked for comment on how Department reviewers are trained. Mr Podonsky replied that a new training process is currently being stood up. The new program will be standardized across the complex. Safety training must continue to be cutting edge.

Member Moniz asked for comment on making a defense HLW repository the next storage site constructed. Mr Podonsky replied that he would answer later.

A recess was taken from 11:02 to 11:15 a.m.

The Co-Chairs assigned the Transportation and Storage Subcommittee to follow the situation in Japan and make and necessary recommendations to the Commission later this year. **Chair Hamilton** thanked Commission staff for preparing its report to the Commission. The Commission appreciates the public response to the report and their comments, strengthening the Commission's work. The presentations and draft reports of the Subcommittees will be posted on the Commission's website, brc.gov. The Subcommittee reports and the comments received pertaining thereto will form the basis of the full Commission's report to the Secretary. Plans for receiving public comment on the draft report will be announced following release of the draft report. The final report will be issued by January 2012.

Members Meserve and Sharp, Co-Chairs of the Transportation and Storage Subcommittee, provided a review of the Subcommittee's draft recommendations.

Member Meserve said the central question the Subcommittee tried to address is whether the United States should change its approach to storing and transporting spent nuclear fuel and high-level waste while one or more permanent disposal facilities are established. Over the past 50 years, storage and transportation have taken place despite the absence of a disposal facility in the US. Subcommittee meetings were held in Maine (near the location of an ISFSI), in Washington, DC, and in Chicago, a major transportation hub.

The Subcommittee recommends that the US proceed expeditiously to establish one or more consolidated interim storage facilities as part of an integrated, comprehensive plan for managing the back end of the fuel cycle. Having interim storage creates options and flexibility without presenting untoward risks. Storing fuel makes its disposal easier due to reduced heat and radiation loading. Interim storage allows removal of fuel from decommissioned sites, resulting in efficiencies and economic benefits to communities and utilities. Creation of an interim storage system would

enable DOE to start to meet its obligations with respect to spent fuel, with respect to which the Department now stands in partial breach. Interim storage allows removal of fuel to areas less vulnerable to extreme events. Interim storage would be a helpful adjunct to a disposal facility. Interim storage affords opportunities for long-term monitoring and testing of technologies.

“The subcommittee has concluded there do not appear to be unmanageable safety or security risks associated with the current methods of storage at existing sites, but rigorous efforts will be needed to ensure this continues to be the case.” Degradation phenomena need to be seriously examined. The Subcommittee recommends that spent fuel at decommissioned sites should be first in line for transfer to interim storage as soon as it is available.

Member Sharp added that consolidated interim storage is already envisioned in the Nuclear Waste Policy Act, is not new and has been studied extensively. Further developed by the Disposal Subcommittee, these recommendations would be carried out by a new, independent spent-fuel-management entity. The Subcommittee envisions a voluntary siting process. The record for transportation of nuclear materials is extensive and positive. Transportation planning should begin early because it takes time to coordinate and educate officials and communities. Resources should be provided to communities to prepare their own technical analyses. The Nuclear Waste Fund should be used to finance interim storage programs. The burden of paying for present waste disposal should not be imposed on future generations.

Member Carnesale, a member of the Subcommittee, asked for elucidation of the term interim. **Member Meserve** replied that the Subcommittee contemplated a term of about a century for interim storage.

Chair Hamilton asked for the Subcommittee’s thinking with respect to constructing “one or more” storage facilities. **Member Sharp** replied, in terms of volume, one such site would do the trick, though there are advantages to have more sites geographically dispersed. The Chair asked what can be done to reduce taxpayer costs of litigating the partial breach of contract. **Member Meserve** replied that most of the litigation has already been done, though liability continues to accrue. Additionally, new litigation is always possible. Standardized settlements could be created to more efficiently and positively resolve these matters.

Member Peterson said the contracts in place between DOE and waste-holders imposed certain constraints with respect to funding and the sequence with which waste would be removed from its present locations, changing the terms of those agreements may impose new liabilities on taxpayers. Since utilities recover costs, they have an interest in the waste-storage system working efficiently. DOE must maintain a certain rate of waste removal; “How do we get around this problem that there's a perverse disincentive not to send your material to consolidated storage even once it's available?”

Member Sharp replied that there will be opportunities to renegotiate terms. **Member Meserve** added that Judgment Fund monies could be applied to the Waste Fund to finance a waste-management system.

Member Moniz, a member of the Subcommittee, endorsed the recommendations. The looming liability with respect to defense wastes must be kept in mind. The period of a century should be thought of as a planning horizon, rather than a committed period of storage. With respect to transportation, the European experience should be emphasized. More consideration must be given to the contemplated new waste-management organization with respect to funding, authorities, technical issues, etc.

Member MacFarlane recommended giving further consideration to converting present high-density racking in spent fuel pools to lower-density arrangements. She asked how large interim storage facilities would be. **Member Meserve** replied that the future state of spent fuels is still being evaluated. Waste should be moved from pools to dry cask storage. Facilities should be designed to accommodate the waste from the nine decommissioned reactor sites, as well as the fuel from plants that will be decommissioned over the next several years. The first interim storage site may start at a relatively modest size and then expand to accommodate demand. **Member Sharp** said the recommendations provide a policy direction and were not intended to supplant technical considerations.

Member Rowe, a member of the Subcommittee, said a number of the recommendations are necessarily conjoined to those recommendations set forth by the Disposal Subcommittee. A voluntary siting process for interim storage must be combined with a similar process for an ultimate disposal site.

A recess was taken from 12:12 p.m. to 1:04 p.m.

Mr Frazier called the meeting back to order.

Member Lash, Co-Chair of the Disposal Subcommittee with **Member Hagel** (absent), presented on behalf of the Subcommittee. His presentation did not include all the comments of the Subcommittee's members. Some work with respect to the organization they recommend is ongoing. Some recommendations will require statutory action.

The Subcommittee attempted to answer the question, "How do we go about establishing appropriate facilities for disposal of high-level wastes, and how do we do that within a time frame and in a manner that is feasible economically and technically, but also politically and socially acceptable?" The Subcommittee held many meetings and heard from many witnesses. It traveled to facilities in the US, Europe and Japan, soliciting input from industry, communities, government and non-governmental organizations.

Disposal is necessary, and a mined geological repository is the most promising and best accepted. Disposal is an ethical obligation in terms of inter-generational equity. The Disposal Subcommittee endorses the recommendations of the Transportation and Storage Subcommittee. The Disposal Subcommittee recommends the creation of "a new single-purpose entity to take responsibility for the siting and operation of a waste facility, and the responsibility for the creation of interim storage and oversight of the transportation of wastes." Other countries have been successful in their siting efforts by following this approach. The waste-organization entity must act with transparency and

in a spirit of public engagement. Statute must strike a balance between appropriate congressional oversight and the entity's ability to make long-term commitments. The entity will be geared for operations, rather than research.

“Congress should make changes that assure that the new entity has access to [disposal] funds so [the entity] can operate in a predictable manner.” The siting process must be consent-based, transparent, phased, adaptive and consistent with generic, science-based standards. The Subcommittee does not recommend the creation of a state veto. States should occupy a more regulatory role. Dual regulation between NRC and EPA, while inefficient, seems to be a good arrangement. Congress should mandate more coordination between the two. Site-independent safety standards should be developed. The NWTRB is a valuable source of technical advice and independent review; it should be strengthened.

Member Bailey, a member of the Subcommittee, asked for comment whether defense and civilian wastes should be commingled in the same facility. **Member Lash** replied that the Subcommittee had discussed the issue but a conclusion was not reached; more work needs to be done.

Member Peterson, a member of the Subcommittee, said a voluntary siting process is likely to be successful. The Commission does not feel strongly that defense and civilian wastes need to be segregated. It is critically important that new, site-independent, performance-based safety standards be developed. Research awards should be based on merit and capability; infrastructure awards can have a different basis. **Member Lash** added that, as a matter of international experience, communities which receive technical facilities tend to be more receptive to the location of waste facilities.

Member Rowe, a member of the Subcommittee, agreed that siting must be consensual. He expressed some disagreement with **Member Peterson's** comments.

Member Ayers, a member of the Subcommittee, commended Commission staff for working to effectively capture the issues that the Subcommittee explored in its What We've Heard Report.

Member MacFarlane, a member of the Subcommittee, said the Subcommittee's recommendations around consensual siting need further elucidation with respect to operationalization, technical criteria, compensation, etc.

Member Meserve said an adaptive and flexible siting process has been encouraged by the National Academy of Sciences and others. Such an approach may present a challenge to NRC's method of licensure and inspection. NRC does have some site-independent regulations but they need to be revamped. He asked how an entity that is dependent on research would require another entity to conduct research the first entity deems necessary. **Member Lash** said the Subcommittee would be receptive to proposed solutions to this problem.

Member Eisenhower, a member of the Subcommittee, said one of the biggest challenges with respect to the authorities of the new independent entity will be its access to the Nuclear Waste Fund. A predictable waste-management system will yield efficiencies and cost reductions.

Chair Hamilton said he would like to hear from budgetary experts on the notion of assured funding. The Commission must make the case for permanent assured access to funding, though there is no long-term guarantee.

Member Sharp said two issues need to be distinguished; first, that waste-management is a government obligation and, to that extent, the funds are available, second, timely access to the funds is a tougher concern. The Commission should develop a catalog of methods by which the government (especially DOE) engages the public in decisionmaking processes. Different communities may require different forms of engagement. **Member Lash** said the head of the Swedish waste-management corporation had gone from home to home near their repository and learned that the people's concerns were very different than had been anticipated.

Member Moniz said the scientific underpinning of long-term geologic disposal needs to be reinforced. Designs should be based on integrated decisionmaking of geochemistry and other factors. EPA repository regulations may need to be amended. The US waste-classification scheme should be reworked based on risk. Ethically, storage systems should be designed to provide options for future generations. Statutory language may help preserve access to the Nuclear Waste Fund.

Member Carnesale said the Subcommittee's report requires more clarity on what not recommending a state veto means with respect to community representation, especially on transportation issues.

Member MacFarlane said regulating a phased, adaptive approach would be difficult under any quantitative assessment, where all design features need to be known ahead of time. A safety-case approach might help.

Member Sharp said the Commission should emphasize that the management of nuclear waste is a national problem, appealing to patriotism.

A recess was taken from 2:17 p.m. to 2:23 p.m.

Tim Frazier called the meeting to order.

Member Peterson, Co-Chair of the Reactor and Fuel Cycle Technology Subcommittee with **Member Domenici** (absent), presented the recommendations of the Subcommittee. The Subcommittee was formed to answer the question, "Do technical alternatives to today's once-through fuel cycle offer sufficient promise to warrant serious consideration and R&D investment, and do these technologies hold significant potential to influence the way in which used fuel is stored and disposed?" Criteria of evaluation included cost, safety, resource utilization, sustainability, nuclear non-proliferation and counter-terrorism. The Subcommittee did not make any recommendations with respect to specific reactor or reprocessing technologies. Rather, it focused its efforts on developing a policy framework under which technologies might be developed. The Subcommittee held meetings in Idaho Falls and Washington, DC to hear from invited speakers and members of the public.

The Subcommittee arrived at two central conclusions. First, advances in nuclear reactor and fuel cycle technologies may hold promise for achieving substantial benefits in terms of broadly held safety, economic, environmental and energy security challenges.

Second, no currently available or reasonably foreseeable reactor and fuel cycle technologies, including current or potential reprocess or recycle technologies, have the potential to fundamentally alter the waste management challenge this nation confronts over at least the next several decades. Put another way, interim storage and long-term disposal are still necessary components of an integrated fuel-management strategy. The Subcommittee was unable to reach consensus on the desirability or feasibility of closing the fuel cycle.

The Subcommittee made the following recommendations: first, the US should provide stable long-term RD&D support for advanced reactor and fuel cycle technologies that have the potential to offer substantial benefits relative to currently available technologies in terms of safety, cost, resource utilization, sustainability, the promotion of nuclear non-proliferation counter-terrorism goals, and waste storage and disposal needs; second, that the Commission concur with the recommendations of the President's Council of Advisors on Science and Technology pertaining to US energy R&D funding; third, a portion of RD&D funds (about 5-10%) should be appropriated to NRC to accelerate development of regulatory frameworks and supporting anticipatory research for novel components of advanced nuclear energy systems; fourth, the US should continue to take a leadership role in international efforts to address global non-proliferation concerns.

Member Moniz, a member of the Subcommittee, said the first recommendation pertained broadly to LWR and non-LWR technologies, including fuel forms, etc. The Commission should examine how the events at Fukushima might shift the nuclear portfolio.

Member Eisenhower, a member of the Subcommittee, said US leadership pertains not only to non-proliferation, but also to innovation.

Member Meserve, a member of the Subcommittee, said the Subcommittee's first recommendation should be viewed in light of an integrated system, including fuel production, reactor, storage, disposal and other aspects. Reprocessing may serve as an international driver of non-proliferation.

Member Carnesale, a member of the Subcommittee, asked why the second recommendation exclusively pertains to nuclear technology. **Member Peterson** replied that this point is important and merits additional work and consideration.

Member Moniz commended the 2009 DOE roadmap to the Commission's attention as it considers technology investment.

The Commission entertained comments from members of the public. Sixteen persons signed up to provide comments lasting up to three minutes. Topics discussed included, but were not limited to: support for nuclear power generally, and certain technologies specifically; support and lack thereof for the NRC; the proper sequencing of licensing and site selection in repository siting; the comparative risks of nuclear and non-nuclear technologies; the global effects of the events at Fukushima; changes to the waste classification scheme; the roll of HOSS in a waste storage system; problems associated with waste transportation; removal of radiological exemptions from the Clean

Water and Hazardous Waste Acts; the importance of public support for waste-management projects; the advantages of molten salt and/or thorium reactors; and the necessary leadership role of the US on nuclear issues

The Commission adjourned at 3:50 p.m.