Minutes of the
Blue Ribbon Commission on America's Nuclear Future
March 25–26, 2010
Willard Hotel
Washington, D.C.

Commission members present:

Lee Hamilton, Co-Chair	Jonathan Lash
Brent Scowcroft, Co-Chair	Allison Macfarlane
Mark Ayers	Richard Meserve
Vicky Bailey	Per Peterson
Albert Carnesale	John Rowe
Pete Domenici	Philip Sharp
Susan Eisenhower	

Commission members absent:

Charles Hagel	Ernest Moniz

Speakers in order of appearance:

- Steven Chu, Secretary, U.S. Department of Energy (USDOE)
- Mark Holt, Congressional Research Service, Library of Congress
- Matthew Crozat, Program Analyst, Office of the Deputy Assistant Secretary for Fuel Cycle Management, USDOE
- Frank Marcinowski, Deputy Assistant Secretary for Technical and Regulatory Support, USDOE
- John McKenzie, Director of Regulatory Affairs, Deputy Administrator for Naval Reactors, USDOE

Thursday, March 25, 2010
Morning Session

Timothy A. Frazier, the Designated Federal Officer, called the Commission to its seats and introduced **Gen. Brent Scowcroft** for his initial comments. General Scowcroft stated that if this country is to progress, nuclear energy has to be part of the energy mix, and the disposition of the waste from that energy source has to be dealt with. He introduced **Rep. Lee Hamilton**, who said it was a great pleasure to work with Gen. Scowcroft, one of the greatest public servants in the country. The issue of nuclear energy has been debated for more than half a century, and we have struggled with this issue as a nation. Managing the fuel cycle and offering new plans is the problem before this Commission. He expressed confidence that this Commission will succeed. Participation of the public will be welcomed. The Commission is grateful to Secretary Chu and the Department of Energy for providing financial and administrative support. This is an independent commission in both law and fact. A draft report is due to the Secretary in 18 months and a final report within 24 months, although it is hoped that these goals are met even sooner than that. The stakes are high for the country. Scowcroft said that it was an

honor to work with his co-chair, and pointed out that they had had a fruitful relationship over the years.

Domenici said that, during his 36 years in the Senate, a lot of commissions were empanelled, and they produced a lot of reports that ended up in the wastebasket. This Commission is not like that. There is a real job here. There are 57 nuclear power plants under construction in the world, only one of which is in the United States. The United States is far behind because it does not want to decide what to do with used fuel. The United States stopped building nuclear power plants; the world moved on. Foreign countries can get fuel and reactors from other sources, unfettered by U.S. nonproliferation restrictions. The country has thousands of tons of transuranic waste stored in Carlsbad, NM, with no accident in 10 years of operation.

Scowcroft introduced the Secretary of Energy, **Steven Chu**. The Secretary thanked the Commission members for taking on this task. The nation is in a different place than 25 years ago when a renaissance in nuclear power was not anticipated. Now there is a certainty of the growth of nuclear power. The back end of the fuel cycle must be studied thoroughly, and a strategy forward must be formulated. Research must be conducted on how to reduce waste, close the fuel cycle, and decide what to do about storage. This is not a Commission to look for a spot for a repository but to look at the whole fuel cycle.

Hamilton stated that the members recognize that Chu's vision brought about this Commission. The title is very broad. The more specific topic is what to do with nuclear waste. He asked how specific the Commission should be.

Chu said that decision makers need to know what technologies might be available. The focus is definitely on the back end of the fuel cycle. How should things be set up as technology progresses to reduce the spent fuel and final disposition of what will not be wanted in the future? He noted that some spent fuel will have some economic value and future generations may want to look at it. On the other hand, there will be waste for which one wants a final disposition. The technologies of nuclear power and waste processing will change. The Nuclear Regulatory Commission (NRC) has made clear that dry-cask storage aboveground is safe for decades. Part of the Commission's recommendations will deal with the problem that emerges after those decades elapse.

Scowcroft noted that what one does in the front end influences what one has to deal with in the back end and asked how broad an approach the Commission should take. Chu replied that the Commission has to consider the possibility of high-burnup reactors because, if one can reduce the lifetime of the waste, it makes a difference in the answers to be provided. Unless one steps back a bit, one will not get the widest perspective.

Domenici noted that there had been a lot of press on Yucca Mountain and asked if it were correct that Yucca Mountain was not to be considered. Chu answered that the Commission should not spend its time discussing whether Yucca Mountain was a good or bad decision. Looking to the future, the Commission needs to look at interim storage, temporary storage, permanent storage, and all other options in a generic manner. This is not a siting commission.

Eisenhower asked to what degree the Commission should consider the cost and political feasibility of the different options. Chu said that the Commission needs to look 25+ years out and recognize that things will change. It is desired to develop a technology that is proliferation-resistant.

Meserve noted that the charge also mentions disposal of other material from commercial power reactors and asked if low-level waste were in the purview of this Commission. Chu replied, yes.

Hamilton thanked the Secretary for addressing the Commission and for the opportunity to serve on the Commission. [Chu left.] Hamilton opened the floor to a discussion of Commission procedural issues.

Meserve stated that the Commission needs to find a strategy to deal with used fuel. The current situation is not a crisis. These materials can be safely stored with little risk for many decades. Deep geological disposal has been found by the National Academies to be technically safe, and that may be a solution. Reprocessing and recycling may be a way to diminish the challenge. This is a solvable problem. The Commission should define a strategy that will lead to safe disposal. The fact that new construction might add an increment of used fuel to the existing inventory does not change the character of the challenge that must be solved and is not a reason to stop new construction.

Deleted: is
Deleted: the next few
Deleted: RC
Deleted: another solution
Deleted: launch onto a path
Deleted: There is a problem now.
Deleted: spent
Deleted: might be added
Deleted: waste is not a serious issue

Lash noted that most of the Commission members were experts, but he was not. He had agreed to participate in this process because society has to move into a carbon-constrained world. The Commission should spend some time on how to increase power production while leading the world in restraining nuclear proliferation.

Macfarlane said that a case can be made to move the spent fuel of decommissioned reactors. Some kind of geological repository is needed. That fact cannot be escaped. There are numerous waste streams that have to be dealt with in technical, economic, and political terms.

Bailey noted that there is a crisis of confidence. The nation's inability to deal with this problem leads to shortages in nuclear engineering students and other hurdles, such as economic investment and governmental permitting and regulation. This Committee and others need to put some building blocks in place to build that confidence.

Carnesale said that nuclear power has to be safe, economic, and acceptable to the public. Spent fuel reprocessing has not generally been considered in the public debate. Reprocessing has substantial economic, safety, and international implications that should be considered by this Commission.

Deleted: ed
Deleted: by
Deleted: Nuclear waste
Deleted: is
Deleted: not
Deleted: and

Peterson noted that it is important to identify the changes that have occurred in the past 25 years. The current policies do not have the flexibility needed to deal with these changes. This Commission needs to look back at these policies in view of future changes. Environmental-management obligations of the government need to be taken seriously. High standards are needed for safety, security, and nonproliferation. That can be done. Much has been learned about nuclear power regulation in the past 25 years.

Rowe called attention to the fact that his company owns and operates 17 nuclear power reactors. He agreed with Gen. Scowcroft and Sen. Domenici in that nuclear power must play an important role in supplying the energy the nation will need. One reason the nation is not a leader in nuclear power is that it has not come up with a way to deal with the nuclear waste. A solution to this problem is needed soon to be able to get the investor and user confidence to finance and build new nuclear plants. The challenge to this Commission is to come up with a *real* solution.

Sharp observed that there are two broad contributions that this Commission will make. The first is educating ourselves about the entire issue. The second is coming up with actionable recommendations.

Ayers stated that a diverse energy portfolio is needed. This nation's energy needs cannot be met without nuclear power. There is an urgency to allay the concerns of the world and to thoughtfully adopt a management approach to waste management.

Domenici invited Macfarlane and all others to consider the salt-dome, 2700-ft-deep Waste Isolation Pilot Plant (WIPP) disposal site. He suggested a field trip to see its operations and to meet the informed citizens there. They are in favor of the WIPP's operation.

Peterson said that a good strategy is to gain experience at smaller scales and then to scale up. There has been a dramatic improvement in the reliability and safety at small disposal operations. Moving a lot of stuff rapidly is not the way to develop experience.

Bailey noted that on-site storage was not designed to be maintained for more than about 40 years. One question is whether they are safe and effective for longer than that.

Macfarlane said that the Commission does have to spend time learning from the lessons of previous failed policies, partly on political grounds. The Commission needs to see where waste disposal is working and to visit those sites.

Meserve pointed out that even though used fuel does not present a crisis, it does present a serious problem. But it is a problem that can be solved over time. Storage casks are licensed for 40 years, and those licenses can be renewed. The NRC has stated that storage in dry casks is adequately safe and secure for many decades. But dry cask storage is not a final solution. In defining a long-term strategy, the Commission cannot look at any piece of the problem in isolation. The Commission needs to consider safety, security, nonproliferation, economics, long-term fuel supply, and no doubt other factors. The whole system (fuel production, reactors, reprocessing facilities, waste disposal) has to work together.

Deleted: this is not

Deleted: not

Deleted: mean it is not

Deleted: dealt with

Deleted: That issue needs to be looked at

Deleted: S

Deleted: is needed for more than a century. There are decommissioned sites where fuel needs to be removed. This

Deleted: etc.

Deleted: as a total system.

Ayers noted that the Commission's broader vision is the American Nuclear Future. It needs to consider where the fuel comes from and the reactors' manufacture. It needs to make this an American venture.

Eisenhower said that, in addition to the need for best practices and scaling up small operations, the Commission needs to understand the international context and issues. The policies of other countries will be affected by the recommendations of this Commission.

Sharp asked what role the United States should take in the deliberations about the security and supervision of nuclear reactors around the world. This Commission's advice may go to the President and Secretary of State about certain national-policy elements.

The meeting was adjourned for lunch at 12:09 p.m.

Thursday, March 25, 2010
Afternoon Session

The meeting was called back into session at 1:30 p.m. Scowcroft announced that the agenda calls for 15 minutes of public comment; but because of demand, that public-comment period will be expanded to 1 hour. The written and graphic materials will be available on DOE's web site. He introduced **Mark Holt** of the Congressional Research Service of the Library of Congress to review the history of nuclear waste policy.

Early weapons were produced with irradiated reactor fuel dissolved in acid, leaving highly radioactive liquid waste that was stored in large underground steel tanks. Naval reactor spent fuel was later reprocessed to recover highly enriched uranium, leaving

similar liquid wastes. This storage was never viewed as a permanent solution, but the national security need for rapid production took precedence over waste management. Underground tanks were expected to be sufficient until a long-term solution could be found. In 1949, the Atomic Energy Commission (AEC) reported that "better means of isolating, concentrating, immobilizing, and controlling wastes will ultimately be required."

The Atomic Energy Act of 1954 created a framework for the nuclear power industry in which commercial spent fuel was expected to be reprocessed like defense spent fuel, producing similar liquid wastes, with the volume of commercial high-level waste expected to be far higher than defense waste by 2000. Reactors and fuel systems were expected to be designed for reprocessing of the fuel.

In 1957, the National Academy of Sciences (NAS) Waste Disposal Study stated that "radioactive waste can be disposed of safely in a variety of ways and at a large number of sites in the United States." Salt deposits (such as those in Utah/Colorado, Texas/Oklahoma/Kansas, Texas/Louisiana, Michigan, Ohio/Pennsylvania/New York, southern New England, and Delaware/Maryland/Virginia/North Carolina) were found to be the "most promising" method of disposal. Reactor waste was expected to be liquid for transportation and disposal, but solidification "would be advantageous."

In the initial AEC site search, the focus was therefore on salt formations. Experiments were conducted in salt mines with solids and liquids, and solidification methods were investigated. Deep injection of liquid waste was considered at tank storage sites. The first commercial waste-reprocessing plant opened at West Valley, NY, in 1966, producing the first commercial liquid high-level waste.

The AEC announced a plan in June 1970 to investigate an abandoned salt mine in Lyons, KS, for a disposal demonstration project. A 6-month site investigation was anticipated, with low-level transuranic waste disposal beginning by 1974 and high-level waste by 1975. But there was strong state opposition by 1971, and the state refused to allow the site to be used as a repository for nuclear waste because of technical problems with the site: It was too close to another salt mine; there were numerous oil and gas wells in the area, some of which had struck pressurized brine pockets; and there was undocumented solution mining in the area. The AEC issued a statement in 1974 that the site was no longer under consideration.

In 1974, another salt site was volunteered by a community in New Mexico. In 1974, exploratory work was begun on the WIPP in a bedded salt site near Carlsbad, NM, with local support. Like the Lyons site, it was planned for high-level waste and defense transuranic (TRU) waste, but high-level waste was dropped. Congress authorized the deposit of TRU waste in 1979, but the facility did not receive its first shipment until 1999. There was some local support for expansion of operations to include high-level waste, but state officials strongly opposed it.

In 1974, the AEC issued a Draft Environmental Impact Statement (EIS) on developing permanent repositories and storage sites. The report stated that the AEC denies "complete reliance on perpetual storage in man-made surface structures" and anticipates a geologic disposal pilot plant. It continued to evaluate geologic formations at conventional depths. Liquid waste was to be solidified for transport, storage, and disposal, and Hanford, Idaho, and the Nevada Test Site were named as surface-storage candidates. The Draft EIS found unconventional disposal methods (e.g., polar ice sheets

and outer space) to be not “viable.” The AEC and the Energy Research and Development Administration (ERDA) continued the search in the 1970s for bedded-salt (huge areas), salt-dome (localized), basalt, and welded-tuff sites and reported the expectation of a repository demonstration by 1985.

A major policy change was the adoption of the once-through fuel cycle. The AEC started a Generic Environmental Statement on the Use of Recycled Plutonium in Mixed Oxide Fuel in Light Water Reactors (GESMO) in 1973. Nonproliferation concerns about GESMO were heightened by the 1974 Indian nuclear test, which raised great controversy. President Ford announced “deferral” of all reprocessing of commercial fuel in October 1976, and President Carter extended the deferral indefinitely in 1977. The policy became to develop “alternative designs” for breeders, focus on non-weapons-material fuel cycles, initiate a study of spent-fuel storage needs, and terminate GESMO. Congress continued funding for reprocessing R&D. The deferral was reversed by Pres. Reagan, but the funds for reprocessing were halted by that administration.

Under the new policy, away-from-reactor storage was to be provided to prevent capacity problems at plant sites, and repositories were to hold the larger amounts of uranium and plutonium. President Carter commissioned an Interagency Review Group to report in 1979, but it had few actionable recommendations. The Carter policy announced in 1980 stated that a repository site was to be chosen from several qualified alternatives and a State Planning Council was to be established.

With the change in policy, there was a perception of an imminent storage crisis at reactor sites, and there was a difficulty in developing waste sites without a congressional mandate. There were a lot of concerns by potential host states. The National Waste Policy Act (NWPA) was enacted in late 1982 after nearly 4 years of debate. The basic idea was to set up a technically driven process that was considered fair by the selected sites’ states and regions. Two repositories were envisioned, one in the East and one in the West. The first repository would be chosen from previous candidate sites. The second was to use a different geologic medium, subject to congressional approval. The first repository would be limited to 70,000 metric tons until a second repository was licensed.

The Office of Civilian Radioactive Waste Management (OCRWM) was created in DOE to focus on waste. DOE was authorized to sign contracts with utilities to dispose of waste by 1998 in return for fees levied upon nuclear utilities. A monitored retrievable storage (MRS) site search was authorized, and federal interim storage was to be set up for emergencies. There were grants for state oversight and a “state veto.” Waste facilities were to be licensed by the NRC using Environmental Protection Agency (EPA) standards.

Sharp pointed out that the westerners were concerned that they would bear the most pain in this process, and the extent of characterization and its costs were issues. There was universal agreement that a geological repository was the way to go.

DOE was to select five candidate sites from the nine under consideration (excluding WIPP), and three of those five sites were to be selected for characterization. In May, DOE selected Yucca Mountain (NV), Deaf Smith (TX), and Hanford (WA). There was strong congressional opposition in the selected states, and lawsuits were filed.

Sharp pointed out that, in 1986 [transcript of the meeting indicates 1992, corrected here for accuracy], just before an election, the eastern sites were ruled out; there had been several sites in the northeast that had aroused much discussion.

Deleted: 1992

Crystalline rock formations were identified for a second repository by a DOE survey begun in 1979. Preliminary candidate sites were named in a Draft Area Recommendation Report in January 1986; they included 12 candidate sites in 7 states and 8 additional candidate areas. There was a negative public reaction to this report's conclusions. The DOE community meetings drew large crowds of opponents. Host state officials and congressional delegations fought the project. Energy Secretary Herrington suspended the second repository in May 1986 because of lower spent-fuel projections and rising cost projections.

Potential hosts criticized the program on the basis of the methodology for ranking candidates for the first repository, DOE cancellation of the second repository, and Tennessee opposition to the MRS site choice. Opposition threatened to paralyze the program after only 5 years. It was concluded that emergency federal interim storage was not needed because dry storage technology could be used to store the waste. Representative Morris Udall stated that potential host states "no longer trust the technical integrity of the Department of Energy's siting decisions."

The NWPA Amendments of 1987 named Yucca Mountain as the sole repository candidate site. Sequential site characterization was used to cut costs. Technical support was cited for Yucca Mountain, and the political dynamics seemed favorable. The second repository program was eliminated. The MRS site selection was rescinded, and future MRS operation was tied to Yucca Mountain progress. No waste was to be shipped to an MRS. A benefits package was offered to host states. A Nuclear Waste Negotiator was established to find voluntary sites, and a Nuclear Waste Technical Review Board (NWTRB) was established to increase confidence in the DOE technical program; it is still in effect today. President Carter issued a National Security Directive (that was rescinded by Pres. Reagan, although he continued to withhold federal funding for reprocessing) prohibiting fuel reprocessing; Pres. Clinton said that the United States would not reprocess fuel; Pres. G. W. Bush made reprocessing an important part of his nuclear energy policy; and Pres. Obama has continued funding for reprocessing R&D but not for facility construction.

DOE quality-control problems caused delays. Nevada was not interested in benefits and denied state permits. Yucca Mountain was found to have trouble meeting EPA general repository standards. The Energy Policy Act of 1992 required EPA standards just for Yucca Mountain, based on an NAS study. Language was offered to eliminate the need for state permits but was dropped.

The Nuclear Waste Negotiator got started and was authorized to offer incentives to host waste facilities, but a negotiated agreement could not take effect without enactment into law. By the early 1990s, a negotiated agreement for an MRS seemed the best hope for meeting the 1998 NWPA deadline. Some localities were interested but were blocked by state governments. Indian tribes were beyond state control, but Congress cut funding. The Private Fuel Storage (PFS) site proposed by an Indian tribe in Utah received an NRC license in 2006, but the Interior Department denied the requisite permits.

Sharp pointed out that states get involved in the issue largely because they represent communities through which waste must be transported. Domenici argued that cities will want to participate in such disposal. Sharp noted that it takes persistent leadership to bring this about. Lash noted the citation of the Indian nuclear test as driving the nonproliferation debate and asked if Hanford and West Valley were part of the debate of

the NWPA. Sharp said they certainly were. The debate was always too politically driven and not enough scientifically driven. The Nuclear Waste Technical Board was an attempt to give an outlet for citizens, states and anybody else to raise scientific questions, but it was not sufficient to resolve the issue. There were also concerns that DOE was not technically competent to store spent fuel. There are a lot of errors and mythology to be sorted out. There are new threats and technologies today. The current policies are not flexible enough to deal with these issues.

Holt continued: Rewrites of the NWPA were proposed in the 1990s. The 104th Congress considered bills to authorize interim surface storage at Yucca Mountain to meet the 1998 deadline. The House and Senate passed Yucca Mountain storage bills in the 105th Congress; Pres. Clinton opposed those bills. The 106th Congress passed a bill, but it was vetoed by Pres. Clinton, and the Senate narrowly sustained the veto. The bill would have set deadlines for Yucca Mountain licensing and authorized surface storage at Yucca Mountain within 18 months of an NRC repository construction permit.

There have been several proposals in appropriations bills for federal storage sites. The Secretary of Energy issued Yucca Mountain a "site suitability determination" in 2002, triggering action under the NWPA. President Bush recommended the site to Congress. Nevada Gov. Guinn issued a state disapproval. And approval legislation was enacted. The Yucca Mountain license application was submitted in June 2008, but DOE requested license-application withdrawal in March 2010.

Sharp pointed out that there has also been the question of financing. The Nuclear Waste Fund collects a fee on every nuclear kilowatt, and the state utility regulatory commissions have become intensely interested in what happens to that money.

Challenges for future policy include developing promising approaches (or combinations of approaches) that have not previously been tried; determining why previous approaches did not work and modifying them accordingly; and identifying changed circumstances that may lead to better results.

The commercial spent fuel in storage at the end of 2009 is approaching the capacity of Yucca Mountain. Illinois has the most stored waste, and Pennsylvania has quite a bit. The greatest concern is with waste storage at shut-down sites, much of which is in wet storage; again, Illinois has the most.

Recent annual U.S. spent-fuel discharges range from 2000 to 2400 tons. The need for dry-cask storage has increased as reactor pools have filled up. Higher marginal costs have been incurred at shut-down sites. There are 3000 metric tons in storage at 11 sites in 9 states.

Federal liabilities under breach of nuclear-waste contracts would involve storage cost payments of $500 million per year for partial breach and the potential return of all payments plus interest (which would total $30 billion) for full breach. This situation poses impediments to new reactors in terms of the NRC "waste confidence decision," the NWPA requirement for waste contracts to be in effect for a new reactor to be licensed, and public opinion. The DOE environmental-cleanup penalties and long-term waste-storage risk are unknown.

Hamilton asked if the federal government has the responsibility for all storage fees and environmental cleanup. Holt replied that there are enforcement actions that could be taken. Sharp pointed out that there are two funds: one for nuclear waste that is held by the government and one for decommissioning that is held by the utilities. In 1998, Congress

said that the federal government had to take title to spent fuel. Hamilton asked how much the federal government was paying for waste management and cleanup. Holt answered, $6 billion per year for both. The fees levied on nuclear electricity production ($23 billion) are held in Treasury securities and cannot be spent without congressional authority. Rowe suggested that this Commission might want to delve into these funds a little deeper; his company had entered into a settlement with DOE.

A break was declared at 3:01 p.m. At 3:15 p.m., the meeting was called back into session to hear **Matthew Crozat** review scenarios for nuclear energy growth and their implication for used-fuel management, focusing on a 2050 time horizon.

Projections of nuclear energy growth focus on three growth scenarios. In the low- or no-growth scenario, all reactors operate to the end of their current licenses; there are no new renewals and no new builds. This scenario produces a minimum case of spent-fuel production. In the medium-growth scenario, nuclear power maintains a 20% share of electricity production with all reactors in the current fleet operating for 60 years. In the high-growth scenario, nuclear power grows to a 50% share of electricity production by 2050. In these projections, it is assumed that electricity grows 1% per year through 2050; all new reactors resemble Gen III+ concepts (large, light-water reactors) with a generic 1400-MW(e) capacity; new builds are constrained to ramp up production; and the average burnup is 50 gigawatt days per metric ton of initial heavy metal (GWd/MTiHM); this is about 20 MT/GW(e)-yr.

In the low-growth scenario, nuclear electricity is phased out by 2049, and almost 100,000 MT of used fuel are produced. In the medium-growth scenario, even with an average build rate of about three reactors per year, the vast majority of the used fuel comes from current reactors by 2050. In the high-growth scenario, there are about 260 reactors resulting from a sustained build rate of about nine reactors per year, and about half of the used fuel still comes from legacy reactors.

The range in electricity production in the three scenarios is much more dramatic than the used-fuel production, with production tapering off to zero in the low-growth scenario and rising to almost 3 trillion kW-hr in 2050.

Hamilton asked which scenario was the most likely. Crozat replied that that depends on the policies adopted. The Energy Information Administration (EIA) sees a no-carbon policy; other experts would disagree. Most would go with the middle scenario. Hamilton asked if the DOE has an opinion. Ayers answered that the first question that would have to be answered is whether there is a tax on carbon; otherwise, utilities would go with cheap coal. Rowe noted that, in the high-growth scenario, carbon emissions would be cut in half. Peterson added that the rate at which reactors produce spent fuel has dropped significantly and that the fees are paid on a kilowatt-produced basis, not on the amount of spent fuel produced. Macfarlane said that the fee is 1 mil per kWh and is set by law. Heat and composition (radioisotopic makeup) are the main determinants of repository requirements. Rowe stated that there are several ways to get at the nuclear problem, and the ones with the most intellectual integrity are cap and trade of carbon emissions or a carbon tax.

Crozat continued: The expected used nuclear fuel from reactors operating in 2050 is calculated by assuming that the reactors run for their full lifetimes (taken to be 60 years), and they do not consider any additional new builds after 2050. In the medium-growth scenario, the spent fuel produced after 2050 is slightly less than that produced before

2050. In the high-growth scenario, the spent fuel produced after 2050 is significantly more than that produced before 2050, even after operation of today's reactors ceases in 2050.

There is a range of used-fuel projections that will need to be considered. Even a low-growth scenario implies about 100,000 metric tons with much of the inventory being produced after 2050. Building new reactors in the coming decades will create expectations of used fuel production beyond 2050. New reactor concepts and fuel-cycle-management approaches could be notably different than in the current system. The amount of used fuel is only one of the relevant attributes.

Frank Marcinowski was asked to provide an overview of DOE's spent nuclear fuel (SNF) and high-level waste (HLW). This inventory excludes naval waste but includes a small amount of spent fuel from R&D programs in Oak Ridge (in Tennessee). Some is damaged fuel (e.g., from Three-Mile Island).

The current SNF inventory is held at the Hanford Site (in Washington), Idaho National Laboratory (INL), Fort St. Vrain (in Colorado), the Savannah River Site (SRS, in South Carolina), and other sites. This inventory totals about 2458 metric tons of heavy metal (MTHM) with Defense accounting for about 2149 MTHM; this total is equivalent to about 3500 DOE canisters. DOE retrieves fuel from university reactors. The waste is divided into 34 categories. A programmatic EIS covers all these activities.

Lash asked where the money is spent among these sites. Marcinowski replied that the annual budget is about $5.8 billion, about one-third of which goes to HLW and fuel. There is overlap with cleanup.

Defense waste includes DOE production reactors and R&D reactors. Non-defense includes core debris from the Three-Mile Island reactor, commercial power demonstration projects [Shippingport (in Pennsylvania), Peach Bottom (in Pennsylvania), and Fort St. Vrain (in Colorado)], domestic research reactors (DRR), and foreign research reactors (FRR, a part of the U.S. nonproliferation efforts).

The Idaho settlement agreement requires that spent nuclear fuel be put in dry storage by December 31, 2023, and out of Idaho by January 1, 2035. DOE is well along with these goals. The penalty for not meeting these goals is a suspension of SNF receipts into Idaho and payment to the State of Idaho of $60,000 per day in violation, subject to appropriations. DOE also has a commitment to the State of Colorado that calls for the Fort St. Vrain spent nuclear fuel to be out of Colorado by January 1, 2035.

Peterson asked if the HLW from naval operations at INL was covered. Marcinowski replied, yes.

In Hanford, all SNF has been moved from wet to dry storage. SNF is stored in about 400 multicanister overpacks and other dry casks. At the appropriate time, DOE will need to package and ship this waste to a repository. Rowe asked about the liquid wastes in tanks. Marcinowski answered that those still exist.

At INL, the diverse inventory of SNF includes both DOE-origin and commercial SNF stored with numerous dry-storage methods and a wet storage pool (containing material being moved to dry storage). Sodium-bonded SNF is stored and may require treatment; the sodium-bonded Fast Flux Test Facility (FFTF) fuel is currently being treated and will be completed in 2011. INL and SRS continue to receive FRR (until 2019) and DRR fuel. Aluminum-clad fuels go to SRS.

Hamilton asked if the United States receives SNF from other countries and who pays for any such storage. Marcinowski stated that it does receive HEU from foreign research reactors; some foreign countries pay for that that storage, and others do not. The amounts retrieved are small. Sharp pointed out that there is also an agreement with Former Soviet Union states to accept HEU through 2019.

At Fort St. Vrain, a 15-metric-ton dry storage facility is managed by DOE and licensed by the NRC. It was the first commercial-scale high-temperature gas-cooled reactor plant in the United States. It had operational difficulties, and some fuel is now in Idaho and some in Colorado. DOE holds title to the fuel.

All SRS SNF is currently in wet storage. Disposition alternatives for aluminum-clad SNF are under consideration. The current plan is to continue to receive FRR (until 2019) and DRR.

The FRR program supports the U.S. nonproliferation policy. More than 9200 assemblies from 29 countries have been received. Aluminum-clad material goes to the SRS; non-aluminum-clad material goes to INL. The current plans are to receive FRR until 2019. The DRR program accepts spent fuel from U.S. universities and other government research reactors and will continue indefinitely.

In summary, the DOE SNF inventory is comprised of 2149 MTHM of defense SNF (10 MTHM at SRS, 2102 MTHM at Hanford, 36 MTHM at INL, and <1 MTHM at other locations) and 309 MTHM of non-defense SNF (19 MTHM at SRS, 27 MTHM at Hanford, 246 MTHM at INL, and 17 MTHM at other locations) for a total of 2458 MTHM. These inventories can be maintained in their current configurations for many decades.

Currently, DOE's HLW inventory consists of about 21,000 canisters (when all operations are completed). These canisters are 10 ft tall and 2 ft in diameter; the waste is embedded in glass. This is a robust waste-management mechanism. At Hanford, there are about 9700 projected canisters. At INL, 3590 to 5090 canisters will have to be taken out of state. At West Valley, there are no operations, and 275 canisters are in storage. At SRS, there are about 2900 canisters; DOE has an agreement with the state to process this material, also. Domenici asked if these canisters are ready for permanent disposal. Marcinowski replied that they were. At SRS there are two buildings available for storage; one is full. About 200 canisters are produced per year. About 31 million gallons of waste remain at SRS to be treated. The Solvay processing facility at SRS will reduce the amount produced each year. Low and high-level waste will be separated.

Macfarlane asked how the remaining 31 million gallons of waste were being calculated. Marcinowski replied that it is 31 million gallons of liquid waste. It will be separated into HLW and LLW. The HLW will go into glass and canisters. The LLW currently goes into vaults at the SRS. Macfarlane asked about the residual amount of waste that is too difficult to get rid of. Marcinowski responded that Section 3116 of the Ronald Reagan National Defense Authorization Act of 2005 allows tanks to be closed after removing as much waste as possible. Then it must be demonstrated that the residual meets the NRC definition of LLW, a permit is obtained from the NRC, and the tank is closed. This process has been done at INL, and it is expected to be done at SRS in the next few years.

At INL, there are three waste streams. (1) 4400 m^3 of calcine (a granular solid) are stored in seven bin sets (43 bins). It is to be converted to a monolithic solid by hot

isostatic pressing; it is projected to produce 2900 to 4400 canisters. (2) 900,000 gallons of sodium-bearing waste (SBW) are stored in four tanks. It is anticipated that they will be treated by steam reforming, producing about 590 10-ft canisters of granular powder. Seven of eleven tanks have been closed. (3) Ceramic/metallic waste is produced by the treatment of sodium-bonded fuel, with 100 canisters projected to be produced.

At the Hanford Site, there are 53 million gallons of liquid waste awaiting treatment in Waste Treatment Plant; 9700 canisters are projected to be produced; more than 400 per year are planned. There are 177 tanks, of which 6 have been emptied; about 1900 cesium/strontium capsules are in wet storage.

At West Valley, there are 275 canisters of commercial-origin HLW stored in a hot cell under the management of DOE's Office of Environmental Management. Dry-cask storage is planned.

The path forward is to vitrify/immobilize tank waste at SRS and to store the canisters of treated waste onsite. Treatment methods continue to be improved. At INL, HLW calcine will be treated by hot isostatic pressing to form a monolithic solid; SBW will be treated by steam reforming and the canisters of treated calcine and SBW will be stored onsite. Safe canister storage (about 22,000 canisters) will be continued onsite; the storage is designed for 100 years. The hope is to move them to permanent storage before that.

There is a Settlement Agreement among the State of Idaho, DOE, and the Department of the Navy under which HLW calcine must be ready for transport out of Idaho by December 31, 2035.

The stakeholder issues are to uphold state commitments (there is a concern that waste may be stored onsite indefinitely), maintain institutional controls, develop the technical basis for extended storage, and assess environmental impacts.

In summary, the DOE HLW consists of about 21,000 projected canisters.

Another waste category is Greater Than Class C (GTCC). It consists of activated metals from the decommissioning of nuclear power plants, radioactive sealed sources and other media from licensees, and non-defense TRU. About 1100 m^3 currently exists in storage. GTCC has no current disposal path, but DOE is in the process of developing an EIS evaluating disposal alternatives.

In summary, DOE plans to continue the safe management/storage of HLW and SNF. There have been no significant near-term technical or safety impacts for more than 50 years. It will also continue to develop improved techniques to reduce treatment costs and schedules. There are potential compliance issues with affected states without a disposal path for defense wastes. The Department is in communication with the states in that regard.

Bailey asked who owned the WIPP. Marcinowski answered that DOE owns it. The law determines what is going into it. EPA and the states ensure that the law is followed.

Eisenhower asked what percentage of defense transuranic waste was disposed of in WIPP now. Marcinowski replied, about one-third.

Domenici noted that he had a primer on the fuel cycle prepared by the DOE Office of Nuclear Energy (NE). It talks about two types of waste, one of which is waste or spent fuel from power reactors with energy still left in it. He asked for a clarification of whether Marcinowski was talking about HLW from which energy is *not* to be reclaimed. Marcinowski responded, yes, the packaged HLW is not to be retrieved. Domenici observed that the primer says that spent fuel could fit on a football field if it were piled 10

ft deep, and asked how much of this HLW there was and what its volume was. Marcinowski replied that there are 13,000 of these canisters. One could figure out how many football fields that would be. Domenici asked how much and what type of waste was to have gone to Yucca Mountain. Marcinowski answered that 7000 metric tons for defense purposes and 10% of the total capacity for DOE. The rest was to have been retrievable fuel rods from commercial power reactors. Peterson noted that to generate the same amount of energy as that from the football field of nuclear fuel would take 5 billion tons of coal.

John McKenzie was asked to describe the Naval Reactor Program, a joint DOE–Navy program.

Since the program was stood up in 1948, 30 core designs and more than 200 nuclear ships have been deployed. The mission of the Naval Nuclear Propulsion Program is to provide militarily effective and affordable nuclear propulsion plants and to ensure their safe, reliable, and long-lived operation. The Naval Reactors Headquarters oversees the program's 82 warships, 6 shipyards (4 of which handle spent fuel), 2 schools, R&D and training reactors, a specialized industrial base, 2 dedicated atomic power laboratories, and a Naval Reactors Facility in Idaho with a dry-storage program and an expended-core facility.

The design of naval nuclear propulsion units must be simple, rugged, redundant, fail-safe, and conservative. There is rigorous quality control by on-site representatives, detailed specifications, and separate logistics/supply. The design requirements are unique. Fuel designs are very effective at retaining fission products. The average radiation exposure for a sailor assigned to a nuclear powered warship is less than the average radiation exposure received by a member of the public from background or medical testing.

Since the late 1950s, we have shipped more than 800 containers to Idaho. Today in a typical year, we ship eight containers, all by rail. There, the fuel is taken out of the shipping containers and placed in the core-storage facility. Many improvements have been made in core design. The core life has been extended from 2 years to 33 years, the effective life of the ship. Twenty-five metric tons of spent fuel have been amassed and are being consolidated in dry storage. Once sealed, the overpack container can be shipped as is. Twenty-eight canisters have been loaded into overpacks.

The total Yucca Mountain repository is intended for 70,000 metric tons. Of that, commercial waste is allocated 63,000 metric tons, non-naval defense is allocated 6935 metric tons, and naval reactors are allocated 65 tons. Thus, naval fuel was to have been a very small fraction (less than 0.1%) of the Yucca Mountain repository inventory. In terms of canisters, naval canisters were to number about 400, and the total number of canisters was to have been about 11,000. By this measure also, naval fuel was a small fraction (less than 4%) of overall repository inventory.

Because naval fuel is made up of highly enriched uranium, one cannot put as much in a canister as with commercial fuel. Nevertheless, compact reactors and long-life fuel result in a small inventory compared to other sources of spent fuel and HLW.

In 1992, Idaho sued DOE over "violations" of the National Environmental Policy Act (NEPA). The resulting 1995 Agreement and Consent Order governs management of spent nuclear fuel and transuranic waste at INL. The federal court retained jurisdiction over compliance. Under the agreement, all spent nuclear fuel is to be placed in dry

storage by January 1, 2023, and all spent nuclear fuel is to be removed from Idaho by January 1, 2035. Ambiguities were resolved, resulting in a 2008 addendum to the agreement, which allows the continued use of the water pool at the Naval Reactors Facility beyond 2023, allows the continued management on a limited in-process inventory of naval spent nuclear fuel at the Naval Reactors Facility beyond 2035, and allows continued archival storage of some naval spent nuclear fuel to support designs under development or in service. The agreement also carries a $60,000 per day fine for noncompliance. The Commission's selected path to dispose of HLW is very important to the naval program.

McFarlane asked if the 150 metric tons of loaded casks was the same as the 25 metric tons of spent fuel. McKenzie replied that, of the current inventory in Idaho, most of the weight is in the cask; one cask would hold 0.1 metric tons of spent fuel.

The meeting was adjourned for the day at 4:43 p.m.

Friday, March 26, 2010
Morning Session

Hamilton called the meeting to order at 8:33 a.m. and described the process that would be followed during the day. He called for a discussion of procedural matters.

Meserve said that, given the immensity of the charge, this Commission should establish some subcommittees. He suggested three subcommittees, storage, the fuel cycle reprocessing issues, and disposal. Topics such as transportation and institutional infrastructure could be embedded in the work of these subcommittees. Subcommittees should have cross membership and open access to all Commissioners. Subcommittee meetings should be open to the public. Eisenhower suggested adding nonproliferation, security, and new technologies.

Deleted: such as ones on

Deleted: Other t

Deleted: might be

Rowe suggested having several of the Committee meetings outside Washington, DC. Visiting WIPP made sense. Any foreign travel should be spartan and would be time-consuming. Many people in DOE and at the national laboratories have experience and biases; consensus of the Commission should be required before hiring any staff member.

Macfarlane said that institutional considerations would be a good subject for each subcommittee to consider. Other countries have done a great deal of work, and this Committee should avail itself of that experience and knowledge.

Deleted: Macfarlane said that institutional considerations would be a good subject for a subcommittee.

Carnesale stated that recycling raises many important issues, and the deliberations of the Committee should have a strong focus on it. International issues are also important. It might be good to have a member from each of several subcommittees visit foreign sites.

Deleted: Institutional

Peterson noted that there are important crosscutting issues requiring some integration (e.g., in human resources, economics, and funding). A subcommittee should be charged to integrate information across all areas. Sharp suggested providing an initial white paper to provide coherence for each subcommittee.

Hamilton asked what the frequency of meetings should be. Rowe suggested meeting every two months with teleconferences during the intervening months. Subcommittee meetings might replace those teleconferences. Peterson concurred. The subcommittees might best be held outside Washington, DC. Full Commission meetings every 2 months would maintain interaction and progress. Meserve agreed; subject to the schedule of the subcommittees' work. In order to integrate the project, the Commission should maintain

its involvement in the broad range of topics arising out of the work of each subcommittee.

Eisenhower noted that there are only 15 people on this Commission. The Commission may want to have a chair for each subcommittee and to have the full Commission invited to each subcommittee meeting.

Carnesale suggested that some work needs to be done early on to select a range of scenarios for the subcommittees to consider. Peterson said that the range of scenarios should include growth and changes in technologies, identifying opportunities. Macfarlane cautioned that the Commission does not want to lock itself into a particular technology; past prognostications about energy have been wrong. Sharp pointed out that there are a lot of waste streams, each of which presents different problems to deal with.

Hamilton summed up the discussion: The Commission should have meetings outside of Washington, DC. Travel should be frugally conducted. A subcommittee structure should be defined. Meetings should be bimonthly with open teleconferences in between.

Hamilton asked for discussion of staff; the Commission needs its own staff. Meserve agreed that it needs some full-time staff. Because many knowledgeable people may not be prepared to work for the Commission on a full-time basis, we should consider engaging part-time consultants. Hamilton stated that it would need legal counsel. Sharp noted that a lot of information already exists; an overview document might be prepared by a contractor; somebody needs to pull all the information together so the Commission can focus on it. Eisenhower suggested that public-relations support might be helpful when the report comes out; also, an energy economist might be needed for some of the deliberations. Carnesale suggested three staff members: one in the technical parts (storage, reprocessing, etc.), one in policy aspects (policy, law, etc.), and one on the organizational side (procedural matters, writing, etc.).

Peterson pointed out that the NWTRB was set up to give advice to the country about topics like nuclear waste. They have a lot of knowledge assembled, have good people, and are funded the same way the Commission is. Meserve agreed that there is a lot of valuable work that has been done by the NWTRB that the Commission should tap. Sharp noted that a lot of the knowledge gathering could be staffed out. A good paper on the foreign experience would be a good substitute for travel by this Commission and would give it better insights. Scowcroft agreed that these are all good ideas but take time. The Commission members do not want to spread themselves too thin. They should rely on staff to do a lot of this.

Macfarlane noted that travel to a site provides a lot of personal insight and allows contact with the community, allowing one to learn what system they have, how it works, whether it would be transferable to the United States, what the compensation is, and what way is the most economical. Eisenhower observed that some Commissioners will likely be in many of these sites in the normal course of business, and they could act on behalf of the Commission while there and report back. Meserve noted a distinction between foreign and domestic travel: foreign travel would be to glean information; domestic travel would involve public hearings.

Hamilton announced that John Kotek would be the staff director and Marika Tatsutani would be the staff writer.

Hamilton said that the Commission needs to think about the organizations and individuals who will be asked to make presentations before it. Rowe said that a few will

Deleted: also, it is important to integrate. The subgroups should look at a broad range of topics for each subcommittee subject and then integrate those findings.

Deleted: It should consider

Deleted: who have day jobs.

Deleted: Macfarlane agreed that there is a lot of work already done that the Commission should tap.

be obvious; the Commission might make a short list early on and allow those groups to prepare their presentations (e.g., the Union of Concerned Scientists and the Nuclear Energy Institute). Carnesale said that getting written material in advance of briefings would conserve time. Hamilton said that the Commission would insist on that format. Ayers suggested assembling the brightest people who have already studied these topics extensively. The Commission would have only nine meetings and should move along rapidly. The United States has to determine whether it is a leader or a follower. Peterson said that such presenting organizations should include the NRC on its ability to license facilities, EPA on standards, Department of Homeland Security on the protection of critical infrastructure, and Department of State and International Atomic Energy Agency on international issues. Sharp suggested that any written material provided should include a précis. Hamilton recognized the need for transparency, but noted that some classified or proprietary information will need to be discussed.

Hamilton asked Scowcroft to lead a discussion of the substantive matters. Scowcroft said that the task is laid out in the eight charges, of which the prime one is the evaluation of existing fuel-cycle technologies. This problem needs to be designed away. Peterson said that there are many types of waste in the world (e.g., NO_x). Sometimes the best way to consider them is to put a price on them. To do that, one needs to understand the technologies used to deal with the waste. Meserve suggested starting with DOE and what it has been doing for many years. Macfarlane offered that it does not matter what specific technologies would produce the waste. Management facilities should be designed to be flexible. The Commission needs to hear critiques of the different management techniques. Scowcroft reiterated that what one does at the end of the fuel cycle depends heavily on what the fuel cycle is. If there is not a back end for the given fuel cycle, nuclear energy will be stifled. Macfarlane stated that what has stifled nuclear energy is cost. Peterson said that nuclear technology is a valid technology, just like air travel. Society's capability to regulate nuclear technology has matured greatly in the past 25 years. A technology-neutral framework will be aided by modeling and simulation. Substantial opportunities exist to build in flexibility. Ayers said that it should be determined if the United States is investing adequately in R&D. Carnesale noted that there is a big problem in determining what to do with the nuclear waste that already exists. It is largely true that disposal is independent of the fuel cycle chosen, but there are differences from fuel cycle to fuel cycle in proliferation, safety, etc. The Commission should get an assessment from DOE of what is currently being done. Sharp suggested requesting overview papers on today's storage system, on the fuel cycle, and on disposal. That would give the Commission a framework for consideration.

Deleted: understanding

Scowcroft stated that the first three charges lay out the task. Peterson said that another problem is translating R&D into commercial products and processes. There are successes to look at (e.g., the AP1000 reactor system). How to bridge R&D to new commercial technology is key to wisely spending federal funds. Rowe stated that the Commission has to look at alternative fuel cycles. Several Massachusetts Institute of Technology task forces have said that the light-water-reactor (LWR) fuel cycle will be around a long time, but one has to ask if nuclear technology can evolve without at least a partly closed fuel cycle. Without closing the fuel cycle, the cost of new repositories gets overwhelming quickly. The economic model favored by utilities is to run old coal plants as long as

possible, run old nuclear plants as long as possible, and use gas-fired plants for all new builds. However, this strategy does not answer enough of the questions.

Peterson said that chemical separations are the most complex activities in the whole fuel cycle and suggested that these activities should be centralized in a highly secure environment. Carnesale said that the Commission should not focus too much on technical issues. It should make conservative assumptions about what that technology will accomplish. Any deployed technology must be publicly acceptable. Eisenhower noted that the Commission's mandate is very broad and includes military waste, some of which is very old and is handled in controversial ways. Other sources of waste in addition to those from commercial reactors need to be factored in.

Deleted: It needs to

Deleted: made

Sharp pointed out that there are groups in Nevada that believe the geologic repository should be there. This question has an emotional component absent in other political issues. Overwhelmingly, Americans say nuclear power is needed. Peterson said that it would be worthwhile to look at places where there has been success (e.g., WIPP). How they exercise oversight is important to understand and to build upon. Scowcroft agreed that building public acceptance is a key aspect. Peterson continued: The Commission has only a limited scale of personnel, training, capital, infrastructure, etc. and needs to build on those resources. Meserve suggested that the Commission needs to learn more from the lessons of past experience, problems as well as successes. Peterson said that one of the most important problems is the lack of credibility about whether temporary storage will become permanent. Macfarlane said that history has shown that things do not change. More than a quarter of a century ago, an Office of Technology Assessment report stated that biggest obstacle that a waste management program must overcome is the severe erosion of public confidence in the federal government created by past problems. Sharp agreed that this issue is controversial; but if the Commission is thorough, it will raise the confidence level.

Eisenhower noted that there is also concern about moving nuclear materials around the country. The Commission needs facts to act upon. Carnesale pointed out that there have been several NAS studies on this issue and on international issues. Some of those studies would need to be updated. The term "public acceptability" should be used to mean "acceptable to the public" not "politically acceptable."

Peterson noted that the quality of students coming into nuclear engineering is spectacular. The industry has a base of bright young people to work with. Carnesale agreed but cautioned that the number of students is very small. Eisenhower suggested that the Commission might want to consider if there is a large enough number of new workers. Scowcroft said that the Commission needs to pave a path forward that gives hope to those who might consider this professional field.

A break was declared at 10:02 a.m. The meeting was called back into session at 10:31 a.m. The floor was opened to public comment.

Michael Montgomery (Lightbridge Corp., McLean, VA) said that his company had worked on the thorium fuel cycle for 15 years and would demonstrate it in Russia in 2 years. It is a direct substitute for LWRs. This system saves uranium up front, and waste is reduced by 50% in volume and 70% in weight, saving millions of dollars in spent-fuel management. It is also non-proliferative, being a once-through fuel cycle. The fuel-assembly design is now being certified in Russia.

Bruce Breslow (State of Nevada) expressed a love-hate relationship with DOE. He pointed out that Nevada accepts thousands of shipments of LLW and wants to work toward a solution to the nuclear waste problem. The NWTRB is fantastic and has a great staff. They have visited every site.

Lake Barrett stated that we make nuclear waste and have a responsibility to our grandchildren. We need a Plan B for Yucca Mountain.

Rick McLeod (SRS Community Reuse Organization, Aiken, SC) charged that DOE's action in Yucca Mountain turns sites like the SRS into long-term storage sites, which is unacceptable. We want

1. Affected communities to get representation
2. Yucca Mountain to be considered for HLW
3. Support for processing operations

Judy Treichel (Nevada Nuclear Waste Task Force) said that people have to buy in and trust. In Nevada during testing, people knew they were being lied to in the 1950s about nuclear-testing effects. Secretary Watkins had a panel similar to this Commission; it had excellent recommendations, but the report went on the shelf and was not acted on. The Committee has to get some understanding from the people and give them respect.

Paul Seidler noted that he had worked for the State of Illinois, the federal government, and the nuclear industry on nuclear issues. DOE should have discussed the implications of the cleanup-site EISs. Disposal of this valuable asset (low-burnup spent fuel) makes no sense. The disposal program should stress safety and provide jobs.

Joe Ziegler (Nye Co., NV) called attention to the fact that there has been no response to the letter to the Secretary of Energy from affected counties in Nevada and California regarding the apparent abandonment of the Yucca Mountain program. There should be local involvement in the decision process and the Blue Ribbon Commission process. Local experience will be of help to the Commission in considering what went right and wrong in implementing the NWPA. A Commission meeting should be held in Nevada.

Jack Spencer (Heritage Foundation, Washington, DC) said that Yucca Mountain should be considered as a potential repository site. How we arrived at Yucca Mountain was not optimal. Nevadans should be in control of the solution. A long-term solution should be rooted in the marketplace. More control should be placed in the hands of those who produce the waste.

Allison Doman (Energy Communities Alliance, Washington, DC) noted that EPA works with various communities affected by nuclear waste. The Alliance emphasizes that it is important to get input from these communities. Their perspective is very important. Where the community has been involved from the beginning, programs have led to success.

Robert Alvarez (Institute for Policy Studies, Washington, DC, on behalf of the Yakama Nation) called two issues to the attention of the Commission: (1) The Commission has trust responsibilities under tribal treaties. (2) The Hanford reservation is a microcosm of the issues that this Commission will be dealing with; it has a commercial nuclear power plant, HLW in leaking storage tanks, and plutonium-contaminated soil. He urged the Commission to visit the Hanford site.

Irene Navis (Clark County, NV) said that Nevada's Nuclear Waste Oversight Program appreciated the openness of this meeting and suggested web streaming of subcommittee meetings and the posting of presentations on a website. There are many

lessons learned and best practices that the Commission should be aware of, as well as public-outreach activities. The Oversight Program has surveyed programs throughout the world, has conducted a survey of stakeholders, and has compiled a library of peer-reviewed literature. It holds annual conferences on HLW.

Charles Powers (Vanderbilt University and the Consortium for Risk Evaluation with Stakeholder Participation, Nashville, TN) was concerned that the Commission would not consider the definitions of classifications of waste. It should develop a system to integrate the subcommittees' work, particularly institutional issues. And it should use three concepts: safety, fairness and equity, and informed consent.

Alfred Meyer said that no nuclear power plant should be built until the nuclear-waste problem has been solved. Reprocessing is expensive, proliferation-prone, and requires a geological repository. Nuclear power will not solve climate change. Nuclear power is too expensive and dangerous. According to the NAS Biological Effects of Ionizing Radiation Report 7 (BEIR 7), all radiation has risk, which is cumulative. He urged the Commission to base its report on reality and not assume that new technologies that do not exist now will solve the problem.

Scott Kirk (Waste Control Specialists, Andrews, TX) noted that his company is licensed as the first LLW disposal site since the NWPA was signed. The community has great support for this facility. The company is developing ways to reduce the nuclear-waste footprint and embraces nuclear energy and technology.

Kevin Kamps (Beyond Nuclear, Takoma Park, MD) said that, at Lake Michigan, a dry-cask storage facility was located just hundreds of yards from the lake. "Parking lot dumps" have been established on Indian reservations. Many of these have been stopped. One cannot just haul radioactive waste down a dirt road and dump it on an Indian reservation. It has caused great wounds to these communities. They were targeted because of political voicelessness and economic desperation.

Michele Boyd (Physicians for Social Responsibility, Washington, DC) said that this fuel is not moving any time soon. Current storage poses an immediate threat to local communities. The storage casks need to be protected from terrorist attack. The Principles for Safeguarding Nuclear Waste at Reactor Sites were recently issued, calling for a low-density, open-frame layout for fuel pools and the establishment of hardened onsite storage. Reprocessing would complicate the situation.

Arjun Makhijani (Institute for Energy and Environmental Research, Takoma Park, MD) said that the Commission should have a discourse with people and communities that have been dealing with this problem for a long time. Demythologize reprocessing. The French experience is that reprocessing and reusing fuel increases burnup from 4% to only 5%. If one were to take 100,000 metric tons of spent fuel and put it in breeder reactors to get the energy value, it would cost $8 trillion. It is not economical.

Allison Fisher (Public Citizen, Washington, DC) said that her organization has 150,000 members and would like to be involved in the Commission's processes. The public's access is central to the mandate of the Commission. Our suggestions will be forwarded to the Commission. They include periodic reporting, open meetings in affected communities, and a survey of waste sites.

Diane D'Arrigo (Nuclear Information and Resource Service, Takoma Park, MD) applauded the withdrawal of the Yucca Mountain license applications. Existing waste sites should be looked at, including West Valley. Cleanup costs there are about $9.7

billion. About half of the waste is LLW in trenches and half from reprocessing. The reprocessing was 50-50 commercial and military. Its leaked reprocessing waste is being leached toward local creeks. A record of decision is being awaited on the cleanup of about 1% of the radioactivity. A decision on the rest is 10 to 30 years away, a wait that is not acceptable. A full cleanup should be done now.

Elisa Brown (Sustainable Energy and Economic Development Coalition, San Antonio, TX) asked for a continued commitment to transparency, especially web streaming of meetings. The Coalition deals with the Waste Control Specialists LLW site in west Texas. The Texas Commission on Environmental Quality unanimously recommended that the site's license not be granted because the water table was 14 ft below ground level in places. A lot of political force and money are being used to push for things that are not supported by the science.

Robert List (former Attorney General and Governor of Nevada) noted that the NWPA was adopted during his term as governor, and he represents four Nevada counties in NRC proceedings. It is obvious that there are hundreds of thousands of points of view on this topic. In Nevada, the NWPA has language for governments to get compensation but no mechanism for implementing such compensation. There is no effective means to allow the government to negotiate. Also, no one is designated to speak for Nevada. An actionable recommendation from this Commission would be to amend the NWPA to establish mechanisms for negotiation and compensation.

Mary Jane Williams (documentary filmmaker, Washington, DC) noted that Adm. Rickover said that he wished nuclear power had never been discovered. Einstein said that the great mistake in his life was when he wrote a letter to Pres. Roosevelt advocating atomic weapons. Nuclear should be phased out in our country, even at the cost of lower energy production. During the lethal life of this waste, the USA will come to an end, our language will disappear, and civilizations will rise and fall. Our lethal legacy of nuclear waste will live on.

Geoffrey Fettus (Natural Resources Defense Council, Washington, DC) did not envy the Commission its task. The information presented yesterday ranged from very good to inexact to incomplete. Some beliefs were presented as facts. The Commission should allow a broad range of perspectives to be expressed. All of the issues will bring out a wide range of perspectives. The balance of the panel is of concern. The institutional ties and financial disclosures of the members should be publicized.

Barrett was brought back because of an error in timekeeping during his presentation. He recommended that the Commission develop a Plan B for Yucca Mountain with three elements: a durable process to deliver a geologic repository within 25 years; advanced nuclear technologies even though they do not dispose of *all* the wastes; and volunteer regional interim storage facilities to bridge the gap between current onsite storage and an eventual geologic repository to consolidate all fuel from shutdown reactors and funded through government incentive performance-based contracts with private industry in partnership with states.

Frazier stated that additional statements could be e-mailed to the Commission and they would be included in the record.

Hamilton said that the Commission will be open to all points of view during all of its proceedings.

The meeting was adjourned at 11:39 a.m. Following the meeting, a press conference was held by the co-chairs of the Commission.

Respectfully submitted,
Frederick M. O'Hara, Jr.
Recording Secretary