

Note: On July 7, 2011, this document replaced the original meeting minutes posted online on June 30. This update more accurately represents comments given by Mr. Jim Kinsey discussing NNGP status on page 15.

**Nuclear Energy Advisory Committee Meeting
L'Enfant Plaza Hotel
Washington, D.C.
June 15, 2011**

Committee Members Participating

John Ahearne	Donald Hintz
Brew Barron	William Martin, Chair
Ashok Bhatnagar	Burton Richter
Dana Christensen	John Sackett (by telephone)
Thomas Cochran	Allen Sessoms
Michael Corradini	

Committee Members Absent

Marvin Fertel	Susan Ion
Raymond Juzaitis	Neil Todreas
Carl Paperiello	

Other Participants:

Carol Berrigan, Senior Director of Industry Infrastructure, Nuclear Energy Institute
Nancy Carder, NEAC Support Staff, Medical University of South Carolina
Shane Johnson, Chief Operating Officer, Office of Nuclear Energy, USDOE
John Kelly, Deputy Assistant Secretary for Nuclear Reactor Technologies, Office of Nuclear Energy, USDOE
Jim Kinsey, Director, Regulatory Affairs, Next-Generation Nuclear Plant Project, Idaho National Laboratory
Steven Koonin, Under Secretary for Science, USDOE
Elizabeth McAndrew-Benevides, Manager of Industry Infrastructure, Nuclear Energy Institute
Peter Lyons, Assistant Secretary, Office of Nuclear Energy, USDOE
Frederick O'Hara, NEAC Recording Secretary, Medical University of South Carolina
Kenneth Chuck Wade, Designated Federal Officer, Office of Nuclear Energy, USDOE
Michael Worley, Program manager, Nuclear Energy University Programs, Office of Nuclear Energy, USDOE

About 60 others were in attendance in the course of the meeting.

Morning Session

Chairman **William Martin** called the meeting to order at 8:57 a.m. He pointed out that a child born today will be alive in 2100 because life expectancy is nearing 90 years. There were 2 billion people in 1920, and there will be 10 billion people by 2100. There has been a 1.4% increase in average annual economic real growth during the past 90 years. As a result, energy production will need to be increased to meet demand. The ramp for renewables is very significant, and there is reason to be pessimistic about nuclear, so a lot of work will need to be done to achieve the goal of 50% non-carbon energy production. That is where nuclear energy comes in.

Peter Lyons welcomed the Committee and said that NEAC's advice is very welcome and important. A number of near-term challenges face the Office of Nuclear Energy (NE):

- Fukushima has changed many lives in Japan and around the globe. DOE set up an emergency operations center right after the incident. The United States should be proud of its outreach to the Japanese people. The incident at Fukushima will have impacts for years or decades.
- He had testified before Congress on the closeout of Yucca Mountain.

- The President's Blue Ribbon Commission (BRC) on America's Nuclear Future has issued draft recommendations on nuclear waste storage and disposal.
- Discussions have been held with the Chinese on the construction of AP1000s in their country.

Kenneth Wade made safety and convenience announcements.

Martin called for approval of the agenda; Ahearne moved to adopt the agenda, and Richter seconded. There was unanimous approval. Martin had the members introduce themselves. Lyons asked the other attendees to introduce themselves, also. Lyons noted that two new NE staff members were present, John Kelly and Monica Regalbutto, both of whom are deputy assistant secretaries.

Steven Koonin was introduced to speak on the DOE Quadrennial Technology Review (QTR). He thanked Lyons for the tremendous job he has been doing with an overwhelming agenda.

The scope of the Review will provide a context and robust framework for the Department's energy programs as well as principles by which to establish multiyear programs, plans, and budgets. The current lack of a systemic vision is notable. The primary focus of the QTR process is framing the energy challenges for Congress and the public; discussing the roles of government, industry, national laboratories, and universities in energy-system transformation; developing program plans and goals for the next 5 years; and setting the principles by which the Department can form its portfolio.

Six strategies are being looked at: increasing vehicle efficiency; progressively electrifying the fleet; deploying alternative fuels; increasing building and industrial efficiency; modernizing the grid; and deploying clean electricity, of which nuclear is a piece of the picture. The Department is not organized along these lines. Each strategy requires policies and technologies.

The Review starts with the energy context and challenges and develops the six strategies to set DOE priorities and portfolio, which are guided by principles, by players and roles, by technology assessments, and by technology roadmaps. This process will inform program plans and budgets for the next several years.

The recommendation to do a Quadrennial Energy Review for both technology and policy was made by the President's Council of Advisors on Science and Technology (PCAST) in November 2010. There was a six-month public-comment period for the QTR framing document before the framework was put out. Workshops are being held on each of the six strategies, and there may be a capstone workshop before submitting the QTR to the White House for approval in July or August with a final release before December 2011. Nuclear energy was in the clean-energy workshop.

Some comments received from the workshop participants include:

- Some continuing support from DOE to supplement the extensive private capital is worthwhile.
- The value proposition of the Department is technology assessment, not technology invention.
- DOE's present approach is not selective enough when it comes to technologies that will stand the test of market viability.
- The user facilities, test facilities, and technical workforce at the national laboratories are great national assets, but establishing common rules for partnering is critical.

Martin asked each member to comment on the QTR. Ahearne said that the Committee had been concerned about getting the DOE departments to work together. Koonin replied that the leadership is working in that direction and seeing some progress in several areas. In addition, there is a greater awareness of how the private sector operates. Martin asked Barron if this review makes sense from a private-sector point of view. Barron replied that it does not make sense for the government to dictate the economics; rather, its strong point would be to focus on the technology. Koonin noted

that it is good practice to work with industry to develop technology. Barron pointed out that one needs capital to deploy technology. One has to be realistic about what it will take.

Cochran said that the water or zirconium should be eliminated from water-moderated reactors. DOE should push a program on silicon carbide cladding. Lyons said that the Office is pushing toward lead tests; that type of cladding is looking promising and is being emphasized.

Koonin said that the National Academy of Sciences (NAS) study on the safety and security of used nuclear fuel is of great import and interest to the Department. It raises the question of how to achieve balance among the recommendations. That issue is being grappled with now.

Hintz suggested that letting the market work is a good philosophy in most areas, but he was not sure that it is applicable to the power sector. A long (20-year) focus is needed, and the market typically focuses on the short term. Koonin cautioned that one has to lay down a compelling rationale for government intervention in fission-energy production. He has not seen such a convincing rationale.

Corradini expressed curiosity about the process of the QTR and asked whether, after the six workshops, there will be an advisory board review. Koonin responded that there are significant blocks of text from the workshops circulating in the government that will then go out for broader review. Corradini asked what the role of government was in the various tasks. Koonin replied that the needs are different for each strategy. Corradini pointed out that it is the long term that one has to be concerned about. Koonin agreed. Natural gas is not the best answer forever. Richter said that that is in the policy area, not the technology area. One needs policy to inform technology, and the other way around, too. Richter said that he did not see anything in the QTR about turning off things that do not work. There needs to be a filter. Koonin said that he would not think it a good tactic to offer that option in the QTR; rather, one should expect such a result from budgeting impact.

Bhatnagar pointed out that one cannot make technological decisions decades out without a broad-based QTR. Koonin agreed and added that these technologies involve a conversation with the Department of Transportation, National Aeronautics and Space Administration, National Science Foundation (NSF), etc. These departments need to be involved through a government-wide QTR. Martin pointed out that this process is in the “report to the President from DOE” step now, not the policy-making-decision step.

Christensen suggested that the Department could write an integrated (academia, industry, etc.) roadmap. Koonin replied that that would be a good next step, but the staff is intensively involved with the internal review right now.

Sessoms stated that there is not a clear understanding of DOE’s role in technological development and asked how this stuff is moved out. DOE and NSF should remain the nation’s R&D backbone. The QTR could clarify that situation. Koonin promised that those writing the review would try to write something down. Having a clear articulation of roles and policies will move the conversation forward. Everyone has a stake in and opinion on energy. As one talks about competitiveness, international influences become important.

Sackett was impressed with the progress on the Advanced Test Reactor (ATR) model. Technology assessment is an important role. Also, it will be interesting to see what Germany will experience as it moves away from nuclear power toward renewable energies.

Hintz pointed out to Koonin that policy statements would make his job easier. Koonin agreed but stated that it is not DOE’s role to set policy (e.g., on carbon). There are real goals that have been and will be set. How to achieve those goals is where the disagreements occur.

Peter Lyons was asked to review NE’s budget and new starts. He was assisted by **Shane Johnson**, the new Principal Deputy Assistant Secretary.

The nation is moving into a very tightly constrained budget period. The FY11 budget and FY12 budget request take into consideration some of those concerns. The Integrated University Program (IUP) is not funded in FY11; it has provided \$5 million for fellowships and scholarships for the past

few years, but the Final Continuing Resolution (CR) has zeroed it out. A fellowship/scholarship program is needed but does not appear in the FY12 budget. Cochran asked if it should be integrated with the National Nuclear Security Administration (NNSA) fellowship program. Lyons responded that it was integrated, but the NNSA and NSF programs have been zeroed out, also. Corradini asked why the Office of Science (SC) gets fellowship funds and NE does not. Lyons said that he had pointed out that inconsistency, and the funding has been reinstated in the House mark.

In Reactor Concepts RD&D, the most important aspect is the support of the Light Water Reactor Sustainability R&D activities. This is considered a new start that was not approved by the CR. It had been hoped to select two small modular reactor (SMR) and light-water reactor (LWR) projects for funding. The program gets \$67 million in the FY12 request. Vendors are expected to come in with cost shares, but it is still awaiting approval as a new start. Corradini asked whether it was research that would be cost shared. Lyons said that that was correct. It will be analogous to the Nuclear Power 2010 (NP2010) initiative. Other mechanisms for funding will be looked at. Barron said that there are many people involved in this program now, but some may drop out when a selection is announced. Lyons said that the program will stay with LWR concepts now. One could not deploy a fast reactor on an accelerated basis. The Office is looking at research on life extension and improving analysis codes and research on how Fukushima was handled. Barron asked if the Office had engaged with the industry group that is looking at many of the same questions. Lyons admitted that DOE needs to work with those groups but has not yet done so. Hintz said that NE would have expertise that the Nuclear Regulatory Commission (NRC) could benefit from in reviewing Fukushima. Lyons pointed out that DOE uses the same national laboratories and other sources of expertise that the NRC does. Corradini said that the Electric Power Research Institute (EPRI) would make a good partner in engaging with the industry study referred to by Barron. Lyons replied that the Next-Generation Nuclear Plant (NGNP) R&D budget will be cut from \$100 million to \$50 million in FY12. It will take all of FY12 to look for industry partners. Construction (at \$100 million) will become an FY13 issue. The program is studying the tristructural-isotropic (TRISO) fuel at the Advanced Test Reactor (ATR) and characterizing the High-Temperature Graphite Reactor graphite.

In Fuel Cycle R&D (FCRD), the budget supports continued investigations of the once-through, modified open, and full-recycled fuel strategies to develop innovative and transformational options within each and continues work on various options for managing and disposing of used nuclear fuel. The draft report from the BRC is expected soon and will have great impact. The Savannah River metal oxide (MOX) fuel project is not under NE but under NNSA. MOX is seeing only very basic research in NE's budget.

In Nuclear Energy Enabling Technologies (NEET), the budget request tries to group together disparate activities like advanced sensors and instrumentation, advanced methods for manufacturing, and proliferation-risk assessment. In addition, it funds the Modeling and Simulation Hub and the national user facility that is to provide a suite of facilities to support university research. This facility is seen to be an important adjunct to universities around the country. Peer-reviewed proposals are being solicited. NEET can provide grants for industry and principal investigators (PIs). Johnson added that the facility is also being made available to researchers outside government-supported R&D programs. Ahearne noted that there is also a problem in appropriating ATR resources between the Navy and DOE. Lyons said that there is a proposal solicitation out to look at molten-salt-cooled reactors. That is a specific request in University Programs. Four proposals are in hand.

At the Idaho facilities, there is increased funding in FY11. They are looking at Fukushima questions and the restart of the Transient Reactor Test (TREAT) Facility for transient testing.

Radiological Facilities Management ties into the restart of plutonium-238 production for deep-space and national-security missions. No funding was received in FY11, and the line item has been zeroed out in FY12. Congress is discussing whether this should be funded through the National

Aeronautics and Space Administration (NASA). The nation is running out of plutonium-238. It is a significant concern. Ahearne said that this situation was absurd. Lyons said that he had tried to make the argument that this is a unique capability of DOE. The country has purchased plutonium-238 from Russia in the past, but that source is no longer available. We are on a path that precludes deep-space missions after 2016.

The government is under a final CR that requires the Department to seek congressional approval for the initiation of new programs. That request has been made for three areas: SMRs, NEET/Crosscutting Technology Development, and International Nuclear Energy Cooperation. The discussions are ongoing with the appropriators, but there has not been an approval for any of these programs.

Sessoms pointed out that NNSA got a \$1 billion cut in International Cooperation and that the impact of that cut is unknown. Lyons stated that the relationship between international and nuclear has been funded out of the reactor and fuel cycle areas. It is important to identify a line item for international cooperation. There has been no pushback from the Hill on NEET and International Cooperation, but there has been no approval so far.

Hintz asked how long it would take to move forward if funding were made available for SMRs. Lyons replied that the proposal solicitations are ready, but they would have to get Office of Management and Budget (OMB) approval and bidders would have to have 60 days to respond. This is a large procurement made by an internal panel and external advisors. It was believed that this award could be gotten out this year. That will now be very difficult. The frustration level is very high on this last chance for the United States to gain leadership.

Cochran asked if DOE had any idea how to make assessments of licenses that do not lead to construction and said that DOE should weed out those proposals. Lyons said that the funding opportunity announcement (FOA) had been carefully worded, and the projects are 50-50 cost shared. Some have been banked but contributed to the process. He believed that NP2010 was a great success in terms of licensing and construction starts. In addition, the United States is benefiting from China's construction of two AP1000s.

Sessoms found Congress's comments on the FY11 CR to be constructive. He asked when new-start approval might be seen. Lyons said that Congress is hot and heavy into the FY12 budget request now, taking time away from new starts. It does not want to do a piecemeal approval of new starts, of which there are many. It seems to want to approve a package of new starts.

A break was declared at 10:51 a.m. The meeting was called back into session at 11:08 a.m. A letter of comment from Marvin Fertel and the Nuclear Energy Institute was accepted by the Committee and entered into the record of the meeting as Appendix A. The content of the letter was to be discussed during the public comment session of the meeting.

John Ahearne reported that the Facility Subcommittee has submitted two reports and will be working on two more: one on industry facilities (helped by EPRI) and one on university facilities [on which he asked Corradini to ask the Nuclear Engineering Department Heads Organization (NEDHO) to assist]. These reports will be combined.

Alan Sessoms reported that the International Subcommittee has reported on its activities at a prior meeting and is awaiting further information before sending a letter containing recommendations to the Secretary of Energy.

Michael Corradini was congratulated on being elected President of the American Nuclear Society and was asked to report on the findings of the Reactor Technology Subcommittee.

The Energy Policy Act of 2005 (EPACT-2005) required that the project's first phase had to be reviewed before advancing to the second phase. The first phase was to

- Select and validate the appropriate technology under Subsection (a)(1);
- Carry out enabling research, development, and demonstration activities on technologies and components under paragraphs (2) through (4) of Subsection (a);

- Determine whether it is appropriate to combine electricity generation and hydrogen production in a single prototype nuclear reactor and plant; and
- Carry out initial design activities for a prototype nuclear reactor and plant, including development of design methods and safety analytical methods and studies under Subsection (a)(5)

The second phase is to

- Continue appropriate activities under paragraphs (1) through (5) of Subsection (a);
- Develop, through a competitive process, a final design for the prototype nuclear reactor and plant;
- Apply for licenses to construct and operate the prototype nuclear reactor from the nuclear regulatory commission; and
- Construct and start up operations of the prototype nuclear reactor.

The Subcommittee reviewed the market case and public-private partnership, status of NGNP licensing activities, status of industrial infrastructure for NGNP, and status of R&D program and international efforts. It also reviewed the conceptual design reports, assessed the readiness to move into Phase II, and provided reports and briefings.

The Subcommittee had four meetings. The September 30 meeting reviewed the charge and review criteria provided to committee; the NGNP project requirements; the background of the NGNP project; the perspective of customers, commitment, and market case; and the current design specifications. The November 15 meeting looked at the NGNP program plan, decision points, time schedule, cost estimates, and needed products and the NGNP licensing strategy with input from NRC. The February 22 meeting reviewed the NGNP Prismatic (PMR) design from General Atomics, the PBMR design elements assembled by AREVA, and the partnership progress. The April 20 meeting looked at the NGNP R&D update by Idaho National Laboratory (INL) with respect to fuels, graphite, materials, design, and analysis tools and revisited the partnership progress.

The first finding of the Subcommittee was that the NGNP role to produce hydrogen has been expanded into a broader role to produce process heat for a variety of applications (including hydrogen production) as part of the mission. Process-heat applications are more general in scope and can significantly expand the market and improve the business case for the NGNP project.

Richter pointed out that the original plan was to produce an operating temperature of 950 °C and produce hydrogen by several chemical processes. Now the temperature has been lowered, and high-temperature electrolysis has been substituted. This will produce less hydrogen at higher cost and with a lower process-heat temperature produced. Corradini answered that the Subcommittee is comfortable with the efficiencies of the technically possible process. The machine would have a broader appeal. Sticking with a narrow product stream limits the technology. The original goal was very aggressive. The design uses the highest heat for process (e.g., hydrogen production) and then makes electricity with the rest of the heat.

The second finding of the Subcommittee was that the R&D program is well designed and focused on the necessary key areas. The fuel qualification program is clearly the major task that has the longest lead-time requiring not only reliable but also reproducible fuel manufacture and irradiation behavior. No impediments were identified from technological barriers to continue the project.

As the detailed NGNP design and licensing safety case are developed, additional R&D may be identified to address particular issues (e.g., crosscutting component testing or analysis-method validation to address specific questions).

Christensen asked what design temperature these comments were based on. Corradini replied that, for most issues, it does not make any difference. Materials R&D is based on the lower temperature.

The third finding of the Subcommittee was that there were two designs (PMR and pebble bed) at the beginning. The pebble-bed design was dropped. The PMR submitted a conceptual design report in 2010. Given this development, the PMR was more complete, but still needs more detailed design to be sufficient for licensing. The lower reactor outlet temperatures (i.e., 700 °C for the PBMR and 725 °C for PMR) are both lower than the 750 to 800 °C from the Industry Alliance. What component and materials testing would be needed to go above 800 °C is included in the design.

The fourth finding of the Subcommittee was that the prototype nuclear reactor and associated plant were supposed to be sited at INL. However, the business case to optimize NGNP use for process-heat applications and electricity indicates that a site in proximity to a wide range of industrial uses is more appropriate. A site at INL will not support a partnership agreement with industry as required by EPACT.

The fifth finding of the Subcommittee was that DOE and its contractors in collaboration with the NRC were to have developed a licensing strategy to use 10CFR52 process and submit a combined operating license (COL) and is well underway. This approach requires a detailed design so that the COL can be submitted to the NRC in a timely fashion. Given the limited scope and duration of the current conceptual design activities, it seems unlikely that any vendor could complete a sufficiently detailed design to obtain a license for a NGNP without a partnership with vendor/owner-operator/customer to proceed in detailed design. The Subcommittee is concerned that it will be hard to move this forward without a partnership. Barron commented that the adoption of 10CFR52 fundamentally flaws the project; 10CFR50 should have been chosen. Corradini said that he did not want to fight over this issue; this position (using 10CFR52) is where the Subcommittee came to concurrence on the issue. Lyons noted that, as an NRC commissioner, he had seen a lot of benefit in going with 10CFR52.

The sixth finding of the Subcommittee was that EPACT-2005 directs DOE to have INL organize a consortium of appropriate industrial partners that will carry out cost-shared research, development, design, and construction activities, and operate facilities, on behalf of the NGNP Project. The activities of industrial partners funded by the Project were to be cost-shared in accordance with Section 988 of the EPACT (i.e., a 50-50 cost share for the project), although how this is to be done is open to interpretation. Barron commented that the notion of what constitutes a cost share should be reconsidered. Corradini related that the Subcommittee was all over the map on this issue. To get consensus, it agreed to state that there is no public-private partnership in place to carry this project forward. Currently, no potential customer has indicated a willingness to commit to share in the cost of constructing a first-of-a-kind NGNP with a 50-50 annual cost share. (DOE knew the Subcommittee's concern and accelerated its call for partners.) Moreover, the current reluctance of vendors, owner-operators, and customers to commit to substantial up-front cost sharing in the NGNP development is unlikely to change in the near term. In addition, other conditions that work against nuclear process-heat projects need to be recognized (e.g., short-term natural gas prices), a failure to internalize the social cost of carbon emissions, and the perceived high initial capital cost of the first few reactor plants deployed.

The seventh of finding of the Subcommittee was that DOE has to develop a project plan for the Phase II activities. Given the absence of a partnership and the limited amount of conceptual design work that will be completed, it does not appear that a COL can be submitted by September 2014 or construction completed by 2021, as defined in the revised project plan. Hintz asked whether, when hydrogen production for transportation was no longer the primary goal of the project, the Subcommittee looked at potential replacement customers for hydrogen. Corradini replied that the case cannot be made for producing process heat given the low cost of natural gas. Bhatnagar added that, as design work progressed, the cost of the plant went up. Corradini stated that, opening the application to process heat for (e.g., petroleum) industries, broadens the field for potential partners.

Ahearne moved to accept the report and recommendations. Martin seconded.

Richter pointed out that this effort was started to support the hydrogen economy, but the reactor's operating temperature has been lowered, the costs of hydrogen production have gone up, and the hydrogen economy's technical basis has not developed. He asked about the likelihood of finding a customer for the process heat. He recommended that if one can find a customer, one should go ahead; if not, the project should be stopped. He would like to hear about this reactor as an electricity generator because it is unclear that there is a priority for developing this reactor for producing electricity.

Cochran said that he thought it was stupid to make hydrogen for transport with a reactor; the reactor should be used to make electricity. There is a potential niche market for process heat. An owner-operator partner is needed to make this project go forward. If one is not found, this project should be killed. That statement should be put in the report and recommendations. Richter asked how long this search should go on. Corradini suggested two or three years. Richter pointed out that this project is absorbing a lot of money away from the search for electricity-generating next-generation reactors. Corradini agreed, but said that there is a lot of cross-cutting R&D in this project (e.g., in fuel development and safety technology).

Bhatnagar said that he did not see this reactor being competitive on the electricity side. It does produce a great volume of process heat. The real issue is the 50-50 cost-share procedure. That is a nonstarter; a partnership cost share has to be more flexible. Corradini said that, without a partnership, one should not go forward. Barron pointed out that location is important for a partner; because Congress specified that this reactor was to be built at INL, the project has to go back to Congress for approval of the alteration of the location. Lyons added that this is a type of SMR and will contribute a lot to SMR technology.

Corradini said that the Subcommittee was also asking the committee to consider some recommendations:

- Accelerate the formation of a public-private partnership as soon as practical to obtain end-user input into design activities and to fund additional design activities to support this effort.
- Continue to engage the NRC for necessary licensing activities to ensure that the regulatory framework for this new reactor technology is ready to support commercialization.
- Expedite NGNP deployment efforts by selecting a single design concept to move forward; completing additional design activities required to support a preliminary safety analysis report (PSAR) level of detail; focusing current R&D efforts on this single concept; and removing the EPACT-2005 requirement that the NGNP first-of-a-kind be located at the INL site.

Barron said that the roles of DOE and Congress have to be reconsidered. Cochran suggested that one might end up with a vendor willing to support a different design. Corradini responded that this project opens up nuclear technology to a new customer base. One has to look at the long-term potential. If one cannot get a partnership, that speaks to the merit of the project.

Sessoms said that there was a misconception in 2005 about the production of hydrogen with nuclear power; that misconception should be corrected by getting rid of this project.

Christensen asked if DOE has the latitude to repurpose this money (e.g., into SMR licensing) and not put this funding at risk. Lyons said that he did not know. This project has had great congressional support and interest. There is a good case for the government to explore the regime of high-temperature reactors (HTRs). As long as it is research on HTR technology, he believed that the project could proceed without losing the funding, if the Secretary agrees and requests the change from Congress.

Bhatnagar commented that the safety case that can be made for this reactor was attractive to potential process-heat users. One does not want to put a reactor of questionable safety next to an \$8 billion plant.

Ahearne said that the Committee should accept the *report* [as opposed to the recommendations] of the Subcommittee. Bhatnagar so moved, and Sessoms seconded. The motion was unanimously adopted. Ahearne noted that the letter attached to the report contains several comments and recommendations and asked if anyone wanted to change them.

Cochran said that the letter should be sent to the Secretary. Corradini seconded that motion. Richter said that continuation of the program should be qualified with the enlistment of a partner; the letter should say something like “if an industrial partner cannot be found in X years, the program should be terminated.”

Corradini asked if that were acceptable to the other Subcommittee members. Sessoms said that the letter should reflect that there are aspects of the program that should be continued even if a process-heat partner cannot be found.

Cochran suggested that the Committee agree to the letter after adding a fourth recommendation that addresses the concerns of the Committee about closing out the project if no partner can be found.

Christensen pointed out that his project was started in order to build a big new machine at INL, but it ran into barriers. The project should be repurposed to address those barriers.

Martin declared a break for lunch at 12:21 p.m., during which the Subcommittee was to develop changes to the letter to the Secretary.

Afternoon Session

The meeting was called back into session at 1:27 p.m. Corradini offered the addition of a fourth recommendation to the letter to the Secretary from the Reactor Technology Subcommittee:

4. If the development of the public-private partnership is not substantially under way by the end of FY12, then the NNGP program should be repurposed for advanced reactor systems R&D.

Ahearne moved and Bhatnagar seconded to approve the letter. The vote was unanimously in favor of the motion.

Burton Richter was asked to report on the Fuel-Cycle Subcommittee.

There is considerable uncertainty on the budget and on the findings of the BRC. Yucca Mountain is still a confused situation. A substitute site cannot be opened for at least 20 years. There are generic issues that can be worked on for now (e.g., storage and transport). The license for a transport cask is only good for 5 years; validation is needed for longer lifetimes. The oldest used fuel is 40 years old. The Nuclear Waste Technology Review Board (NWTRB) was created by Congress to validate technical aspects of nuclear-waste disposal. They do an excellent job. They are not limited to Yucca Mountain. It is not clear if the NWTRB's responsibilities extend to dry-cask storage. This Subcommittee recommends that the roles and responsibilities of the NWTRB and NEAC and its subcommittees be clarified.

The first tier of systems engineering and FCRD have been selected with the following criteria for relative ranking:

- Nuclear-waste management
- Safety
- Environmental impacts
- Fuel-resource use
- Security risk
- Nuclear Regulatory Commission familiarity
- Proliferation risk (which is poorly defined)
- First-of-a-kind investment
- Compatibility with existing infrastructure

Some criteria are missing (e.g., cost of electricity).

The Subcommittee has two recommendations for systems studies

1. Ranking involves a lot of policy issues, so NE leadership should be involved in reviewing the weighting of criteria used in the systems studies.
2. There is a need for a system for ranking reactor systems for nonproliferation. No peer-reviewed reports exist on the subject.

Sessoms stated that, because technology has progressed, the choice of once-through as having the best proliferation resistance should be reassessed. Richter replied that there is nothing objective about proliferation risk. Lyons said that there is an NAS study under way with DOE–NNSA funding.

There have been large budget variations in University Programs until recently. Congress pressured DOE until 2008 when the decision was made to commit 20% of R&D plus \$5 million for fellowships and scholarships. This has become a strong program and has increased student enrollment. However, the OMB zeroed out the \$5 million for 2012, saying that the industry would pick it up [although the Nuclear Energy Institute (NEI) has said that there is no discussion about industry doing this]. University Programs should not be so narrowly singled out. It is where work on advanced concepts is carried out. Thus, the Subcommittee recommended that an appropriate balance between NE University Programs (NEUP) and laboratory funding be maintained, bearing in mind that sharp cutbacks in university programs can have a long-term effect on the attractiveness of the nuclear field.

Richter moved to accept the report and its recommendations. Ahearne seconded.

Sessoms pointed out that a lot of studies had been done on the need for educational support to sustain the nuclear workforce. He suggested that those studies be cited in the report.

The motion carried unanimously.

Michael Worley was asked to review the status of the NEUP.

The FY11 NEUP funding is program driven and has been expanded to include not only mission-supported funding and program-supported funding but also program-directed funding. Improvements and new programs for FY11 include expansion of the “Blue Sky” R&D; initiation of the Integrated Research Projects (IRP); expansion and formalization of the peer-review database (which is approaching 1000 people); evaluation of the adoption of NRC and NNSA metrics, as appropriate to NEUP, to ensure that the investments made are commensurate with the returns on investment; and conducting a peer review at the pre-application stage for R&D, which was manageable this year and is expected to be done going forward.

Corradini asked whether there are enough staff members to do the relevance review. Worley answered affirmatively and added that national laboratory personnel are eager to participate; there have not been any problems populating the relevancy-review panels.

No FY11 awards have been announced as yet. The two program-directed IRPs are being funded at \$12.0 million. The traditional program/mission funding is being supported at \$38.6 million. University Infrastructure has been funded in the form of reactor upgrades and University Equipment for a total of \$5.7 million (funding all proposals rated 80 and above). The Administration, Contributions, and HQ Holdback line items are \$2.7, \$2.5, and \$0.3 million, respectively. The funding of IUP fellowships and scholarships is to be determined.

In FY09, NE received about 400 pre-applications for R&D. In FY11, it received 766 pre-applications, of which 245 were invited to submit full proposals. 259 full proposals were received, including 18 uninvited proposals. 50 full proposals were recommended for award, including two upgraded uninvited proposals. These are all multi-tier proposals, up to 3 years. They are bigger than NSF awards but smaller than SC awards. Lyons added that these proposals are funded upfront, so no one gets hurt if Congress changes its mind in future years.

Fewer applications than expected were received for the FY11 Infrastructure Solicitations. Panels recommended funding 21 infrastructure grants with a value of \$5.7 million and \$1.4 million in cost match. All of the high-quality proposals are expected to be funded.

The IRP solicitation process is a little farther behind. There were seven applications received for the Fuel Cycle IRP and four for the Reactor Concepts IRP. Individual reviews are under way. Awards are expected by the end of FY11.

The NEUP FY12 Planning Conference will be held Aug. 9-10, 2011, in Chicago, Ill. At that meeting, the Office will provide the anticipated focus of FY12 NEUP R&D solicitations, the results of FY11 activities and lessons learned, and a request for feedback on the NEUP program and processes.

Corradini asked where they got input from the national laboratories. Worley responded that the national laboratory points of contact respond to program managers in the Office. Corradini asked how they do quality assurance for analysis and what standards were used. Worley answered that the Idaho Operations Office has developed a checklist based on DOE orders.

Christensen asked if it was true that three years of funding would be given out in the first year so there were no mortgages. Worley said that that is right. Christensen pointed out that HR 1 prohibits DOE from funding fellowships and scholarships unless they are in the request and are supported by the bill. He asked if NE's fellowships were at risk. Lyons said that his guess was that the funding was not at risk but that the issue needs more study and discussion.

A break was declared at 2:27 p.m., and the meeting was called back into session at 2:41 p.m.

Peter Lyons was asked to present the outlook for NE and its programs and for NEAC. He thanked Corradini and Richter for the subcommittee reports. Many have made contributions to NEAC for a long while. They are due relief. In the future, a NEAC term could be 5 years with one renewal. That would allow continuity and the introduction of new personnel. Ahearne, Cochran, Sessoms, Todreas, and Fertel have been on the committee for 13 years. He suggested that five new members be appointed by the next meeting and that the retiring members stay on for two meetings after that. Suggestions for new members would be welcome. In addition, each subcommittee chair should look at the subcommittee members and develop a system of rotation. The Office would like to draw on the expertise of the Committee and others to produce a review report with technology and policy sections to be presented at the June 2012 meeting to re-examine what is being done in NE. It should include discussions of SMRs, Yucca Mountain, Fukushima, and other topics.

He presented ideas for focus areas for some of the subcommittees:

- Reactor Technology Subcommittee: NGNP, SMRs, and the suggestions coming out of the Massachusetts Institute of Technology (MIT) study
- Fuel-Cycle Subcommittee: the BRC recommendations and the suggestions coming out of the MIT study
- International Subcommittee: Fukushima's international impact
- Facilities Subcommittee: interactions with industry about facilities available there and a list of university facilities

Martin noted that this is a rich time for NEAC. Four years ago, the Committee decided that one could not do technology without policy and could not do policy without technology. The puzzle has to be put together again after Fukushima, Yucca Mountain, and the BRC. He asked the Committee members to respond to Lyons's suggestions.

Ahearne replied that this was a good list of challenges for the subcommittees and that the chairs will take them to heart.

Martin stated that the NNSA should become engaged with NE. Next year there will be the second President's Nuclear Security Summit. The topics discussed at NEAC should be broadened. Lyons suggested asking Anne Harrington to talk about NNSA's nonproliferation program. Barron

stated that greater integration would be a good step forward; there are opportunities to make all of these committees better.

Hintz said that rotation is a good idea. There is a good coverage of the technology through the national laboratories. More expertise is needed on energy policy, which is a detriment at the national level. Lyons stated that what was heard from Koonin today was an attempt to deal with that issue.

Corradini noted that the charges to the subcommittees to deal with the MIT study recommendations would imply a joint effort between the Reactor Technology and the Fuel-Cycle subcommittees. Lyons agreed.

Sessoms stated that the International Subcommittee should deal with the DOE reaction to the Fukushima disaster. Participation by the NNSA in the International Subcommittee's look forward would be needed to drive the policy discussions. Lyons believed that Anne Harrington would be supportive, and he would mention it in a meeting with her the following day.

Christensen endorsed the limitation of terms.

Richter asked if there were issues that NE should prepare position papers on for the Nuclear Security Summit, which will be held in Seoul, Korea, in 2012. Lyons said that the Seoul meeting will be on topics that are only tangential to NE. Martin noted that most countries are interested in technologies, not safeguards. NE is becoming a technology and policy bureau for the government. The Office's friends elsewhere in the government need to be rallied to promote better funding for NE. Richter pointed out that the developing countries have no infrastructure, training, regulatory framework, etc. DOE should do some thinking about how these attributes can be developed in these countries. Cochran added that the problem is primarily about consolidation and securing of highly enriched uranium (HEU) around the world. The major threat is HEU use in Russia, and that cannot be addressed until the United States gets out of HEU use itself, and the Navy will not back away from HEU for ship and submarine propulsion.

Bhatnagar pointed out that the President has laid out a vision for energy, and we are going to do a technology review. However, some policy decisions are missing, such as system studies, Gen-IV decisions, hydrogen decisions, funding of universities, and the response to Fukushima. These policies should be the priority, and the technology should follow. Sessoms stated that the policy issues are so much harder. The important piece of the puzzle is to lay down a framework and let people take shots at it.

Sackett said that this rich time for NE gives NEAC the flexibility to deal with a lot of issues. The international approach is quite varied across Germany, India, and China. There is a lot to be learned from these different approaches. Increased coordination with NNSA and others is necessary. The United States is interesting to others because of the technologies it has to offer. SMRs offer a chance to regain technological leadership.

Lyons stated that he appreciated all of these comments and that all of them were well taken. There seemed to be agreement on the plan to rotate the Committee membership.

John Kelly was asked to present an update on the DOE and other U.S. responses to the Fukushima Daiichi accident.

As a result of the damage sustained from the magnitude-9.0 earthquake and 14-m-high tsunami, the six Fukushima Daiichi reactors experienced several severe explosions and meltdowns. In addition, many thousands perished and more than 100,000 people were homeless; the cost to humanity was huge.

The major root cause of the damage was loss of offsite power caused by the earthquake; the reactors scrambled, and the diesel generators kicked in. The emergency generators worked properly until the tsunami hit 1 hour later and made them inoperable, shutting down all motor-operated pumps. The loss of batteries led to the loss of control over the steam-driven emergency pumps. As a result, cores overheated, cladding oxidized and melted, and hydrogen was produced.

Hydrogen escaped from the containment vessels and exploded in reactors 1, 2, 3, and 4. It is not known how the hydrogen was vented.

There was an immediate coordinated response. The U.S. NRC and DOE opened an emergency operations center (EOC) and deployed personnel to the U.S. Embassy in Japan to support the reactor safety team and to provide expert advice to the U.S. ambassador and to the Government of Japan ministers. The Institute of Nuclear Power Operations (INPO) played a vital role and served as a clearinghouse of information to Japan. DOE deployed airborne monitoring aircraft and consequence-management response teams; provided DOE embassy representatives; deployed national-laboratory representatives; and assigned NE personnel to stand watch in the EOC with twice-a-day reports to the White House.

During the first several weeks, DOE provided a significant and diverse set of analyses to support the events and to make projections. This led to bringing in more than 200 people from NE, SC, NNSA, and the Office of Environmental Management (EM). The Nuclear Energy Response Team was centered on a triad of SC, NE, and NNSA with support from national laboratories. Information was supplied to the NRC, DOE, industry, and INPO, which then communicated to the U.S. Embassy in Japan, which advised the Tokyo Electric Power Company/Nuclear and Industrial Safety Agency (TEPCO/NISA) and the Government of Japan integrator.

NNSA had primary responsibility to monitor radiological fallout and provide data to the U.S. Government and the Government of Japan. It determined where the radiological contamination was coming from. It was mostly from reactors, but there was a lot of conflicting information on Pool 4. Airborne deposition was modeled.

The response team was getting a lot of questions to assess and clarify information for DOE and NE leadership concerning the status of the situation, to provide support to NE EOC watch standers, and to organize national-laboratory analysis activities. There are still 40 to 50 NE staff members in Japan.

The big question was the potential for a hydrogen explosion. A definitive answer could not be arrived at, just probabilistic analyses and results. Flyovers and radiation-shielding codes indicated no problem with the spent-fuel pools.

Corradini asked whether, in offsite radiological contamination, NNSA was the lead agency for the Japanese. Kelly answered, yes.

Robots are finding high levels of radiation in the building basements, limiting the ability to proceed to a cold shutdown. It will be a long time before the system can actually conduct the heat out of itself. This is an enormous engineering challenge.

In terms of spent-fuel pools, models were developed to predict pool boil-off time and to understand hydrogen production. A zirconium fire would last several days, so the fire that was extinguished was not of the cladding. The models predicted that it would take 10 or 11 days to boil off the water if the pool were full. However, there were no reliable temperature or water-level readings. The radiation levels indicated that the pools were nearly full. Infrared cameras indicated pool temperatures of about 80 °C. The iodine-to-cesium levels indicated that the cooling-pool contamination likely resulted from the plume from one of the reactors rather than from the stored spent fuel.

The recovery phase, involving the cleanup of water, was also looked at. Concept studies were conducted for a few days. It is still a struggle. They have not started treating water, yet. The ion-exchange technology is similar to that used at Three Mile Island.

Corrosion rates of reactor pressure vessel (RPV) steels have been examined in the open literature. The Fukushima Daiichi plants use A533B steel for the pressure vessels. There are few data on this class of steels in salt or concentrated salt solutions, although some data have been identified. Some 100 to 200 tons of salt could accumulate in the bottom of the RPV. In 1972, the Millstone Unit 1 had seawater introduced into full-flow demineralizers, and high-conductivity

water entered the reactor vessel. There was stress-corrosion cracking, but it was considered to be “superficial.” Some cracking likely occurred in all units at Fukushima as soon as seawater was introduced. Initial data for low-alloy steels and carbon steels in salt solutions indicate the corrosion rate to be very slow. The jury is still out on what occurred at Fukushima. They have to wait to get heat extraction working before they worry about corrosion.

DOE is continuing its support for the Government of Japan. Data collection and accident forensics are being used to support lessons learned. And the response team is continuing to monitor potential accident consequences.

Cochran asked if anyone had calculated a collective dose estimate. Kelly replied that the NNSA is looking at annual individual doses. A collective dose is not meaningful because people were evacuated before the radiation was released. Cochran asked if anyone at Lawrence Livermore National Laboratory (LLNL) or anywhere else had done a collective effective dose estimate (e.g., in Tokyo). It is a crude estimate, but inhalation exposure and other exposures can be modeled. Kelly answered that the data have been collected to go back and do a retrospective analysis. Cochran pointed out that, for Chernobyl, LLNL did models showing the effective dosage received by the exposed population.

Corradini said that he had heard that about 1% of the cesium (20 million curies) had been released and asked how that had been determined and whether any more estimates of the release had been made. Kelly said that these values have been determined from dose estimates. Corradini stated that that is a very small release. Kelly replied, yes, but it is not inconsistent from the engineering analyses. There are containment vessels and suppression pools that limit releases.

Sessoms observed that stationing DOE people at the embassy facilitated communication with the Government of Japan and asked whether the United States has technical people at all embassies. Kelly said that he did not know the makeup of the nation’s embassy staffs. Johnson added that NE had people there in 36 hours. Sessoms pointed out that it is possible that nuclear reactors could be deployed all over the world. Barron added that, as one looks at NE’s role in supporting NNSA, one should also look at what could be done for the owner-operators.

Elizabeth McAndrew-Benevides and **Carol Berrigan** were invited to speak about the results of the Nuclear Energy Institute workforce survey, which covered 102 of the 104 nuclear power reactors. About 60,000 people are directly employed at nuclear power plants. For every reactor worker, there is another worker supported elsewhere in the commercial nuclear sector. It is expected that 39% of the workforce will retire by 2016. The industry is working with colleges to shore up nuclear technology programs. There are more than 1000 students in those programs. At universities, there are 2800 students in nuclear engineering programs. These levels may be negatively impacted by failure to fund fellowship and scholarship programs. DOE should support nuclear education at all levels. Only the United Kingdom has had a similar program. The pipeline should extend from high school to employment. A high-level program should be maintained. The industry provides additional training to new hires. Many with two-year associate degrees go on to complete their bachelor degrees while employed. Other countries are copying this program. Without infrastructure and workforce, one cannot respond to the needs of the future.

Hintz stated that many workers in the nuclear industry are chemical engineers and other types of engineers. Berrigan replied that technician-level people are graduates of nuclear programs. In 2010, the industry hired more than 5000 people: 19% in operations, 23% in maintenance, 27% in engineering, and 31% in other. NSF does not want to fund nuclear engineering scholarships or fellowships.

Corradini said that, from another viewpoint, for undergraduate and graduate students, the only other places for support are NSF and DOE’s Office of Science for support in physics, chemistry, and materials science. Only a small percentage of nuclear engineering students are supported by DOE.

Sessoms pointed out that it is in DOE’s charter to do this.

Jim Kinsey noted that the conceptual design report developed by General Atomics under contract to DOE proposed an HTGR design with a reactor outlet temperature of 725 °C. However, he also noted that NGNP Project activities (R&D, licensing, etc.) are focused on the development of an HTGR with a reactor outlet temperature in the range of 750 °C to 800 °C, which is believed to be the center of the bell curve of what the end users are going to be looking for. Researchers have a good understanding of what it will take to go to even higher temperatures. The sweet spot for the NGNP reactor is in the range of \$8 to \$10/MM Btu. With current gas prices under \$5/MM Btu, that tends to cause people to think that HTGRs are a nonstarter. But feedback indicates that end users would be willing to pay a premium just to stabilize their energy costs because gas reactors are the only alternative they have to petroleum-based fuels. They remember when natural gas was \$14/MM Btu a few years ago. Martin noted that even a \$10/MM Btu natural gas price is equivalent to \$60/bbl crude oil, so the economics of an HTGR look very competitive for the future.

Another comment was submitted by e-mail by **Mark Auernheimer** and is attached to the meeting record as Appendix B.

Sackett expressed thanks for being included in the meeting remotely.

Johnson said that the Committee has a green light to go forward on the technology/policy report. He thanked the members of the Subcommittee on Reactor Technology for their hard work.

Cochran commented that the two governments of the United States and Japan have mostly kept secret their analyses and information about the Fukushima accident. They should stop treating their citizens as children and release these data and the information to the public and let the public understand the nature of the beast. There should have been more public data.

The meeting was adjourned at 4:36 p.m.

Respectfully submitted,
Frederick M. O'Hara, Jr.
Recording Secretary
June 21, 2011
Corrected July 5, 2011

Appendix A



Marvin S. Fertel
PRESIDENT AND CHIEF EXECUTIVE OFFICER

May 23, 2011

William (Bill) Martin
Chairman
Nuclear Energy Advisory Committee
c/o Kenneth Wade
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

Dear Chairman Martin:

Because of a conflict with the Edison Electric Institute annual meeting, I will be unable to personally attend the June 15 Nuclear Energy Advisory Committee meeting. However, I would like to offer NEI's expertise to help inform the discussion on Nuclear Energy University Program Activities. The future nuclear workforce is a vital concern to the commercial nuclear industry. NEI closely monitors current and future education and training needs and coordinates industry efforts in this area. In my absence, I believe that such a briefing would be useful and timely, given that industry has recently updated its workforce projections.

In addition, the industry has been working with partners in universities and community colleges to develop and deploy the Nuclear Uniform Curriculum Program (NUCP). This program fills an important gap in the nation's nuclear education infrastructure—providing education and training in critical fields such as nuclear plant operations, radiation protection, instrumentation and control, mechanical maintenance and electrical maintenance. By creating a pipeline for nuclear qualified technicians, NUCP will prepare individuals for challenging careers in commercial nuclear facilities and government laboratories.

If you agree that a briefing by NEI staff would add value to NEAC's discussion, I would be happy to make Carol Berrigan, senior director of industry infrastructure, and Elizabeth McAndrew-Benavides, manager of industry infrastructure, available during the meeting. If you have any questions or need additional information, please contact me.

Sincerely,

A handwritten signature in black ink that reads "Marvin S. Fertel". The signature is written in a cursive style with a large, stylized "M" and "F".

Marvin S. Fertel

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Appendix B

From: auernheimer@gmail.com [<mailto:auernheimer@gmail.com>]
Sent: Thursday, April 28, 2011 12:33 PM
To: Wade, Chuck
Subject: NEAC Comment: Waste Safety and Disposal Projects, MSR technology, burners

Regarding: Comment
Meeting of the Nuclear Energy Advisory Committee (NEAC).
DATES: Wednesday, June 15, 2011, 8:30a.m.-4:30 p.m.
ADDRESS: L'Enfant Plaza Hotel, 480 L'Enfant Plaza, SW., Washington, DC

Kenneth Chuck Wade, U.S.
Department of Energy, 1000
Independence Avenue, SW.,
Washington, DC 20585

Mr. Wade,

Please review, include, and discuss the issues and comments below, as I am not able to make the meeting on June 15th.

As you review the projects in the scope of your activity and agenda, please also evaluate the enhancement of MSR (Molton Salt Reactor) emphasis, as this will add inherent safety to our nuclear endeavors. I would like to see many more MSR and LFTR (Liquid Fluoride Thorium Reactor) demonstration projects for burning wastes, activating thorium for reactor fuel, and generating electricity. There should be more Program Concentration on the way forward with alternative technologies such as LFTR and other MSR burners to reduce our need for hazardous storage. The average American would feel better about all of our nuclear efforts if there was publication of how many tons of nuclear waste is disposed of permanently, and if that metric were increasingly accelerating upward.

As a believer in true Reuse-Recycle philosophy (not just the marketing hype), it is logical that we derive energy from the nuclear wastes we have stored, and that we do this in a melt-down-proof and inherently safe design such as the MSR. Basic MSR technology was proven and running in the 1960s and 1970s, and for this use could be replicated exactly or improved marginally with new materials and technologies.

We need more ACTION on wastes now, and more emphasis on the Most Safe designs. MSR and LFTR provides this path. Ultimate safety through geometry, engineering, and inherent safety design is always more effective and reliable than procedural safety and methods. Safety factor emphasis is now even more relevant in the postscript of Japan's Fukushima Daiichi nuclear power facility, which is also on your agenda.

Viewpoint on how we pay for these suggested project expansions: Waste Fee Fund- Our public's frustrations are real, but could be mitigated with actions - make a portion of waste fees available for burner technology. Actual production projects (small pilot systems) to eliminate waste is the start. Liquid Fluoride Thorium Reactor (LFTR) technology, and other burner

technologies, are well suited for this action. These funds are already currently assessed on our nuclear utilities and would not need to be increased, and increased taxes would not result.

How to move forward: Neglected, and mostly proven Reactor Technologies that have inherent safety designs- Emphasis needed on LFTR, MSR, and hybrid burners. Produce pilot projects Now in order to "tune for industrialization" on a larger scale.

The progress I am asking for would result in Safety Improvements for Materials/Waste Transport-MSR burners would mitigate, reduce, and substantially add to the remedy of these issues. Initial reactors in our National Labs sites, then On-site regional processing of piles to burn actinides at selected nuclear park storage sites would substantially reduce transport needs, costs, and risks. Reduction of Storage of Wastes would result- LFTR/MSR burners would mitigate, reduce, and substantially add to the remedy of these issues. MSR burners would utilize the waste as fuel. This fuel could be the incentive that Utilities need in order to implement a free market solution. MSR LFTR technology would mitigate, reduce, and substantially add to the remedy of the Waste Disposal System issues and provide a sustainable path to efficient, clean and cheap electricity generation..

I strongly believe additional actions must be taken Now for production of solutions, not just study, evaluation, and analysis.

I do understand that America's broader nuclear problem is not necessarily wholly included in your agenda, but it is related. Our real problem is one of public confidence. Political Inaction, combined with the fact that waste piles are growing, are keys to a poor public consciousness in nuclear issues. Inaction allows the public view to be skeptical and deters support from everyday Americans.

Our broader nuclear problems also immensely impacted by the slow development of the next generation and beyond of nuclear reactor technology. I appreciate the work that is being done, much of what you are reporting, but it is not sufficient, and not fast enough.

I ask you to recommend to Use Now a portion of waste fee money now to create MSR and LFTR burner pilot projects with engineering variations/specializations. Through these projects, the way forward for a total fuel cycle problem solution will be demonstrated. If facilities are being built Now to "Dispose of Waste", the public will be happier. When more than a couple of these sites are running, the frustration and complaints will be reduced in tenor because a real solution is in process. Our current National Labs and Nuclear Research sites would be the ideal place for such project siting.

I strongly ask and urge, in response to my feedback, is to have additional discussions of the specific points I have made above with Kirk Sorensen, and utilize his expertise much more heavily.

Every member of the Department and the Administration should give Mr. Sorenson a two hour one-on-one -- this would be greatly in the national interest.

Aim high, take immediate Action.

Produce now, study always.

Regards,

Mark Auernheimer
804 714 6869<tel:804-20714-206869>
Richmond, VA