

WM2008 Conference Panel Reports

Session 22 Summary The Global Nuclear Energy Partnership and Beyond

Six senior panel members representing a broad perspective from industry, universities, and the Department of Energy and its National Laboratories convened to discuss various aspects of commercial spent fuel recycling in this country and abroad. Discussion topics centered around the drivers, nonproliferation characteristics, economics, technology readiness, government and industrial roles, and regulatory and policy issues associated with recycling spent fuel.

The discussion involved upwards of 70 audience members, including international participation, over a three plus hour duration which involved introductory comments by each of the panel members, discussion and debate in response to structured questions for the panel, and response to freeform questions posed by the audience.

Panel members who participated in the session were the following:

- Sal Golub (Co-chair), Program Manager for the Advanced Burner Reactor, US Department of Energy, Office of Nuclear Energy
- Mike Lawrence (Co-chair), Nuclear Energy Programs Manager, Pacific Northwest National Laboratory
- Alan Hanson, Executive Vice President, Technology and Used Fuel Management, AREVA NC, Inc.
- Steven Kraft, Senior Director for Used Fuel Management, Nuclear Energy Institute
- Raul Deju, President and Chief Administrative Officer, Energy Solutions, Inc.
- Per Peterson, Professor of Nuclear Engineering, University of California at Berkeley

Introductory Remarks

Each of the panel members provided some introductory remarks on their views of recycling in this country and abroad. Some of the more pertinent aspects of the remarks include the following:

- Despite the controversial nature of the Global Nuclear Energy Partnership (GNEP) being undertaken by the Department of Energy, it has taken some meaningful steps. Two ministerial meetings have occurred in 2007 to establish international bilateral and multilateral agreements to pursue fuel cycle closure. Efforts are underway now to inform a DOE Secretarial decision later this year on how to best proceed with fuel cycle closure within the Department.
- Recycling helps enable the expansion of nuclear power. The drivers for recycling include: 1) reduces reliance on fresh uranium, 2) addresses waste disposal confidence issues, 3) is economically viable, in the face of rising uranium prices, and 4) reduces the radiotoxicity and heat, reducing the complexity of repository disposal.
- Proliferation is a primarily a policy issue, which technical approaches can make more difficult, but not preclude. One of the primary benefits of recycling used fuel today is to reduce the demand for enrichment, which is a primary proliferation concern with the global expansion of nuclear power.

WM2008 Conference Panel Reports

- The U.S. is suffering from a policy vacuum. Key elements of the Nuclear Waste Policy Act no longer make sense and are politically out of date. Recycling will require policy changes to address these gaps. Meanwhile, the efforts to license Yucca Mountain need to be continued to allow the process to determine the suitability of the repository to meet its requirements.
- The key to a successful nuclear renaissance will be the success of the first half dozen power plant construction projects. Whether these projects can be conducted within cost will determine whether the renaissance continues. A successful renaissance, however, will require recycling, and R&D and demonstrations need to be undertaken and continued.
- Even though opposition for recycling comes largely from the nonproliferation community, it is recognized that both enrichment and reprocessing technologies are proliferation concerns. Previous policies have been established largely on the proliferation concerns associated with reprocessing.

Response to Structured Questions

After each of the panel members provided their introductory remarks, prepared questions were presented to the panel for their response, debate, and discussion. These questions and a brief summary of the ensuing discussion were as follows:

1. Fuel Recycling Drivers: Several reasons have been cited for shifting the recycling policy in the United States: enhanced repository benefits, fluctuating uranium prices, domestic fuel security, and reliable fuel services for the international community. What are the views of the panel members as to the principal driver or drivers for recycling in this country?

- When discussing the drivers for recycling, the panel presented several ideas. Clearly the need to establish reliable fuel services for non-fuel cycle nations was one of the founding principles of GNEP. But, just as importantly, recycling adds to the waste confidence issue. An international approach to disposing wastes from recycle is an important consideration that needs to be examined and developed.

2. Nonproliferation: The Nuclear Energy Institute's policy brief on fuel recycling states "The industry believes that to fully realize the long-term benefits of nuclear energy, the United States and other nations must develop proliferation-resistant advanced fuel-cycle technologies that will supply recycled fuel when it is economic to do so...." What features or characteristics of advanced fuel cycle technologies are necessary to meet proliferation-resistance requirements for deploying commercial recycling technology in this country?

- With regards to proliferation resistance, there was agreement among the panelists that there are no intrinsic nonproliferation methods. In other words what technology might achieve, alternate technology can likely undo. As GNEP was originally rolled out, there was much confusion as to the nature of the technologies being proposed as being inherently proliferation resistant, leading to mixed messages and confusion about GNEP. The primary focus should be on limiting the spread of enrichment and reprocessing facilities.

WM2008 Conference Panel Reports

3. **Economics:** The report on Economic Assessment of Used Nuclear Fuel Management in the United States by the Boston Consulting Group cited several economic factors leading to considerations for recycling in the U.S.: 1) Rising costs for repository disposal, 2) anticipated growth in US nuclear generation, 3) improved economics for recycling, and 4) international experience with commercial reprocessing. What is the panel's view on an economic model that would be necessary to support recycling in this country?

- With regards to the economics of recycling, they must be evaluated in terms of the overall waste management model. The cost of waste disposal must be included in the economic model for it to be attractive to industry. Consequently, the government and industry roles must be clearly delineated apportioned and the funds, to the degree possible assured. Industry will not take on the economic risk alone for recycling without a clearly defined government role.

4. **Readiness of Technology Options:** Several technology options exist for recycling such as electrochemical vs. aqueous based processing, gaseous effluent capture, minor actinide separations, and fast vs. light water reactor recycle. For instance, in November 2005, the American Nuclear Society developed a position paper stating that the development of fast neutron reactors was important to the sustainability of the world's energy supply. However, the recycle capability of international communities is currently based on light water reactor recycle with MOX. What are the panel members views on the appropriate technical approach and the level of technology readiness needed for commercial scale recycling facilities to be built in the U.S.?

- The technology readiness question brought about interesting perspectives among the panel. It was generally agreed that fast reactors will eventually be needed to bring about the ultimate benefit of recycling, both from a waste toxicity perspective as well as energy sustainability perspective.
- However, commercial scale fast reactors are not presently economically viable. A two tier system, in which light water reactors are used for recycled fuel, would reduce the number and time for fast reactors, and potentially offer a solution to the technology readiness question for fast reactors.

5. **Government vs. Industrial Roles:** What are the panel members' views on the relative roles that government and industry should play in developing and deploying commercial fuel recycling capability in this country?

- One of the more notable discussions was on the government and industrial roles in deploying commercial scale recycling capability in the United States. It is clear from the discussion that, even though there are significant drivers for establishing recycling capability in this country, it will not proceed in earnest until the relative roles between government and industry are more clearly established. Such roles may include establishing certain guarantees by the government so that industrial investments could proceed in confidence.

6. **Regulatory/Safety Infrastructure:** What changes to laws, policies, and regulations are needed to implement recycling in the United States?

WM2008 Conference Panel Reports

- The panel outlined the changes that are necessary in the realm of regulatory and policy infrastructure. Regulatory changes need to be streamlined in a one-step licensing process to support recycling. For instance, 10CFR50 currently used to license power reactors would not be appropriate for a recycling plant. Moreover, the regulations need to be reliable. The outcome of these regulatory changes would be that industry could proceed in confidence that their investment would not be in vain. The situation that occurred at Barnwell in the 1970's when the reprocessing plant investment was made worthless set a huge precedent that must be avoided in the future.

Audience Participation and Feedback

During the final 30 to 45 minutes of the session, the audience was invited to pose questions to the panel. Briefly the questions and the panel's responses can be summarized as follows:

- In light of the Reagan administration cancelling the prohibition on reprocessing in the 1980's, what is holding the US back? – The industry needs fundamental shifts in policy such as extension of the Price Anderson Amendment's Act to cover liability of construction and production, loan guarantees, streamlined licensing processes, and other risk mitigation measures. A determination on Yucca Mountain licensability will also be vitally important to informing the national policy decision.
- Under a fuel services regime, where will the waste components from recycling go? What happens to the Pu? – Under the GNEP vision, Pu will be transmuted in advanced fuel cycle countries. It is thought that waste disposal must be part of the service, likely under an international agreement on waste disposal.
- What is the best case scenario for GNEP this year? – The best outcome for GNEP this year will be to frame GNEP for sustainability into the next administration, combined with a reasonable appropriation of funding for FY-09. The Programmatic Environmental Impact Statement is currently being prepared to inform the DOE Secretary's decision on GNEP as it transitions to the next administration.
- How much money will be required for a sustainable government program and what would be the funding priorities? - GNEP was originally planned for growth to \$1.7 billion by year 5 of the program. Realizing that the large budgets required are not likely to be forthcoming, a sustainable program of \$250 million/yr should focus on qualification of fuels that will be needed to support recycling. Moreover, at these funding levels, a viable framework for public/private partnerships in moving forward is a key outcome.

Summary and Conclusions

Although several significant conclusions could be drawn from the panel session, one of the more notable was from the discussion on government and industrial roles in deploying commercial scale recycling capability in the United States. It was a recurring discussion topic by the panel members that recycling will not proceed in earnest until the relative roles are more clearly established. Such roles may include establishing certain guarantees by the government so that industrial investments could proceed in confidence in a streamlined regulatory framework.