

The Regulation and Logistics of Spent Fuel Transportation

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ABOUT THE AUTHOR

Jennifer Cole is a junior at the University of Tennessee-Knoxville, where she studies nuclear engineering. She has participated in the Cooperative Education program at her school, resulting in the opportunity to work for Southern Nuclear Company for three semesters. Her interest in nuclear energy has grown immensely since the start of her college education. She is very active in Society of Women Engineers, American Nuclear Society, Women in Nuclear, and North American – Young Generation in Nuclear.

Jennifer is a participant of the 2003 summer Washington Internships for Students of Engineering (WISE) program, and her sponsor is the American Nuclear Society. This research gathers the current work being done towards the goal of transporting spent nuclear fuel to a repository site, as it relates to public policy.

ABOUT WISE

Washington Internships for Students of Engineering (WISE) is a 10-week program created for select engineering students from all over the U.S. to participate in research on a topic of interest which relates to public policy issues. This unique experience gives engineers a chance to meet with a variety of government agencies and private organizations in the Washington, D.C. area. Some of the tours and meetings included the National Academy of Engineering, the Department of State, the Office of Science and Technology Policy, National Science Foundation, and many other remarkable appointments.

This program allows students an opportunity to see how the technical world overlaps with government. A presentation and report are given at the end of the 10 weeks to summarize the research done throughout the course of the summer, offering any policy recommendations dealing with each student's chosen topic. To find out more information about the WISE program, visit the website at <http://www.wise-intern.org>.

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EXECUTIVE SUMMARY

Nuclear power plants all over the country are running out of space to temporarily store their spent fuel on-site, so they are turning to new solutions of on-site storage. To continue our country's electricity usage of nuclear power at 20%, this problem must be resolved to revitalize the industry.¹ As established through the Nuclear Waste Policy Act (NWPA) of 1982, the transportation and acceptance of spent nuclear fuel would occur on January 31, 1998. Therefore, the Department of Energy (DOE) is liable for its failure to begin waste acceptance as predicted in 1998, and as a result, work is being done to reach an alternative goal.

When the NWPA was amended in 1987, Yucca Mountain was selected as the only choice of study for a repository (Sec. 160), continuing with future plans for this particular site. As promised by the DOE through the NWPA, this repository will provide a place for all nuclear power plants to combine their waste at one common site. Many steps precede the actual movement of spent nuclear fuel across the U.S., entailing the current stage of this process.

When and how will the spent nuclear fuel travel safely from the various plant sites spread throughout the U.S. to the proposed repository site? What will be the projected travel route during this process? These questions have stirred an uneasy public fear with the thought of high-level radioactive material traveling through towns across the U.S. Legal and congressional challenges continue during the current licensing phase, as those in opposition seek to reduce funding in order to delay the progress on this vital project. This poses a threat to the final goal of transporting the material to a repository in the goal year of 2010.

Since spent nuclear fuel will travel through many states, a common initiative must be taken to bring consistency to the program. This way, the same ideas will not be repeated, unless they prove successful. DOE is working to achieve a balanced understanding among the states that will be directly affected by this transportation endeavor. With this organized planning of the regulations and logistics involved, this paper will analyze the steps involved towards spent fuel disposal.

INTRODUCTION

As Benjamin Franklin once stated, "*Well done is better than well said.*" The nuclear industry believes the job of transporting spent nuclear fuel can be done in a very safe and efficient manner, but those in opposition to the process do not agree. This situation encompasses people who provide valid arguments from either side, but ultimately, a compromised and sound decision must be decided – and soon. Based on our country's safety record of transporting radioactive material, the

¹ http://www.aboutnuclear.org/view.cgi?fC=Electricity,Global_Map_of_Nuclear_Power_Plants

industry argues that the transportation of spent nuclear fuel should not be such an event, as it represents a secure and resourceful way of doing business. Over the past 40 years, about 3,000 shipments of spent nuclear fuel have navigated more than 1.7 million miles of U.S. roads and railways. During this travel, no radioactive materials have been released; therefore, nothing has presented harm to the environment or people.²

When preparing to transport and store spent nuclear fuel at Yucca Mountain in the year 2010, the logistics of the transportation has given many people a sense of uncertainty. For this process to be consistent and respected by the public, issues must be resolved and explained throughout progression. Currently, spent nuclear fuel and high-level radioactive waste is housed in 131 temporary storage sites located in 39 states, and 161 million Americans live within 75 miles of these sites.³

The shipment of nuclear waste is a highly regulated procedure, requiring the work and expertise of many government agencies. In the current licensing stage, the DOE must wait to make the final detailed plans depending on if their application meets approval by the Nuclear Regulatory Commission (NRC) when submitted by December 2004. Likewise, no spent fuel can be moved to Yucca Mountain until the NRC licenses the repository for receipt of spent fuel, thus authorizing construction, which is planned for three to four years after the submittal of the license application.⁴ Though the licensing stage is vital to the process, other plans must be in order. This leads to the current stage of the process - the development of a broad working plan.

During this process, detailed planning of transportation rules, carrying casks, advance route approval and notification states, and public education should be set. Although plans are currently in the preliminary stages, research is progressing in the developmental stages, as the planning of routes develops to meet the regulatory requirements. Also, testing of the carrying casks which will carry the spent fuel during transportation is underway. The federal government maintains responsibility for working with states and tribal governments prior to these shipments, checking on public preparation in these aspects. Through extensive planning of this transportation infrastructure developed to suit the shipment of spent nuclear fuel, safety and security measures, funding, federal regulations, cask testing, and public involvement play key roles in the process.

FEDERAL RESPONSIBILITY

The NRC, DOE, Department of Transportation (DOT), and Environmental Protection Agency (EPA) uphold prime duties dealing with spent fuel

² ANS Reactions, Vol. 18, Sept 2002.

³ White House Statement by the Press Secretary, Yucca Mountain Statement, February 15, 2002.

⁴ www.nei.org, Used Nuclear Fuel Background by Terry Freese.

transportation. The NRC enforces standards, grants or denies licenses, inspects, regulates casks, and interacts with authorities. The DOT regulates transportation of waste, enforces requirements, and also interacts with authorities. The EPA is responsible for establishing standards. The DOE maintains responsibility for creating the license application, in addition to designing, operating, and constructing a repository as authorized.

The Federal Nuclear Waste Fund has raised \$21 billion from the utilities since 1983, and the balance at end of 2002 was \$13.4 billion. This fund accumulates more than \$1 billion each year due to rate-payer contributions and interest, with a fee of one-tenth of a cent for every kilowatt-hour of electricity.⁵ DOE acts as an oversight agency to these utilities, as they do not own these mostly private plant sites. These supervisory agencies merely set the guidelines of safety, security, tracking, and testing, and the industry is asked to step up from here to do more intricate planning.

The infrastructure of the transportation plan intends to rely on what already exists and what has been used in the past for similar campaigns. Training and dry-runs will be performed one year in advance to actual shipments. A well-defined picture exists for the shipping, but there is no clear view how the receiving side will be handled at Yucca Mountain. Presently, DOE is in the process of developing a National Strategic Plan by the end of this fiscal year to address policies, interactions between affected governments, identification of necessary activities, and the final approach to having an operational transportation system in place and operating by 2010. So essentially, the process underway will develop a strategic plan to be used to form the actual plan seven years down the road.

CURRENT STAGES OF THE TRANSPORTATION INFRASTRUCTURE

DOE has been involved in much of the preliminary work, but there are still many steps that must follow for the Yucca Mountain vision to be a reality. For the Yucca Mountain repository to be used as a permanent disposal of high-level radioactive waste between years 2010 and 2024, DOE must submit a license application to the NRC by the end of 2004. After this step, the NRC will decide to accept the license to construct the repository for nuclear waste. Also, it cannot be predicted what will happen if the NRC does not approve the license application. This explains why DOE is keeping very strict guidelines, to ensure meeting the NRC's requirements.

The waste will be transported in NRC-certified casks along approved transportation routes by the DOT. Transportation procedures and emergency response will be developed in accordance with the NWPA, as amended in 1987, to

⁵ Radwaste Solutions, "Budgets, licensing, Water, Transport: Yucca Mountain Updates," May/June 2003.

address Yucca Mountain as the only repository choice. Since a broad range of agencies and stakeholders are involved in the decisions dealing with this transportation plan, it can take years to come up with a solution. This explains the extensive timeline for this project.

In the Yucca Mountain Project Site Recommendation, it states that “the real choice is not between transporting or not transporting, but between transporting with as much planning and safety as possible, or transporting with such organization as the moment might invite.”⁶ This statement refers to the wastes which have been bound for a location and ultimately must be transported somewhere in the future. It may be to the public’s advantage to realize this in-depth strategizing will lead to better results later in the process of handling this waste. Otherwise, if plans are delayed and the waste is not routed to a repository, the utilities face the process of making huge decisions on their own. This strategic method aims to be well-respected by looking out for the industry before the dire need of storage strikes.

In addition to the agency and utility concerns, The National Academies Board on Radioactive Waste Management is currently performing an \$850,000 study on “Transportation of Radioactive Waste,” funded by the DOE, the NRC, the U.S. DOT, and National Cooperative Highway Research Program, and the Electric Power Research Institute.⁷ This two-year study, which started March 25, 2003, includes all aspects of the transportation, such as potential transportation routes, state of Nevada perspectives, federal agency involvement, county government perspectives, tribal perspectives, opportunity for public comment, and discussion of problems and proposed solutions dealing with this topic. The 15-person panel comprises independent experts in risk assessment and risk communications, health physics, transportation operations, regulations and safety, public policy, social justice, and nuclear security. As additional plans are created for the transportation of high-level waste, this study has potential to be of beneficial use to DOE. The developed information acquired for this study may be integrated into the working transportation plans for 2010, as it proves useful.

TESTING

The NRC has an extensive process for licensing the casks, which will be used prior to the transporting of spent nuclear fuel. To be certified by the NRC, every transportation cask must be able to withstand four types of tests. These include, in

⁶ Yucca Mountain Project Site Recommendation, 9.5. Assertion 5: Transportation of Nuclear Materials is Disruptive and Dangerous, p. 38, February 2002.

⁷ Radwaste Solutions, ““Budgets, licensing, Water, Transport: Yucca Mountain Updates,” May/June 2003.

sequence, a free drop, puncture, immersion, and thermal tests. During these tests, the cask must not release any harmful radioactive material to the environment. The NRC evaluates these casks as part of a certification process, while DOE's labs have been called upon to perform a variety of tests also. A more detailed description of the tests follows:⁸

- A drop from 30 feet onto an unyielding (ensures damaging energy created by impact will be absorbed by cask rather than the surface) surface, equivalent to hitting a bridge abutment at 120 mph, followed by
- A drop from 40 inches onto a shaft 6 inches in diameter and at least 8 inches long, followed by
- A fully engulfing fire at 1475° F for 30 minutes, followed by
- Immersion in 3 feet of water in a position where maximum leakage is expected for 8 hours.

The drop from 30 feet simulates a cask being dropped from an overpass onto a concrete highway. The drop from 40 inches onto a shaft imitates the cask hitting a sharp corner of a bridge abutment. The engulfment of the cask in fire is an example of if a tank of gasoline ruptured in an accident and a fire ensued. The immersion into water simulates the cask rolling off the truck from the highway into a creek.⁹ Additionally, security features are built into the cask designs. NRC maintains responsibility for pre-notifications to the public throughout the transportation process, ensuring that no one will be caught by surprise with the timing of the shipments.

The used fuel transportation casks are about 15 times thicker than a gasoline truck, and they include three inches of stainless steel and thick radiation shields. To put into comparison, for every ton of spent fuel, more than three tons of protective packaging and shielding exist.¹⁰ The dimensions of the cask are 17 feet by 5 feet, and an average cask will weigh around 70 tons.¹¹

The packaging certification methods consist of a mixture of computer-simulated tests, scale modeling, or full-scale testing. In addition, quality assurance documentation is completed for each package design. Since the computer simulation can be directly compared with physical testing, it often provides helpful information to meet the design requirements. Scale-model tests prove to be more cost effective than full-scale testing, but not all of the testing can be done without doing a full-scale test. Lastly, the full-scale testing is performed only to correspond to the computer analysis and to do some specific testing, but this test remains the most

⁸ Yucca Mountain Project Site Recommendation, p. 17-18, February 2002.

⁹ http://www.aboutnuclear.org/view.cgi?fC=Transportation.Testing_%5E_Safety

¹⁰ ANS Reactions, Vol. 18, Sept 2002.

¹¹ www.nei.org

expensive and time-consuming.¹² One must realize that these tests are not meant to duplicate real transportation accidents, but to produce damage that is of equivalence or worse than a severe transportation accident.

Applicants for licenses must abide by various codes, standards, and regulations. During review of the license applications, the NRC assesses compliance with these specific requirements. Under title 10 Code of Federal Regulations part 71 (10 CFR 71), the NRC's major roles and requirements for the transportation casks are specified.

SECURITY AND RISK FACTORS

The security of the spent nuclear fuel as it travels across the country concerns the general public, pertaining to the exact transportation routes and the timing of the process. The casks used during the transportation of spent nuclear fuel are designed using extra secure measures. Security comes from both sides of this process, as the private plant sites prepare for their waste to leave the site in a well-protected manner.

Since risk is measured by both frequency and consequence, calculated risk does not represent a true risk to a population. With this, frequency of accidents from historical data can be found, but that is by no means a direct mirror of the frequency of terror attacks, for example. When dealing with such a big part of the country involved in the process of spent fuel transportation, the perception of risk cannot be controlled. People who feel threatened by this risk will have different ideas of the magnitude of risk at which they feel unprotected. Therefore, the training and education is vital so that the actual risks are recognized, but comparatively, they are not thought of as a threat in the overall realm of the system.

Risk assessments study accident rate, transit time, population density, the details of other vehicles sharing the road, and time of day.¹³ Through these studies, it becomes more evident which roads should be used, or railways in the case of trains. Also, the realistic view of accidents can be noticed, and this information can be used towards creating a more efficient system of travel, if needed.

It must be noted that the transportation infrastructure was designed as an open infrastructure, so vulnerabilities will be protected on a need-basis. Cooperation and coordination of stakeholders involved directly with the process interact to protect the system, participating in checks and updates of each other. In addition, the transportation infrastructure was created to withstand populated areas, so it would be to our country's disadvantage to go above the realms of the

¹² U.S. DOE National Transportation Program, Radioactive Materials Package Performance.

¹³ Ibid.

system and decide what areas to avoid during the process. Our country could be put out of business by merely trying to exceed the boundaries of a system and propose even stricter rules to follow.

LEGISLATION

As Senators Harry Reid and John Ensign of Nevada announced on July 7, 2003, they plan to introduce legislation to strengthen whistleblower protection laws. Reid says, “But, it appears that the DOE will resort to any means necessary to prevent Yucca Mountain project employees from speaking out.” Reid believes President Bush has created “targets of opportunity for terrorists” by supporting the decision to ship nuclear waste across the entire country to store it at Yucca Mountain.¹⁴ Here, he refers to last summer on July 23, 2002 when President Bush signed House Joint Resolution 87 giving way to DOE’s Office of Civilian Radioactive Waste Management (OCRWM) to prepare a license application to submit to the NRC for construction of a repository at Yucca Mountain.

When the 1987 NWPA Amendment directed no further consideration of any other site but Yucca Mountain, DOE began to follow its direction, despite some opposition from the people in Nevada. The passing of the 1987 NWPA Amendment meant that no other site would be considered as a backup plan if the license application was to be decided unacceptable by the NRC. In the case of a transportation accident, liability coverage would be covered by Public Law 95-256, better known as the Price-Anderson Act. This was passed by Congress in 1957, but most recently amended in 1988, requiring the nuclear industry (including DOE) to provide financial protection to the public in the unlikely event of a major nuclear accident.¹⁵

A central point of debate by Representative Gibbons of Nevada on the Yucca Mountain debate in the House last year addressed the point that if a repository is built at Yucca Mountain, it will not be adequate for all government and commercial high-level waste that is expected to need disposal. The NWPA places a limit of the amount of spent nuclear fuel which can be stored at the “first repository,” with Sec. 161 stating that the Secretary of Energy “may not conduct site-specific activities with respect to a second repository unless Congress has specifically authorized and appropriated funds for such activities”. This further directs the Secretary to report to the President and to Congress “on or after January 1, 2007, but not later than January 1, 2010, on the need for a second repository.”¹⁶

¹⁴ <http://reid.senate.gov/record2.cfm?id=205932> ; <http://reid.senate.gov/record2.cfm?id=181193>

¹⁵ US DOE National Transportation Program; Transporting Radioactive Materials – Answers to Your Questions, June 1999.

¹⁶ NARUC Comments on Yucca Mountain Transportation Planning, July 2003.

On July 15, 2003, the House Appropriations Committee passed the fiscal year 2004 Energy and Water Development Appropriations bill, which provides funding for most programs at the DOE. The bill also funds programs of the Nuclear Regulatory Commission. This included a High-level Waste Fund of \$765 million, an increase of \$174 million over the DOE budget request.¹⁷ The Senate did not approve the same appropriations as the House, and the final amount will depend on the results of the House-Senate conference committee. Of the \$73.1 million requested from the Senate in FY 2004, \$18 million will be for activities associated with developing a waste transportation infrastructure in NV.¹⁸

In *Nevada v. DOE II*, Nevada challenges DOE's Final Environmental Impact Statement (FEIS) based on the deficiencies such as failure to properly analyze the impacts of transportation, among other reasons. Oral argument is scheduled for some time in September 2003, when the *NEI v. EPA* case and *Nevada v. NRC* case will also be addressed.¹⁹

Also, Congress is expected to consider reauthorization of the Hazardous Materials Transportation Act in 2003 through Senator John McCain, R-AZ, which could address used fuel transportation issues. In addition, Senator Richard Durbin, D-IL, has indicated he intends to reintroduce S.3162, the Nuclear Waste Transportation Security Act in the 108th Congress, but so far, he has not made a movement with this.

This current legislation shows that although many of the transportation plans are long-term, preliminary action has already been taken to deal with this extensive process. This way, the government and the general public remain aware of this movement by the nuclear industry. In some regards, the extra time gives those in opposition a chance to state why they feel this process may not be the best way to handle this waste problem. Idealistically, this time can be used to achieve a compromise between opposing parties who deal with this dilemma.

RAILWAY PROGRESS

Currently, no railways exist in the state of Nevada that would be capable of transporting spent nuclear fuel directly to the Yucca Mountain, NV site. This poses a problem because DOE thinks that the "mostly rail" approach would be the most efficient to handle the future shipment of waste. This "mostly rail" scenario would involve 1,100 truck shipments and 10,700 rail shipments, while the "mostly legal-weight truck" scenario involves 53,000 truck and 300 rail shipments.²⁰ DOE's

¹⁷ <http://www.ans.org/pi/news/index.cgi?d=1058468844>

¹⁸ Statement by Dr. Margaret Chu, Director for Office of Civilian Radioactive Waste Management, U.S. DOE, FY 2004 Senate Energy and Water Development Appropriations Hearing, April 7, 2003.

¹⁹ <http://member.nei.org>

²⁰ NARUC Comments on Yucca Mountain Transportation Planning, July 2003.

definition of a rail shipment includes three rail casks per train, estimating an average of 175 shipments per year to Yucca Mountain over a 24-year period.²¹

DOE has looked at 5 different proposed railway ideas; however, in hopes of moving spent fuel by 2010, they may already be behind schedule to complete a useful railway system. Possibly, DOE will be forced into using trucks during the first years of shipment, although trains would more efficiently handle heavier loads. It is believed that the building of a railway should be completely independent of the licensing process for this master plan to work.

DOE has not begun to build a rail line because of many reasons. Mainly, the five candidate corridors have not been narrowed down, funding has not been requested or assured, and starting construction before it is certain that the repository will be licensed could be wasteful. Most important to note, DOE did not receive funding in FY 2003, and funding was not requested in FY 2004. In conjunction with the NRC's review of the license application that will take three to four years, 2010 remains a key date of which hopes to be met.

DOE estimates a \$500 million per year cost for every year of delay in waste acceptance beyond 2010.²² If developed, the rail system would cost an estimated \$300 million to \$1 billion, depending on the corridor choice.²³ The routes vary between 98 and 323 miles; however, using the shorter routes may lead to greater difficulty of obtaining site control. For example, DOE has been warned not to consider routes that "go anywhere near Las Vegas" by Representative Hobson (OH) who sits on the Appropriations subcommittee that reviews the repository budget.²⁴ These suggestions must be evaluated and judged through a systematic approach, choosing the best overall option. Ultimately, the choice with less conflict would be a good start.

REGULATORY RESPONSIBILITY

DOT and NRC share primary responsibility for regulating the safe transport of radioactive materials in the U.S., with these regulations based on international transport safety standards. The Hazardous Materials Transportation Act of 1975 directed DOT to develop transportation safety standards for hazardous materials, including radioactive materials. DOT regulations are contained in the Code of Federal Regulations (CFR), Title 49. Standards are set for packaging, transporting, and handling radioactive materials, including labeling, shipping papers, placarding,

²¹ DOE's Environmental Impact Statement, February 2002.

²² TEC Meeting July 2003

²³ Statement by Dr. Margaret Chu, Director for Office of Civilian Radioactive Waste Management, U.S. DOE, FY 2004 Senate Energy and Water Development Appropriations Hearing, April 7, 2003.

²⁴ NARUC Comments on Yucca Mountain Transportation Planning, July 2003.

loading, and unloading requirements. DOT is also responsible for training personnel who perform handling and transport of hazardous materials.²⁵

Likewise, NRC regulates the packaging and transport operations of its licensees, including commercial shippers of radioactive materials. It sets design and performance standards for casks that carry materials with higher levels of radioactivity. The establishment of safeguards and security regulations are fixed by the NRC, and detailed in CFR, Title 10.

Some shipments with a high level of radioactivity are identified as Highway Route Controlled Quantity (HRCQ). Highway carriers of these shipments are required to use “preferred routing,” which restricts transport to specific interstate highways and takes into consideration such risk factors as accident rate, transit time, population density, activities, time of day, and day of week.

Once the preferred route is chosen, the carrier of these shipments must prepare a written plan for NRC showing origin and destination of the shipment, scheduled route, planned stops, estimated time of departure and arrival, and emergency telephone numbers. Then, NRC does an in-depth check of these routes for security purposes. Through these regulated processes, it can be seen that the agencies work on a close basis to maintain secure measures.

CURRENT INITIATIVES

Several DOE programs have successfully completed hundreds of radioactive materials shipments in the past 50 years, where each of the programs chose a different approach to working with the public, media, and agency and elected officials who were interested in or affected by the shipments. When DOE prepares for the shipment of radioactive material, it involves designing and procuring new shipping containers, matching shipping sites with receiver sites, contracting with carriers, and safely moving the material in the process. Moreover, the logistics of the transportation has been done before and can be done for years to come, but the reaction of the public during the shipping campaign remains unpredictable.

How much information should the public know? If all information is released, DOE risks extreme security issues dealing with the transportation process. By informing all people of the exact schedule of transport, DOE harbors the risk of developing a “target” model. DOE’s National Transportation Program (NTP) works to maintain an updated list of contacts dealing with radioactive materials shipment planning, including state representatives appointed by the governors and tribal points of contact.²⁶ This ensures the information goes out to the right people, so that all boundaries are covered.

²⁵ US DOE National Transportation Program, Radioactive Materials Shipping Regulations, 3/99.

²⁶ www.ntp.doe.gov

Through the public outreach campaign, NTP has resources such as booklets and fact sheets on various radioactive transportation subjects, and sample language explaining the risks associated with transporting radioactive materials. A major resource comes from the updated websites that exist, and they explain the process and facts in an up-to-date manner. They work hardest to reach those people who are actually on the proposed shipping route than those who are not in proximity to the transportation routes. There must be a priority on releasing true information to the public, making sure the facts are coordinated with all involved agencies. This enables everyone to maintain a record of shared information, building credibility. Through this initiative, there are no worries of what information was shared, as all agencies keep the same documentation of facts.

When transportation methods are brought to public view, DOE must be prepared to answer questions and share information in greater detail. A fact sheet should be prepared, containing general information for the shipping activity - number of shipments, mode, possible route(s), broad timeframe, quantity and type of material being shipped, and the reason for making the shipment. With this awareness, all information should be as accurate as possible, and any uncertainties should be made clear from the start.

For long-term shipping campaigns, a “show and tell” or “road show” has proved successful involving the shipping casks. This way, the communities along the shipping route are given a chance to ask questions and see a transportation cask up close. By this approach, any negative images the public may have perceived about the process will be discussed, and questions of safety can be answered. DOE’s shipping-related activities are performed by contractor companies, so the DOE must make sure questions are answered properly when dealing with the public. Otherwise, the public could be informed by various agencies, having potential to give a twist to the facts.

Even after stressing the impressive safety record and standards, it may still be difficult for the public to see how the benefits measure up to the disadvantages. One of DOE’s major goals is to make sure successful shipping activities are publicized more often, giving way to a more positive perception of radioactive materials transportation. Through exposure, people can usually make their own judgment based on personal conclusions, rather than adopting other’s perceptions.

DOE’s studies and experiences from past shipping campaigns show that programs are likely to be successful if they:

1. properly identify the scope, or level of interest in the campaign of shipping schedule, enlisting the assistance of state, tribal, and regional points of contact at the start and throughout the campaign;
2. make use of existing resources;

3. provide accurate information written for the target audience;
4. are managed directly by the DOE program or public information officers themselves
5. freely share information with other agencies and organizations that are helping to plan the shipments and
6. consider a post-shipment press release.²⁷

PUBLIC INVOLVEMENT

A major role must be to involve the public as the planning of the repository is discussed. This way, people will not feel as if the industry is trying to hide anything from them. While the good records and efficiency reported by the nuclear industry usually go without notice, the few bad events that have occurred have shaped a somewhat “negative perception” of nuclear in general. Educating the public on the true information must form a big part of this initiative for the process to be complete. Noting the facts based on past experience could make a huge difference in the public’s trust of nuclear safety. Through this newfound trust, it also remains important for people to see why it would be advantageous for fuel to be stored at one site, rather than dispersed around the country.

As the schedule continues to be planned, there are many factors to be considered. It only takes a few people to say something bad about the process for it to get out of hand. Efforts must be achieved to ensure that the people of the towns who are involved will have an open-door policy when the trains or trucks are ready to go through their town. For the Senators who oppose the repository and the transportation to it, their constituents will most likely follow their lead instead of forming their own opinions. It remains the job of the agencies and the nuclear industry to shape a positive view on this subject matter in the minds of the public.

POLICY RECOMMENDATIONS

Besides a push for the safe transportation of spent nuclear fuel from Congress and key government figures, our country can only hope the general public will begin to see the benefits of this process to aid in a future of nuclear power. By understanding the future of nuclear and giving trust to DOE’s programs, the transition of moving the spent fuel to one site will be easy to do. The movement of spent nuclear fuel to one location makes more sense from an industry and safety viewpoint than keeping the waste distributed around the country.

For this project to succeed, the NRC needs to make sure the licensing process runs as smoothly as possible. With this in mind, the DOE should work in a close

²⁷ Transportation External Coordination (TEC) Working Group, Communications Topic Group, Best Practices for DOE’s Radioactive Materials Transportation Public Information Program.

regard to the NRC, making sure to cover all bases dealing with this project. This way, there will be no doubt about the NRC's approval of the license application next year. Throughout this process, there also needs to be a close working relationship on educating the public and planning ahead of the logistics. In the long-term, the shipment of spent nuclear fuel to Yucca Mountain remains on a tight schedule. With help and continued support from all agencies involved, the chances of an unsuccessful program remain slim.

To meet the goal stated in the FY 2004 OCRWM Budget (page 570) for "reduction in time to both first emplacement of waste and completion of waste receipt in the repository," the "mostly rail" solution must become more than a just the best plan.²⁸ With the public and government's interest in the process, a plan should be procured with as much input as possible, listening to all people involved. This problem of waste can be handled in a safe and productive manner, if all phases of the plan are executed using a method of equality and fairness. Everyone can learn from each other, and hopefully, the plan will move forward in a joint effort. Sometimes to reach a goal, compromise is required; this process needs to develop the best possible plan that meets all expected objectives.

The future of the nuclear industry may be indicated by the results of this transportation plan. If the spent nuclear fuel travels to the repository, then the public will be more aware of nuclear, and hopefully the safe shipments will lead to a new and positive perception of the process. Furthermore, the construction of new nuclear plants will not go into effect until our country knows there will be a place to store the current waste. The planning of the transportation remains key, as it could mold the potential for the nuclear industry.

Some of these ideas are shaped by the Nuclear Energy Institute (NEI), in attempt to regard all of the pending issues and develop a working plan. NEI constructed a formal policy paper on used fuel transportation that will form the basis of interaction with the Congress on anticipated hazardous waste transportation legislation. They advocate these principles of transportation should apply when transporting the fuel to a repository. The Industry Policy by NEI includes:

- Robust shipping containers certified by NRC
- Implement and enforce regulations at federal level
- Adopt safety culture
- Develop transportation plans
- Coordinate transportation routing
- Use best available routes consistent with regulations
- Where rail is chosen, use dedicated trains

²⁸ NARUC Comments on Yucca Mountain Transportation Planning, July 2003.

- Provide support for emergency response²⁹

CONCLUSION

The future of a well-organized transportation program lies in an intricate and organized planning process. If the proposed timeline is not delayed, then the spent nuclear fuel will travel to Yucca Mountain in year 2010 without any interruptions. The success of the program remains to be seen while everyone involved reaches the goal of achieved planning and efficiency. The spent fuel has great potential to travel in a safe manner towards one common site; however, it will take cooperation from state, local, tribal and federal governments, in addition to the plant sites who are involved.

After the logistics are worked out for this initiative, the process is hoped to be one that can be reproduced in years to come. Since the standards have been set high, this enables the program to be a working model to those in the future. The detailed planning of the transportation infrastructure involves experts from all areas of the spectrum who are related to this cause.

Many people have a strong desire for Yucca Mountain to be developed and used as a permanent repository for our nation's spent fuel. This advance of a repository by a strategic transportation system will complete the vision from twenty years ago, affirmed by the President and Congress last year. DOE is working productively on their license application in hopes that it will pass; otherwise, it faces a serious problem of having no second choice site and would add costs of delay in amounts of billions of dollars. From there, the country would be posed with a question of keeping the nuclear reactors running, in fear of no place to store the future waste. Once the spent fuel pools and dry storage facilities are completely full at the individual sites and a place does not exist to ship some of it, the nuclear industry could go start on a downward path. By placing trust in the hands of those who have tested, planned, and prepared for this process, our country would be making a good choice for a continued production of nuclear energy.

DOE works closely with the utilities and other federal agencies involved during this crucial process of development, licensing, design, and testing to ensure this plan is executed in a proper fashion. By basing the overall operating plan on safe shipments done in the past, DOE has prime examples to follow. Upon approval by the NRC of the license application prepared by DOE, construction will be authorized at Yucca Mountain, and the plan will begin to move in fast gear.

Overall, high expectations exist in the process of this transportation plan. In conjunction with stringent regulations and clear logistics, DOE will strive to achieve

²⁹ Nuclear Energy Institute, "Industry Policy on the Transportation of Used Nuclear Fuel to a Federal Facility," Attachment 5A, February 6, 2003.

safe transportation, security and emergency response plans, cost effectiveness, and a well-maintained schedule. Through all of these achieved principles, the core transportation plan has great potential to be a success throughout the years of movement.

A vital part of this process lies in all groups maintaining composure and handling the logistics before problems have the opportunity to develop. The nuclear industry's success very much outweighs any negatives; therefore, if allowed, the regulations and logistics of the transportation will once again bring a positive glow to this business. In conclusion, one central site will provide more protection for this material than do the existing 131 sites, and this would present a positive step towards America's national security and homeland security interests.³⁰ The government needs to step up and take greater charge over their role of shipping and storing this nuclear waste. The plants should not have to spend their valuable land and time worrying about alternative storage, when they were promised a place of storage many years ago.

APPENDIX A: STATISTICS AND FIGURES

³⁰ Yucca Mountain Statement, Statement by the Press Secretary, Feb 15, 2002.

**Nuclear Waste Fund Commitments
Through September 30, 2002**

State	Total (in millions)	State	Total (in millions)
Alabama	\$885.4	Mississippi	\$225.2
Arizona	589.3	Missouri	225.8
Arkansas	488.7	Nebraska	326.5
California	991.5	N. Hampshire	150.5
Colorado	0.4	N. Jersey	808.5
Connecticut	830.5	New York	1290.2
Florida	942.3	N. Carolina	949.7
Georgia	777.8	Ohio	371.2
Illinois	2,775.0	Oregon	122.9
Iowa	136.2	Pennsylvania	1,775.9
Kansas	212.9	S. Carolina	1,490.5
Louisiana	357.2	Tennessee	478.3
Maine	262.7	Texas	602.2
Maryland	432.3	Vermont	228.7
Mass.	206.0	Virginia	857.6
Michigan	911.0	Washington	171.9
Minnesota	494.2	Wisconsin	454.0
		Total	21,883.0

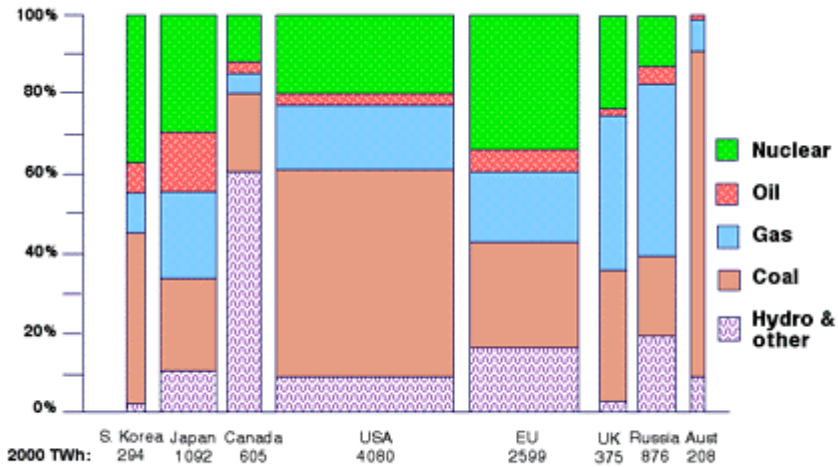
Source: Energy Resources International Inc.

Nuclear Waste Fund Fee Income and Appropriations

	(in millions)				
	1998	1999	2000	2001	2002
Fee Income	\$600	662	702	689	707
Appropriations	\$156	169	241	191	95

Source: DOE

Fuel for electricity generation (percent)



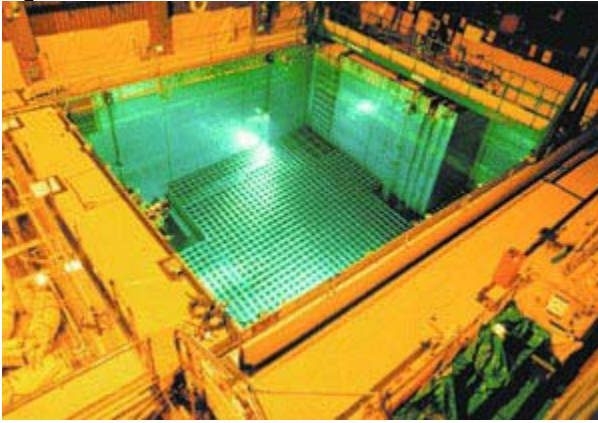
Width of each bar is indicative of power generated (gross production)
 Source: OECD/IEA 2002, Electricity Information 2002 (2001 data), OECD/IEA 2002
 Energy Balances of non-OECD countries

Transportation Cask



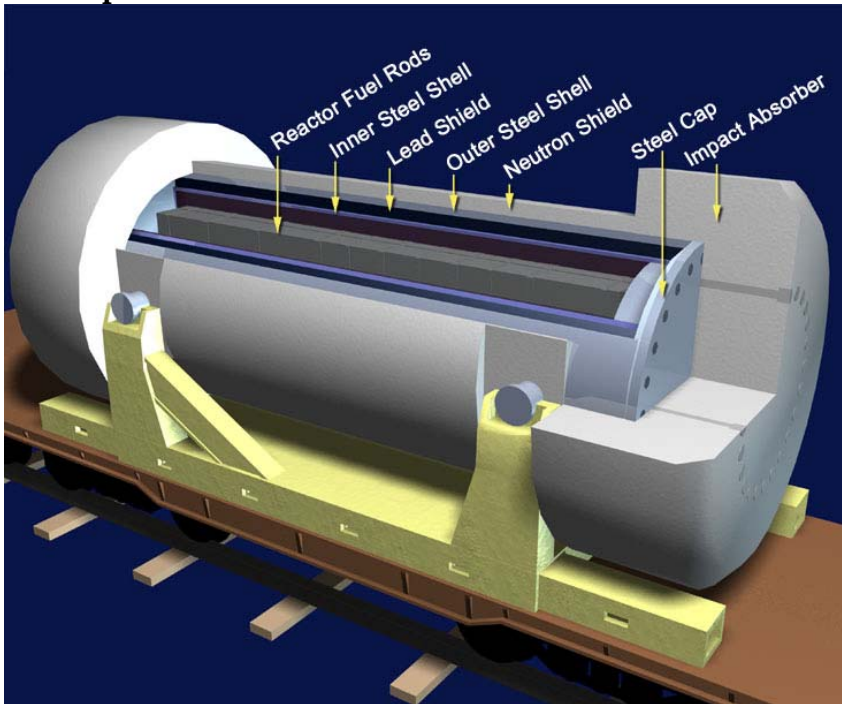
Source: <http://www.uic.com.au/graphics/cask.jpg>

Spent Fuel Pool



Source: <http://www.nrc.gov/images/waste/spent-fuel-storage/spent-fuel-pool.jpg>

Transportation Cask



Source: http://www.nei.org/images/Container_Labels.jpg