

## **Why DOE's Messages on Transportation Don't Resonate with the Public (and What DOE Can Do to Fix the Problem) – 8098**

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### **ABSTRACT**

This paper describes the U.S. Department of Energy's (DOE) challenge in addressing public perceptions about the planned transport of spent nuclear fuel and high-level nuclear waste to a national repository. The authors focus on ways to improve one small but important component of a well-designed effort to manage social risk – namely, public outreach. After reviewing fundamental principles of risk perception, the authors examine DOE's own public information materials from various radioactive waste shipping campaigns to determine the extent to which DOE uses such messages. This review reveals that, not only are these suggested messages seldom if ever incorporated, but DOE's reliance on five key messages likely provides little benefit and could actually heighten public concern. To improve the outcome of DOE's future public outreach activities, the authors recommend specific changes to DOE's key messages on transportation of radioactive waste to better reflect the underlying factors that influence public perception of risk.

### **INTRODUCTION**

In 2017, if DOE meets its “best achievable schedule” [1] for developing a national high-level radioactive waste repository at Yucca Mountain in Nevada, DOE will embark on a radioactive waste shipping campaign that will dwarf all others. Shipments of spent nuclear fuel and high-level radioactive waste to Yucca Mountain will travel through an estimated 44 states over a period of up to 50 years. By one estimate, a campaign of this size would affect approximately 18 million Americans living within a half mile of a transportation corridor [2]. Reaching out to inform such a large number of affected people will pose a significant challenge, requiring DOE's greatest effort if the program is to succeed.

Not only is the size of the public outreach task daunting, but the nature of the necessary outreach is, as well. Communicating with the general public about issues related to radioactivity is notoriously fraught with difficulties. The public's perception of the risks associated with radiation is well known to be tremendously different from that of the scientific community. The persistent disparity between expert and lay perception of the risks associated with the transport of spent nuclear fuel builds in a disadvantage for DOE in reaching out to the public – a disadvantage that can be exacerbated when program opponents exploit the public's traditional negative reaction to most things nuclear. For example, we have already seen efforts to amplify fears of radioactive material transportation in an attempt to derail the Yucca Mountain repository project. When Congress was deciding in 2002 whether to move forward with Yucca Mountain, activists took to America's highways with a “Mobile Chernobyl” road show, generating a considerable amount of outrage and attention. While public protest was not sufficient to stop Congress from overriding Nevada's veto and approving Yucca Mountain as the repository, the Mobile Chernobyl campaign did offer us a glimpse of what lies ahead should transportation to Yucca Mountain ever become a reality. It also demonstrated how DOE's own public relations efforts need to improve significantly if they are to succeed in countering the strong messages carried by program opponents.

The National Academy of Sciences (NAS) recognized the potential challenges caused by public perceptions of risk in its 2006 report *Going the Distance? The Safe Transport of Spent Nuclear Fuel and High-Level Radioactive Waste in the United States*. After two years of studying the transport of spent nuclear fuel, the NAS's Committee on Transportation of Radioactive Waste concluded that, while the technical risks of such transport are well understood and manageable, the social risks present very real challenges for DOE to overcome [3]. Among the report's recommendations, the NAS committee highlighted the need for DOE to “establish formal mechanisms for gathering

high-quality and diverse advice regarding social risks and their management on an ongoing basis” [3]. The committee stated that, by taking “early proactive steps to characterize, communicate, and manage ... social risks,” organizations such as DOE may “increase the openness and transparency of transportation planning and programs ...and possibly increase trust and confidence in transportation programs” [3].

In response to this recommendation, DOE has stated, “DOE also agrees that there are social and institutional challenges, but the Department believes it would meet these challenges successfully through a process that has transportation safety as its priority” [4]. While consistent with DOE’s traditional approach to risk communication, this response demonstrates a lack of understanding or acknowledgement of how risk perception is shaped. DOE’s failure to understand and act on the basics of public perception of risk will inevitably hamper the department’s ability to communicate successfully with the public regarding the transportation program to move radioactive waste to the national repository.

## **PERCEPTION OF RISK**

The task of reaching out to the public with information on shipments of radioactive waste is, at its core, a risk communication issue. To understand how to communicate risks to the public, one must understand how the perceptions of risk are shaped in the first place. Research in the field of risk perception has found that there are many factors that influence the perception of risk [5,6]. While scientists or so-called “experts” calculate risk based on statistical probability and other quantifiable data, many nonscientists or lay people instead consider factors such as fairness, benefits, and whether they have any say about incurring the risk.

These factors have come to be called “outrage factors” (Table I). At the risk of oversimplifying, research has demonstrated three important characteristics of risk perception:

- Outrage factors such as fairness, control, etc., appear to be extremely influential in shaping people’s perceptions of risk in a manner that often does not align with expert opinion.
- Once people become sufficiently outraged, they will likely stop heeding the advice of experts.
- External forces – such as the media, or activists – can succeed in amplifying the risks even further.

In other words, risk perceptions develop and are then unlikely to be changed by people (experts or otherwise) advocating an opposite view point, but they can be amplified or reinforced by people espousing the same opinion (often with more emotion and hyperbole) [7].

Table I. Key Outrage Factors [6]

Voluntary	People often choose to do risky activities. Since it is their choice, the risk seems absent, or at least acceptable. When decisions are forced upon them and the choice is taken away, the perception of risk is often heightened.
Individual control	People are much more comfortable when they – or someone they trust – can influence or control a risk. They don't feel nearly as comfortable relying on others – such as the federal government – to protect them.
Fairness	If a risk is shared equally by all, then it generally is more acceptable. When people feel that a risk is being unfairly placed upon them, the risk seems more serious.
Benefits	People are more willing to accept a risk if they receive a benefit from taking that risk. If they receive no benefits, they are unlikely to accept the risk.
Natural versus artificial	Natural risks are much more accepted and therefore considered less risky than man-made or artificial risks.
Familiarity	As people become more familiar with certain hazards, they seem less risky. Conversely, a new hazard may seem less acceptable.
Dreaded	If a particular risk can result in an effect that is dreaded, such as cancer, then the risks are much less acceptable.
Detectable	Risks that are not easily detectable are less acceptable.
Well understood	Risks that are not well understood by the public are less acceptable.
Catastrophic potential	If a particular risk has the potential to cause catastrophic consequences, the risk will be perceived as much higher.
Trusted source of information	People are willing to accept a risk more readily if someone or some organization that they trust says the risk is manageable. If the source of that information is not trusted, then the risk seems much greater.

The transport of spent nuclear fuel and high-level radioactive waste across the United States to a national repository will score high on the negative side of virtually all these factors. Those people who live along the transportation routes are unlikely to perceive the risk is being shared equitably; they certainly didn't choose for these shipments to occur; knowing the shipments meet federal transportation regulations won't ease their fears; and few will see a personal benefit stemming from the shipments. They will know that exposure to radiation can cause cancer and that the radioactive materials being transported near their homes are artificially generated. Radiation from the shipments will be, for them, impossible to detect, so they will not know whether they are being exposed. They will be inundated with information and messages through the news media and through other means from activists, local officials, and neighbors they trust, many of whom will say that this activity is putting their lives and their property at risk. Finally, they will know that a truly bad accident can cause death and massive evacuations.

Often, it is possible to reduce the level of outrage – in some cases significantly – by sincerely and meaningfully recognizing and responding to these outrage factors. Efforts to make the risk more fair or to give stakeholders a measure of control can help to reduce the level of outrage and reduce the perception of risk. Unfortunately for DOE, when it comes to the transport of spent nuclear fuel and high-level radioactive waste, many of the outrage factors cannot realistically be resolved or even appreciably reduced. For example, DOE is not likely to convince the public that a worst-case transportation accident would not be catastrophic, or that the radiation released would not result in at least some cases of the dreaded disease cancer. But DOE can address several of the factors, and the more DOE does address, the more likely public outrage will be reduced along with the perception of the risk [6]. For DOE, the challenge will be to find ways to do this both in developing the transportation program and in communicating with the public about the program.

## DOE'S KEY MESSAGES FAIL TO ADDRESS OUTRAGE FACTORS

To see how well DOE's public information materials incorporated messages that respond to outrage factors, the authors reviewed 40 fact sheets, booklets, and brochures that various DOE programs prepared either for general purposes or in connection with specific shipments of spent fuel, transuranic waste, low-level radioactive waste, and other radioactive waste and materials (see References for a partial list). The publication dates for the materials

ranged from 1978 to 2007. The purpose of the review was to find key messages that matched up with what the authors identified as responsive key messages, as well as to identify examples where DOE's public information messages either overlooked these factors or, worse, had the potential to exacerbate public concern.

In reviewing the materials, the authors searched for instances of messages that responded to common outrage factors, focusing on four which the authors believe stand out as candidates for reducing outrage over the transport of spent nuclear fuel (see Table II):

Benefits: Strong statements clearly linking shipments to some tangible benefit to people – e.g., cleaning up an environmental resource or better protecting public safety/security.

Individual control: Statements indicating that public input had influenced program decisions.

Familiarity: Direct comparisons of the shipments to other radioactive materials shipments people might have encountered before – e.g., shipments to the Waste Isolation Pilot Plant (WIPP).

Trusted source: Statements that would connect DOE in a meaningful way to more credible information sources at the local or state level – such as an endorsement of or testimonial to planning or preparations.

Table II. Documents displaying responsive messages

Message	Documents
Benefits	11
Control	5
Familiarity	3
Trusted source	1

DOE's public information materials provided few examples of messages that could be deemed responsive to these or other common outrage factors. Only 11 documents included statements explaining the benefit of shipments, and most of those statements were, at best, weak. For example, a 1999 fact sheet on spent fuel transportation explained that DOE ships spent fuel and high-level radioactive waste because "[t]his action implements the nonproliferation policy for foreign fuels and provides temporary storage for naval propulsion fuels" [8]. True, perhaps, but this explanation does not offer any evidence of a direct, tangible benefit to the average American. Most of the other "benefits" references likewise cited abstract concepts of "support for" activities such as "waste cleanup and environmental restoration," or shipments being necessary to meet "program milestones" [9,10,11].

Two recent OCRWM booklets on transportation did mention the benefits of disposing of waste in a repository, for example "protect[ing] public health and safety and the environment from these highly radioactive materials," and "provid[ing] the nation with additional protection from acts of terrorism" [12,13]. Both booklets, however, failed to make a direct link to the necessity of transport to result in those benefits. In addition, the benefits seemed somewhat generic and difficult for someone to personally realize.

Perhaps the best description of a tangible benefit to the public appeared in a fact sheet on shipments of low-level radioactive waste from Rocky Flats in Colorado: "Cleaning up Rocky Flats will return thousands of acres to the citizens of Colorado. The site will become a national wildlife refuge" [14]. Even in this case, though, DOE neglected to connect the shipments to the "return" of Rocky Flats to Colorado residents. In addition, rather than emphasize this point in the body of the text, DOE relegated it to a caption on an artist's depiction of the post-cleanup site.

On the subject of individual control, the authors found only five documents in which DOE's public information materials mentioned public input as a driver for program decisions. One reference amounted to nothing more than an unsubstantiated claim: "In addition to the formal National Environmental Policy Act process of Environmental Assessments, Environmental Impact Statements, and public meetings for actions that could adversely affect the environment, DOE solicits and incorporates those opinions related to transportation programs in other ways" [15]. The document provided no evidence that DOE had, in fact, "incorporated... opinions" into its shipment planning. In its fact sheet on foreign research reactor shipments, DOE claimed that it selected the two receiving ports for the

shipments “[a]fter an exhaustive analysis that included public involvement” [16]. The document neglected to mention what impact, if any, public involvement actually had on DOE’s selection of the ports. Recent OCRWM documents are an improvement, citing the selection of “mostly rail” as the preferred transport mode for repository shipments in part because “public and state officials have expressed a preference for rail” [12,13,17].

DOE almost completely missed the opportunity to make shipments more familiar by comparing them to shipping campaigns that have already taken place. This is ironic because DOE clearly does recognize the value of basing its new public information materials on documents used for previous shipments, as evidenced by the same messages showing up in fact sheets for different campaigns. Rarely, however, did DOE refer to these other campaigns in its fact sheets except to mention, in a generic sense, the record of safe shipments. In fact, the authors found only three specific references to other campaigns. A 2005 fact sheet on shipments of low-level radioactive waste from Fernald in Ohio mentioned that the shipments would use routes that “are currently being used for other infrequent low-level waste shipments from Fernald to Envirocare in Clive, Utah” [18]. A stronger attempt to make these new shipments seem “familiar” would have left out the word “infrequent.” The OCRWM booklets again showed modest improvement over other materials by mentioning the shipments to WIPP and shipments of foreign research reactor spent nuclear fuel. These references were fairly weak, however, because they did not highlight any similarities between these campaigns and what OCRWM is proposing to do (other than the obvious fact that the same federal department will be responsible) [12,13].

Of the four “responsive messages,” the one that made the worst showing within DOE’s outreach materials is the one that would link DOE or its plans in a meaningful way to more trusted sources of information at the local and state level. To be fair, 30 of the documents reviewed did contain references to state, tribal, or local governments being involved in some way in planning or overseeing shipments, or preparing to respond to emergencies. A statement found in a fact sheet on the transport of depleted uranium oxide cylinders was typical of these references: “DOE has also coordinated key emergency response notification and response issues with the affected State emergency management agencies” [9]. A stronger reference described DOE’s low-level waste shipments as being compliant with DOE Manual 460.2-1, “which was developed in a collaborative effort with the states and tribes” [11]. Most of the references to more trusted sources involved inspections and emergency response, with state agencies cited much more frequently than local.

The problem with these references to more trusted sources is that, like the references to “public involvement” discussed earlier, they merely conveyed that interaction had occurred – they said nothing of the content or the outcome of that interaction. Mentioning that the states or, less frequently, local agencies have some role in connection with shipments does not necessarily mean that these parties are satisfied with their level of involvement or with the actions DOE is taking. The one document that did get the message right was OCRWM’s 2001 public information brochure, which began with a quote from the Chief of the Chicago Fire Department: “The International Association of Fire Chiefs have taken the position that, yes, you can safely move spent nuclear fuel and looking at the protective measures that have been taken, it seems to us that a superior job has been done in preparing to move this product” [19].

While instances of “responsive messages” in DOE’s public information materials were few and far between, the authors found many examples of “unresponsive” messages – messages that either failed to respond to the common outrage factors or, worse, could actually heighten public outrage. Five key, and often repeated messages emerged from the review (Table III):

Table III. Documents displaying unresponsive messages

Message	Documents
Federal oversight	33
Proven safety record	27
Special packaging	30
Statistics	9
No deaths or injuries	17

Federal oversight: A significant number of DOE’s public information documents highlighted the federal oversight of shipments of radioactive waste. One fact sheet even opened with such a reference: “In the United States, safe

transportation of radioactive materials is achieved by compliance with Federal regulations” [20]. A problem with this message is that federal agencies traditionally rank among the least credible sources of information [21]. Touting the involvement of sources regarded as having low credibility – or, worse, asserting that the safety of shipments *depends on* the actions of these sources – is hardly a promising means of reducing public outrage over shipments. Moreover, there were instances in which DOE emphasized the theme that federal regulations promote safety, only to acknowledge elsewhere in the same document that DOE was not actually *required* to follow these regulations [e.g., 8,22,23]. For example, after noting that “compliance with Federal regulations ensures that radioactive materials are transported safely,” DOE’s 1993 booklet on transportation included this statement: “Although DOE is a shipper, not a regulator, of radioactive materials, it administers its shipments according to a series of DOE orders and other internal guidance” [23]. More recent documents, particularly OCRWM’s booklets, frequently claimed that DOE would “meet or exceed” the federal regulations that apply to private shippers [4,24,19,13]. Undoubtedly intended to be strong statements, these references further reinforce the notion that DOE is not, in fact, *required* to follow all the DOT and NRC regulations it cites as being directly responsible for the safety of shipments.

Proven safety record: Another frequently appearing message was that government and industry had conducted shipments of radioactive waste safely for decades. Most of the public information materials reviewed called attention to this “proven safety record,” as in “For more than 50 years, the U.S. Department of Energy and its predecessor agencies have maintained a record of safe and efficient transport of radioactive material” [25].<sup>1</sup> One problem with this message is that the “actors” – namely, industry and the federal government – are not highly credible sources. If any entity can be regarded as meriting less public trust than the federal government when it comes to managing radioactive waste, it would have to be the nuclear industry itself.<sup>2</sup> Furthermore, because probability is an extremely complex concept for most people, pointing to the safety record could have the opposite effect DOE intends if the public perceives that, after so many years of safe shipments, an accident is “overdue.” Lastly, regardless of how many years shipments have taken place safely, the message fails to recognize that the catastrophic potential of a worst-case accident diminishes the value of even an unblemished safety record given that it only takes one accident to cause a major disaster.

Special packaging: Most of the materials also made note of the use of special packaging for radioactive waste, especially the “robust” casks used to transport spent nuclear fuel. As with the general “federal oversight” message, a problem with this message is that it relies on yet another federal agency – the U.S. Nuclear Regulatory Commission (NRC) – that is not widely trusted, therefore the message is unlikely to cultivate public confidence in the safety of shipments. Furthermore, the concept of shipping casks is neither familiar to nor well understood by most people. Their design, the properties of the materials used to construct them, the requirements for certification and use – none of these things has any natural connection to the lives of ordinary people. As a result, it is a stretch to think that merely citing the use of robust packaging could reduce public concern or outrage. For example, DOE often mentions the crash tests of casks that took place at Sandia National Laboratory, as well as similar tests conducted in Europe [19,13]. Without an understandable frame of reference, however, it is likely DOE is not reaping the full value of these references.<sup>3</sup>

Statistics about shipments: As noted earlier, DOE frequently cited the long history of safe shipments, often with a total number of shipments conducted to date. Less common although persistent over the years was the attempt to portray DOE’s contribution to the total universe of shipments as inconsequential. Nine of the documents specifically mentioned the total number of hazardous materials shipments in the U.S., then proceeded to describe DOE’s shipments as making up a miniscule fraction of the total. DOE would likely assert that it was simply putting its shipments in context, however there are several things wrong with this message as a means of doing so. First, deflecting concerns about risk onto a different activity is rarely an effective strategy. People might accuse DOE of

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<sup>1</sup> A more subtle reference to the proven safety record is the frequent use of the adjective “unlikely” to describe the possibility of an accident: “In the unlikely event of an accident or incident involving one of these shipments....” [30]. Seven fact sheets included this wording – and one source used it twice [31].

<sup>2</sup> *The Simpsons’* character Montgomery Burns is comical precisely because he epitomizes the nuclear industry for many people.

<sup>3</sup> In 2003, in a public discussion of the NRC’s proposed Package Performance Study, a panelist suggested the NRC consider conducting a drop test of a minivan or other common object in addition to testing a spent fuel cask. The panelist recognized the need to provide people with a more understandable frame of reference to help them make sense of results of a crash test involving a shipping cask [32].

comparing apples to oranges – or, worse, being disingenuous– when it equates a shipment of spent fuel from weapons research with a shipment of medical isotopes that will help a physician treat cancer in a patient. Second, DOE only reinforced its status as an “untrusted” source by appearing to point the finger at other shipments as being just as “bad” or worse than DOE’s. Upon reading a statement about DOE’s tiny fraction of shipments, one could expect most readers to be somewhat skeptical. After all, if DOE’s shipments aren’t that big a deal, then why did the department put together a fact sheet on them? If anything, the attempt to put DOE’s shipments “in context” could actually reinforce the idea that DOE is trying to hide something and, therefore, not to be trusted.

An even worse use of comparative statistics occurred in a 1978 DOE document about the transport of high-level nuclear waste. The document estimated the total population exposure of U.S. citizens to naturally occurring radiation at about 30 million man-rem per year, then stated that the added exposure from high-level waste shipments would be increased by about 500 man-rem per year. “That is a very small fraction of the total,” the document concluded [26]. That comparison triggers several outrage factors: the “inhabitants” would not receive that additional radiation exposure voluntarily, nor would they perceive any benefits; they would have no way to actually detect and verify that additional exposure; and the radiation from natural sources is often perceived as less harmful than artificially generated radiation.

No deaths or injuries: Last but certainly not least was the frequent appearance of statements that “no deaths or serious injuries have resulted from exposure to the radioactive contents of these shipments” [27]. Variations on this theme showed up in almost half of the documents reviewed. More recent examples toned down the message to say shipments had not resulted in “any harmful release of radioactive material” [12,13]. It is understandable for DOE to want to emphasize the “positives” about its shipments, however “no deaths or harmful releases” is not an attribute that is likely to ease the concerns of the public. Just as two wrongs don’t make a right, the absence of a significant negative does *not* make a positive. Imagine advertisers trying to “sell” any other product or service on the basis of it not having killed anyone or caused serious harm. In a sense, this message turns the whole concept of benefits on its head: that is, there may or may not be an identifiable benefit stemming from the shipments, but at least the radiation hasn’t killed anyone (or contaminated the environment). In addition, when presented with the statement that no deaths or harmful releases had occurred, a sufficiently outraged person could very well insert “yet” at the end of the statement – both because accidents are bound to happen and because of radiation having “unseen,” long-term effects. That is, no one has been killed yet, but what deadly cancers have yet to manifest themselves?

Other messages: While the five messages cited above were frequently found in DOE’s transportation documents, there were many other messages found in these same materials that likely escalated outrage. A 1989 DOE booklet attempted a comparison of radiation exposure between natural background and radioactive material shipments. “If 100 spent fuel casks went by the same house every year, the increase in radiation exposure to the inhabitants would be less than half the dose they already get from background radiation” [27]. Again, that statement ignores the same outrage factors mentioned above – the exposure is not voluntary, there are no perceived benefits, people could not detect the radiation, and it comes from artificial sources.

## **HOW DOE CAN REDUCE OUTRAGE**

As previously mentioned, it is not realistic to expect that DOE can resolve or appreciably reduce many outrage factors in communicating with the public about the transport of spent nuclear fuel and high-level radioactive waste. However, DOE would likely be able to alleviate at least some of the concerns and outrage of the public if the department were to use messages that accomplish the following:

- Demonstrate that it is using public input and effectively communicating those actions;
- Offer tangible and meaningful benefits to the public;
- Explain that these shipments and the way in which they are conducted are not that different from other shipments that have traveled safely through many of the same areas; and
- Meaningfully work with state and local officials in order to get their endorsement and willingness to be advocates for the transport safety program.

Toward this end, the authors offer the following suggestions for changing DOE’s messages on transportation.

Individual control: While it would be impossible for DOE to give the public control over whether shipments will occur, it is entirely reasonable for DOE to give the public some say in *how* they will occur. If DOE solicits and incorporates public input into decisions such as route selection or winter weather precautions, those actions can have a positive influence on the public's sense of having control over the program and, thereby, their perception of the risks. In public information materials, therefore, it would be wise for DOE to highlight decisions or practices that demonstrate the department's responsiveness to public feedback on the transportation program.

Of course, to *highlight* decisions that are based on public input first requires DOE to actually *make* some decisions based on public input. And to do that, DOE will need to make significant improvements to its efforts to solicit and use public input. The WIPP transportation program offers some important lessons. That transportation program is based, in part, on citizen involvement in rural northeast Oregon. In 1988, DOE believed they would soon begin shipments to WIPP. State officials in Oregon supported the plan to ship transuranic waste from the Hanford Site in Washington as a means to help protect the Columbia River, even though it would result in thousands of such shipments through Oregon.

The Oregon Department of Energy, along with a Governor-appointed citizen advisory board, met with elected officials, emergency responders, the public, and the news media in four northeast Oregon towns. The state and advisory committee asked for input in developing a comprehensive transport safety program – including operational requirements, driver and carrier qualifications, winter weather restrictions and other elements to help reduce the likelihood of an accident and beef up response capabilities for when accidents do occur.

Although there was a good deal of skepticism in the route communities that the shipments could be sufficiently safe, and concern that existing emergency response capabilities were not adequate along the entire route, a series of recommendations were developed over the course of several months, with follow-up meetings in each of the towns. The recommendations were taken to the Western Governors' Association, and from there, a dialogue began with other Western states and eventually with the U.S. Department of Energy. The Oregon citizen recommendations were refined and expanded upon, but they truly formed the foundation for what eventually became the WIPP transport program [28]. Working with the states to reach out to the public in a similar process may help DOE's repository shipments meet with a similar level of acceptance as the department's WIPP shipments.

Benefits: DOE should choose key messages that call attention to the benefits of having shipments occur. Different targeted messages would likely have to be crafted to focus on specific regions or areas, as global, generic messages such as "protect the environment" or "ensure safety from terrorists" generally do not provide tangible benefits for people to be willing to accept additional risk.

In certain, limited examples, DOE can point to shipments as being necessary to continue the operation of nuclear power plants, providing necessary electricity generation in a specific region. While most nuclear plants have no real restrictions on expanding their dry fuel storage areas and continuing to operate for decades, reactor operators could find themselves constrained by state laws, agreements with Native American tribes, or geographic limitations at the reactor site. While a certain segment of the population would certainly welcome the shut-down of those reactors, for some members of the public, they would recognize a benefit in having those nuclear plants continue to generate electricity.

One "benefits" message that DOE uses – unsuccessfully, we feel – is that opening Yucca Mountain will result in a reduction of potential terrorist targets throughout the country. Supporters of this argument say that protecting one location where the spent fuel has been consolidated is far easier than trying to protect dozens of sites across the country. What these proponents often fail to acknowledge is that, so long as a reactor is running, it will continue to store spent nuclear fuel. Opening Yucca Mountain, therefore, will *not* eliminate all of the reactor sites as potential targets. Opponents are quick to point this out. They also take DOE's "safe from terrorism" message and run with it, pointing out that the thousands of shipments necessary to move waste to Yucca Mountain could end up being terrorist targets themselves. In this case, DOE's own attempt to emphasize security as a benefit winds up backfiring in a big way.

An additional benefit that some people could realize – again likely only in some targeted areas – would be that the transport of waste will lead to better protection for an important resource, such as Lake Michigan for residents of Wisconsin, Illinois, and Michigan, or the Columbia River for people in Washington and Oregon. This message



would be most effective for residents of communities with shutdown reactors, in which all the spent nuclear fuel could be removed in a relatively short period of time.

Familiarity: As with the other factors, DOE has an opportunity to appeal to a certain segment of the public on the familiarity factor.<sup>4</sup> This segment consists of people living or working along routes used previously for other radioactive waste shipments – such as transuranic waste heading to WIPP in New Mexico or research reactor spent fuel heading to DOE sites in Idaho or South Carolina. Public information materials that note the similarities between the campaigns – while being honest about the differences – may help DOE create a sense that the repository shipments are, indeed, familiar to a small but important segment of the population that will be affected by shipments.

An important part of making shipments familiar would be for DOE to tout similarities in specific elements of the transportation safety programs. For example, DOE could say, “State and local emergency responders wanted to ensure that WIPP shipments are not on the road in snow or other hazardous weather conditions. We agreed, and together we developed procedures that spelled out when the trucks could not travel. Because of that, we have not had a weather-related accident involving these shipments. It was a good decision and we’ll do the same for spent fuel shipments.” Making shipments seem familiar depends on there being similarities in the materials being shipped. DOE should *not* attempt to compare these shipments to shipments of gasoline, chlorine, or other types of hazardous material, which – owing to their scoring better on the outrage factors – the public sees as completely different from nuclear waste.

Trusted source of information: Ironically, DOE’s best bet for improving its delivery of key messages may be to use a different messenger. Research has consistently shown that the most credible sources for risk information are usually local, with the fire chief typically among the most credible source [21]. Other first responders, such as police, also have strong credibility as sources of risk information. The National Academies recognize this phenomenon, saying “Emergency responders are among the most trusted members of their communities. Well-trained responders can become important emissaries for DOE’s transportation program in local communities and can enhance community preparedness to respond to other kinds of emergencies” [3]. Conversely, federal agencies, including DOE, most often end up at or near the bottom of the list of credible sources. State agencies, along with the news media and citizen groups, are somewhere in the middle.

Clearly, DOE cannot forego its own outreach in the hope that local officials will take care of it. However, DOE can enhance its credibility by partnering with and forming alliances with organizations that the public trusts more. An important message for DOE to convey, therefore, is that the department works closely with state and local officials to plan and prepare for shipments. In addition, DOE should look for opportunities to let local officials do the talking.<sup>5</sup>

With the WIPP program, and several other DOE shipping campaigns, such as the cross-country shipments of foreign research reactor spent fuel, DOE did get the states to become willing partners and therefore advocates of the transportation safety program. Oftentimes, that endorsement also came from local fire chiefs and other local emergency responders after the states and DOE provided training, exercises, radiation detection equipment, and shipment schedules.

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<sup>4</sup> There is a bit of a conundrum at play with familiarity as an outrage factor. Government agencies too often interpret familiarity as a matter of how well the risk is understood. They believe that if people are educated to the “real” risk, they will understand and accept that the risk is negligible. Key messages, therefore, often involve statistics and expert assessments of risk. Focusing on “education” ignores the fact that many well-educated people come to completely different conclusions than the experts when they consider the same information. Just because the public may not agree with the statistical evidence provided by an agency, doesn’t mean they don’t understand it.

<sup>5</sup> Because it is possible that this “credible association” phenomenon works both ways, DOE should be judicious in its reliance on more credible sources. That is, DOE can, indeed, make itself seem more credible by affiliating with local officials. However there may a “tipping point” – i.e., too great a connection between DOE and those traditionally trusted sources could actually reduce the public’s level of trust in local, traditionally more credible sources if it appears DOE has “co-opted” them.

Consider the reaction a DOE official would get if they told an audience at a public meeting not to worry about the hundreds of shipments of radioactive waste that will be traveling through their town. Without a more credible source at hand to provide support, the public is likely to react quite negatively to this message coming from the federal government. The outrage level would be high. A state official would likely only slightly reduce the level of concern. But imagine the reaction from the public if the local fire chief stands up in front of the audience and says, “We have received training, equipment, and plenty of information about these shipments. We’re prepared if there is an accident and we don’t see these shipments as posing a significant hazard.” The level of outrage would likely be dramatically reduced not only for those people in the audience, but also for those members of the community who read or heard the fire chief’s comment in the local media or heard word-of-mouth what the fire chief had to say.

Now consider the different reaction if the fire chief had stood up at the meeting and said, “I don’t have the training or the equipment or the information. I don’t know how we would respond to an accident.” The local headline the next morning would likely be something like, “Fire department not prepared for nuclear shipments.”

Clearly, it is up to DOE as to which message the fire chiefs, other local emergency responders, and even the state officials will provide when asked about shipments to Yucca Mountain. For DOE to gain that local and state support, DOE must first sincerely work with the states and locals to understand their concerns, and then do what they realistically can to address those concerns. DOE has done that with several shipping campaigns, and has indicated that is its plan for preparations of shipments to Yucca Mountain. If that cooperative planning does occur, then DOE would again have fodder to craft messages that emphasize DOE’s responsiveness. Cooperative planning would also provide DOE with important allies in support of the program.

## CONCLUSION

DOE will need to improve its public messages on transportation if it is to succeed in communicating with the public regarding the thousands of shipments to a national repository. In developing its “new and improved” messages, DOE should be mindful of the common outrage factors that shape public perception of risk. Messages on transportation should attempt to respond to these factors by emphasizing tangible benefits, the similarities between these shipments and others, the influence of the public on decisions, and the endorsement of more credible information sources at the local and state level. DOE’s public information materials do show some signs of progress over the years. For example, starting a 2006 pamphlet with a positive quote from the Chicago Fire Chief shows DOE has come a long way from the days when it would offer up gems like this: “People living close to a transport route (less than 30.5 meters/100feet away) of a vehicle containing the highest level or greatest quantity of radioactive materials (spent fuel of high-level waste) would receive 0.000005 millisievert (0.0005 millirem) per routine shipment” [29]. But despite this progress, DOE’s very recent statements indicate that the department still stubbornly clings to the belief that it can meet its social and institutional challenges simply by adopting a “process that has transportation safety as its priority” [4]. Unless DOE embraces the concept of outrage factors and uses the lessons of risk perception to its advantage, the department will never win public acceptance of – or even tolerance for – its program to ship spent fuel and high-level waste to Yucca Mountain.

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