Adapting Community Impact Assessment for Nuclear Waste Transportation
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As the United States develops a consent-based approach for an interim storage facility for nuclear waste, it is clear that the impacts on corridor communities will have to be assessed. The Yucca Mountain Program established a requirement for assessing impacts on communities. In order to achieve consent, impact assessment will have to be part of a transportation plan. Conventional transportation planners have developed a process for assessing the impacts on communities that occur as the result of transportation projects. This Process-Community Impact Assessment (CIA) has been widely adopted throughout the United States. This paper suggests ways in which CIA can be adapted from conventional transportation planning to the problem of spent nuclear fuel. This paper uses the CIA as "an iterative process to evaluate the effects of a transportation action on a community and its quality of life." This paper describes the community impact assessment process as it would be adapted for spent nuclear fuel transportation. The paper lists common impacts attributable to transportation projects and whether or not these would be applicable for this process. The paper describes the legal basis for assessing these impacts and shows how early commencement of an impact process helps ensure that transportation policies and investments include the concerns of affected communities. Conducting an assessment of this type leads to an understanding of the relationship between transportation actions and the community. Such an understanding can minimize conflict and resolve potential problems. Underlying this process is the idea that assessments that include the active participation of affected

parties, leads to better decisions and greater acceptance of projects, while enhancing agency credibility. The paper defines "community" as it applies in this case and describes the process that can be used to perform an assessment of this type. The paper concludes that a process of this type can facilitate a successful siting decision making and accelerate community acceptance that is necessary for a successful transportation program.

INTRODUCTION

The year 2016, is the tenth anniversary of the National Academy of Sciences' study, Going the Distance. In this NAS study, an informed group of experts examined the problem of transporting High-Level Radioactive Waste (HLW) and Spent Nuclear Fuel (SNF). They concluded that (*Going the Distance? The Safe Transport of Spent Nuclear Fuel and High-Level Radioactive Waste in the United States*, 2006):

> Principal finding on transportation safety: The committee could identify no fundamental technical barriers to the safe transport of spent nuclear fuel and high-level radioactive waste in the United States. Transport by highway (for small-quantity shipments) and by rail (for large-quantity shipments) is, from a technical viewpoint, a low-radiological-risk activity with manageable safety, health, and environmental consequences when conducted with strict adherence to existing regulations. However, there are a number of social and institutional challenges to the successful initial implementation of large-quantity shipping programs that will require expeditious resolution as described in this report. Moreover, the challenges of sustained implementation should not be underestimated (Page 8)

The transportation recommendations made by the report set the standard by which the transportation component of a new program will be judged. These recommendations also establish the basic conditions that will enable the Department of Energy (DOE) to develop a successful program, gain stakeholder acceptance and ultimately avoid the problems that have plagued the handling of waste issues for decades.

The NAS report is in significant agreement with the state of Nevada's findings about SNF and HLW transportation (Stakeholder Scorecard). However, the most difficult and salient recommendation made by the NAS have not been acted on: "social and institutional challenges." Responding to these challenges will be difficult. This paper

suggests there is a process that can be used to do this. But it is important to examine past assessments to understand why they have been insufficient.

PAST ASSESSMENTS

There are currently a variety of regulatory assessments for the transportation of HLW. The NRC has the regulatory responsibility for overseeing the shipment of spent nuclear fuel. Although this authority does not extend to HLW shipments made by the DOE (Meserve, 2002). The NRC oversees two types of assessments. The first are risk assessments that have been prepared to validate the NRC's regulations. These assessments are meant to demonstrate the effectiveness of NRC's regulatory regime (Nuclear Regulatory Commission, 2013). They conclude that there is very low probability of an accident and an even lower probability of an accident involving a release. However, these risk assessments do not use a standard method, use different tools and different data sets. Unsurprisingly, they arrive at different conclusions (Nuclear Regulatory Commission, 2013). These assessments have not been persuasive in allaying public concern. The second type of assessment done by the NRC is related to the physical security of the shipments. These assessments are classified and are beyond the scope of this paper.

The DOE has assessed impacts of transporting HLW through the National Environmental Policy Act (NEPA) process. These assessments emphasize impacts near the site at the expense of transportation corridors (Department of Energy, 2008). These have also been unsatisfactory from the standpoint of affected parties. The EIS' were prepared for the now defunct YMP. They conformed (somewhat) to the standards for compliance with the NEPA. However, there were still many concerns about the scope and depth of the assessments (contentions). Information about the environmental impacts was collected for the EIS, but the resulting documents presented an incomplete picture of the size and scope of a large-scale shipping campaign.

Another type of assessment is the problem of public safety. Section 180c of the Nuclear Waste Policy Act Amendments provides for funds for local communities to

prepare their first responders for HLW shipments (Nuclear Waste Policy Act Amendments of 1987, 1987). These assessments have not been prepared for individual communities. The work to date has been on defining the funding allocation method.

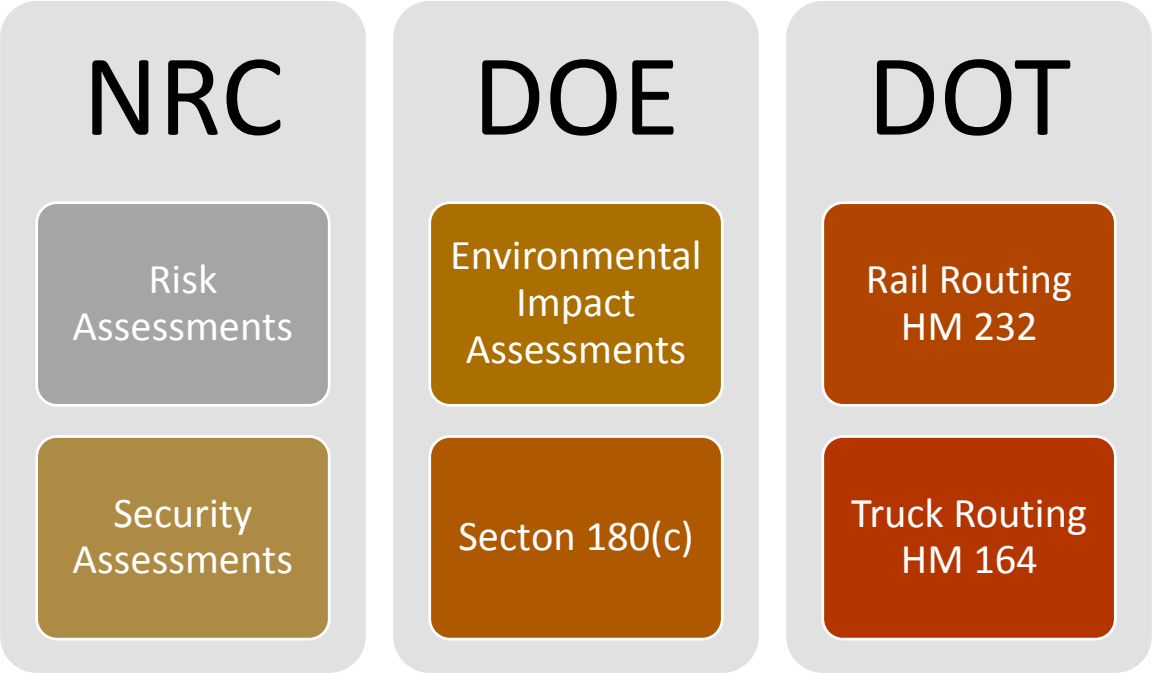

Figure 1 Current Types of Assessments

The Department of Transportation has authority over assessments related to route selection. The oldest type of assessment methods is contained in HM 164 (US Department of Transportation, 1984). This type of assessment provides a method for selecting a route around an area. It applies only to truck shipments. The HM 232 is a new process designed to ensure rail routing avoided sensitive areas. The rule was designed to address industry concerns, rather than the public.

These efforts have been unsatisfactory from the perspective of many stakeholders. Risk assessments focus on the probability of an accident, while local communities are more concerned about the consequences. Environmental Impact Assessments emphasize problems at the site rather than the transportation route. The routing guidelines have proven to be cumbersome to apply for truck transportation and have not been tested in court (Dilger, Halstead, & Ballard, 2013).

Each of these assessments address a different aspect of the problem of shipping HLW. They are intended for different audiences; they produce different findings and they are prepared to fulfill different regulations. As a result, the public sees a portion of the problem, not the entire picture. The assessments present a picture to that affected public that is incomplete, inconsistent and not comprehensive.

This problem precisely mirrors the problem that has daily confronted transportation agencies during the last sixty years. Engineering plans, environmental impact assessments, and other technical documents do not explain, mitigate or engage the interests of communities in which the projects are built. Recognizing the problem, these agencies developed techniques to address the problem and ensure that projects are built in a way that is consistent with the goals of affected communities. A procedure to deal with the issues raised by transportation projects has been developed over the course of decades. This process is known by a variety of names or acronyms. The most common is Context Sensitive Solutions (CSS), Context Sensitive Design (CSD) or Community Impact Assessment (CIA) (Forkenbrock & Weisbrod, 2001). This paper uses the term CIA and describes how this process can be modified to support assessment of HLW impacts. The resulting process may offer a genuine path forward for a HLW shipping program.

Community Impact Assessment for Transportation Facilities

The Federal Highway Administration (FHWA) defines CIA as an: "iterative process to evaluate the effects of a transportation action on a community and its quality of life. The assessment process is an integral part of project planning and development that shapes the outcome of a project." An impact is defined as "the effects of a transportation action on a community and its quality of life" (Center for Urban Transportation Research, 2000). CIA provides a framework that enables agencies to comply with legal and regulatory requirements and helps communities respond to the possible changes due to a change in transportation infrastructure. Unlike the other kinds of assessments listed above, this kind of assessment emphasizes concerns raised by affected parties rather than the concerns of Federal agencies. CIA helps agencies identify issues, needs, and possible solutions early in

the planning and project development process. This speeds up projects and avoids conflict with affected communities. It helps communities by ensuring they are also included early in the effort and that they will have the opportunity to change or modify the project in a way that will have positive results.

This kind of process has been specifically adopted to enable controversial projects to be constructed. It defuses public controversy before it happens and reduces the impacts of the project. It undertakes this not through devotion to the Code of Federal Regulations, but instead through a cooperative process. Undertaking the cooperative CIA process has prevented and forestalled controversy across the country. It is possible that it may do so for HLW shipping (Center for Urban Transportation Research, 2000). It is important to note that this process is so broad that State and Federal agencies have considerable latitude to respond to local concerns. This process is quite similar to the way in which the WIPP transportation program was developed.

LEGAL AND REGUALTORY BASIS FOR CIA

There are political and administrative advantages of a cooperative process suggested by CIA. But there are an array of Federal regulations, statutes, policies, technical advisories, and Executive Orders that support the need for a process to evaluate these impacts. Among them are:

- Intermodal Surface Transportations Efficiency Act of 1991 (ISTEA)
- National Environmental Policy Act of 1969 (NEPA)
- Title VI of the Civil Rights Act of 1964 and related statutes
- 23 USC 109(h), Federal-Aid Highway Act of 1970
- 23 CFR 771, Environmental Impact and Related Procedures (1987)
- TA 6640.8A (1987), Guidance for Preparing and Processing Environmental and Section 4(f) Documents
- Executive Order (EO) 12898 on Environmental Justice (1994) and proposed Department of Transportation Order on Environmental Justice (1997)
- Farmland Protection Policy Act (1981), as amended in 1994 (7 CFR 658)
- Uniform Relocation Assistance and Real Property Acquisition Policies Act (1970, referred to as the "Uniform Act,") as amended in 1987
- FHWA Environmental Policy Statements (1990 & 1994)
- Recommendations of the President's Council on Sustainable Development (1999)
- Nuclear Waste Policy Act Amendments NWPAA

- HM232 Security Requirements for Offerors and Transporters of Hazardous Materials RSPA-02-12064
- HM 164 Guidelines for Highway Route Controlled Quantity Shipments of Radioactive Materials

The NWPAA is included in the list above because it established the need for assessing impacts by the Affected Units of Local Government (AULG). The AULG were the counties contiguous to the county containing Yucca Mountain. These counties prepared assessments of the impacts on their communities. However, the assessments suffered from a lack of standardization. The CIA method provides a standard that can be widely adapted across the US. Adapting CIA for HLW transportation requires only slight changes and can result in streamlined, credible results.

APPLYING THE PROCESS TO HLW TRANSPORTAATION

The process of applying CIA to HLW is nearly identical to conventional transportation planning. The only differences are that the affected areas must first be evaluated to determine the possible intensity and consequences of the radiological impacts. The second is that the public safety impacts on communities must be included. A generalized process for conducting a CIA assessment is:

1. Determine whether or not or not an impact requires assessment: measure the context and intensity of the radiological impacts, compare the impacts to a standard for impacts
2. Define study area: During this step, the region of influence for shipments is determined, this requires an appraisal of the route, the travel shed
3. Inventory Community Characteristics: Determine the types of business, land uses, and populations effected by the shipment
4. Identify Community impacts: Determine which impacts occur in the affected community
5. Identify Solutions: Determine how to mitigate the impacts by avoiding, minimizing, mitigating

If a large-scale shipping campaign occurs, it will be necessary to assess the impacts of the shipments as they relate to routine and non-routine shipments. Routine shipments are those where the cask moves from its origin to its destination without incident. Non-routine shipments occur when the cask's movement is disrupted in some way. Routine impacts are due to the peculiar nature of HLW, that is there is

radiation exposure even during normal shipments. There will be unique locations where casks are delayed and impacts may occur. These routine impacts will be a cause for concern when shipments are delayed (e.g. traffic jam or rail classification yard) or when many shipments are funneled through a few routes to arrive at their destination.

INSERT FUNNEL IMAGE

Figure 2 Depiction of Shipments as They Would be Funneled to Defunct Yucca Mt.

Additionally, HLW shipments to a storage site will create impacts because impacts will funnel on just a few routes into the site. Past US shipments occurred from a variety of origins to a variety of destinations. Centralized storage will mean shipments from many sites converge on a single site. It is clear that there will be a threshold of shipments which create impacts that requires assessment.

Establishing a Standard for Impact Assessment

As part of the Yucca Mountain licensing process, NRC staff reviewed and adopted the DOE SEIS, including the transportation impact calculations for the mostly rail transportation scenario. The SEIS evaluated transportation radiological impacts in four categories: (1) "incident-free" exposures to members of the public residing near transportation routes, cumulative total up to 2,500 person-rem dose and 1.5 latent cancer fatalities, and in certain special circumstances (for example, 0.016 rem to a person in a traffic jam); [Pp.6-20, 6-21, 8-41] (2) "incident-free" exposures to transportation workers such as escorts, truck drivers, & inspectors, cumulative total up to 13,000 person-rem and 7.6 latent cancer fatalities (by administrative controls, DOE would limit individual doses to 0.5 rem per year; the allowable occupational dose is 5 rem per year); [Pp.6-21, 8-41] (3) release of radioactive material as a result of the maximum reasonably foreseeable transportation accident (probability about 5 in one million per year), involving a fully engulfing fire, 34 rem dose to the maximally exposed individual, 16,000 person-rem population dose and 9.4 latent cancer fatalities in an urban area, and cleanup-costs of $300,000 to $10 billion; [Pp.6-15, 6-24, G-56] and (4) release of radioactive material following a successful act of sabotage or terrorism, using a high-energy density device, resulting in 27-43 rem dose to the maximally exposed individual, 32,000-47,000 person-rem population

dose and 19-28 latent cancer fatalities in an urban area, and cleanup costs similar to a severe transportation accident. [Pp.6-27, CR-467] California and Nevada contentions specifically challenged the NEPA sufficiency of DOE's transportation radiological impact evaluations. If the licensing proceeding should resume, these impacts would be further explored in great detail.

TRANSPORTATION PROEJCT EFFECTS

Past examinations of effects of HLW transportation have been largely confined to the environmental effects found in EIS' or the possibility of property value diminution (Gawande & Hank Jenkins-Smith, 2001). However, past experience suggests that there will be a broader range of impacts. The Federal Highway Administration (FHWA identifies seven broad areas of effects resulting from transportation projects. (Center for Urban Transportation Research, 2000). These impacts have been identified, tested and examined over the last 30 years. Some impacts will occur during normal shipments (classified as "Routine"). Other impacts will occur only in the event of a release of radiation (classified as Non-routine). There are a variety of different impacts within each of those broad categories. For the purposes of this paper, some of the FHWA identified impacts are excluded as not relevant, while public safety impacts have been added. For HLW, the categories and types of impacts are:

Type of Impact	Description	Routine or Non-Routine
Sociocultural		
Community cohesion and barrier effects	Ongoing shipments can effectively create a barrier between portions of a community	Non-routine
Changes in demographics	People may relocate or refuse to locate as the result of the shipping	Routine and Non-routine
Community facilities, focal points, services, social cultural events	Changes to access to particular community facilities due to barriers erected by shipments	Routine and Non-routine
Radiological Impacts		
Safety/Health	On-link, off-link and non-routine exposures	Routine and Non-routine

Attractiveness as a target	If HLW shipments are successfully attacked, there will be radiation exposure	Non-routine
Emergency response	There will be considerable costs for localities to prepare to respond to a release of radioactivity or to a routine accident	Routine and Non-routine
Health effects for sensitive populations	Sensitive populations (e.g. the very young and the very old) living within the radiation exposure zone may experience disparate effects	Routine and Non-routine
Sensory/Aesthetic		
Noise and vibration	Increased shipments in certain areas create additional impacts	Routine
Community focal points	Areas of particular concern to a community	Routine and Non-routine
Displacement		
Business	Movement of businesses away from or the decision of businesses not to locate in the radiation exposure zone or close to a route	Routine and Non-routine
Community facilities	Movement of community assets away from or the decision of businesses not to locate in the radiation exposure zone or close to a route	Routine and Non-routine
Residential	Movement of residents away from or the decision of businesses not to locate in the radiation exposure zone or close to a route	Routine and Non-routine
Farmland	Impact on decisions of farmers	Routine and Non-routine
Economics		
Tax Base	Alterations in the amount of taxes collected by local government	Routine and Non-routine
Access and visibility to business	Alterations in the amount of taxes collected by local government	Non-routine
Regional employment	Alterations in the types and levels of regional employment	Routine and Non-routine
Property values	Changes in property values	Routine and Non-routine
Land Use	Changes in land uses	Routine and Non-routine
Change in accessibility		
Influence on land use (density, type of use, induced or misdirected growth)	Changes in land uses	Routine and Non-routine
Consistency with future land use plans	Changes in land uses	Routine and Non-routine

Mobility Accessibility		
Access to business, public service and facilities	Changes in travel patterns due to shipments. The shipments may cause effects at different times of day or effect commuting or shipment decisions.	Routine and Non-routine
Bicycle and pedestrian access	Changes in travel patterns due to shipments. The shipments may cause effects at different times of day or effect commuting or shipment decisions.	Non-routine
Connectivity (Intermodal/Land Use)'Travel problems	Changes in travel patterns due to shipments. The shipments may cause effects at different times of day or effect commuting or shipment decisions.	Non-routine
Disable and transit dependent accessibility	Changes in travel patterns due to shipments. The shipments may cause effects at different times of day or effect commuting or shipment decisions.	Non-routine
First Response Impacts		
Additional training requirements	Changes in training	Routine and Non-routine
Additional equipment requirements	Changes in equipment	Routine and Non-routine
Managerial burden	Additional management burden as local officials must assume responsibility for a new issue	Routine and Non-routine

Figure 3 Impacts and routine non-routine

In the event of a large-scale shipping campaign, it will be possible to document the extent and severity of these impacts. While these effects have been documented in conventional transportation and emergency response settings, never been a long duration, large-quantity, cross-country shipping campaign such as was proposed for Yucca Mountain in the United States. As a result, the kinds of effects that will occur and how severe they will be are unclear. Where these impacts will occur and how severe they will be can be anticipated but not accurately understood until some shipments have occurred. But they should be and can be anticipated. Failing to do so will increase conflict and create new controversy.

RESULTS

Implementing this process across the country has reduced conflict between Federal, State and County agencies, it has facilitated cooperation among Federal, State, and Local agencies and the public. The assessment provides an integrated picture of community values for the formulation of project objectives and the development of alternatives. This process would be extended beyond the current analysis procedures which stovepipe analysis. During the project development process, the selection of a preferred alternative can integrate information from the community impact assessment along with other related environmental studies in making sound project decisions.

CONCLUSION

Ten years after Going the Distance, one of its most important recommendations has gone unnoticed and unheralded. Social issues must be addressed in a meaningful and forthright manner. Transportation investments have major influences on society, with significant economic and social consequences. However, in many instances in the past, impacts on people have not received the attention they deserve. The community impact assessment process alerts affected communities and residents, as well as transportation planners and decision makers, to the likely consequences of a project, and ensures that human values and concerns receive proper attention during project development.

REFERENCES

Center for Urban Transportation Research. (2000). *Community Impact Assessment: A Handbook for Transportation Professionals*. Retrieved from Tallahassee:

Department of Energy. (2008). *Final Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada*. Retrieved from Washington, D.C.:

Dilger, F., Halstead, R. J., & Ballard, J. D. (2013). *Walk the Line: The Development of Route Selection Standards for Spent Nuclear Fuel and High-level Radioactive Waste in the United States-13519.* Paper presented at the Waste Management, Phoenix, AZ.

Forkenbrock, D. J., & Weisbrod, G. E. (2001). *Handbook for Assessing the Social and Economic Effects of Transportation Projects*. Retrieved from Washington D C:

Gawande, K., & Hank Jenkins-Smith. (2001). Environmental Risk Perception and Property Values: Evidence From Nuclear Waste Transportation. *Journal of Environmental Economics and Management, 42*, 207-233.

Going the Distance? The Safe Transport of Spent Nuclear Fuel and High-Level Radioactive Waste in the United States. (2006). Washington D.C.: National Academies Press.

Meserve, R. A. (2002). *Responses to Questions from Senator Durbin*. Nuclear Regulatory Commission. Washington D.C.

Nuclear Regulatory Commission. (2013). *Spent Fuel Transportation Risk Assessment*. Washington D.C.: Nuclear Regulatory Commission.

Nuclear Waste Policy Act Amendment of 1987,, Pub. L. No. Public Law, vol. 101, 1987, 1 § 1 1 stat 1330-1227 (1987).

US Department of Transportation. (1984). *Guidelines for Selecting Preferred Highway Routes for Highway Route Controlled Quantity Shipments of Radioactive Materials* (DOT/RSPA/MTB-84/22). Retrieved from Washington, D.C.: