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The Excess Perfection Syndrome II:

What Happens with Unnecessary Requirements

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ABSTRACT

Radioactive materials transportation is stringently regulated by the U.S. Department of Transportation and the Nuclear Regulatory Commission to provide safety measures protecting the public and the environment. When the U.S. Department of Energy (DOE) makes radioactive materials shipments, tradeoffs between regulatory intent and local requirements are often caught in the crossfire of stakeholder negotiation during attempts to obtain "informed consent." In an effort to gain consent the DOE has sought out state, local and tribal involvement in the transportation process. This interaction has resulted in the imposition of additional requirements, increasing the costs of transportation and threatening to actually *decrease* the safety and effectiveness of existing regulations.

This problem, which we have called the *"Excess Perfection Syndrome,"* and which often arises during preparations for DOE radioactive waste shipments, is discussed in this paper. Also included is a systems science process that has been used by the DOE National Transportation Program's Integration and Planning program to identify stakeholders, compile their concerns, perceptions, needs, and causes, and translate them into an appropriate set of "derived requirements" which can be addressed to obtain informed consent.

Participants will gain a greater appreciation for the preparations DOE must make to ensure that shipments of radioactive wastes and materials are not only performed safely but have public consent. Participants will also gain an understanding of the need to ensure that transportation requirements are

based on the actual risks posed by the shipments, and that self-imposition of additional requirements does not necessarily gain informed consent.

INTRODUCTION

As part of an effort to streamline the emergency preparedness process for certain U.S. Department of Energy (DOE) waste shipments, a systems science approach was used to examine the requirements governing such shipments. It is a systems science principal that to best design a "system" - which might be a product, a process, or any set of complex, interrelated components that must function as a whole - all system requirements should be gathered, understood, and validated at an early stage. The term "requirement" in this context has been defined as follows:
"If it mandates that something must be accomplished, transformed, produced, provided [constrained], it is a requirement — period."(Martin, 1997, 43)

Historically, regulatory requirements for the transportation of hazardous materials emerged in the 1800's, even before the advent of motorized highway vehicles. These first legal controls were placed on the shipping of black powder following a series of accidents that resulted in explosions and loss of life. Many years later, the first transportation regulations addressing radioactive materials arose after photographic film shipments were found to have been fogged by radiation exposure. These regulations simply required appropriate segregation of packages. From these beginnings and in this way, the current set of regulatory requirements has evolved: a hazard is recognized and reasonable steps are taken to reduce the associated risks to acceptable levels.

There are, however, requirements placed on "high visibility" DOE radioactive material shipments in addition to those represented by regulations. The primary source of these additional, extra-regulatory requirements is the set of potentially affected interests commonly called "stakeholders." The presence of stakeholder requirements is a characteristic of social and technological systems in general, and is not

unique to the DOE transportation function. In discussing requirements, Martin generalizes as follows: "The source of requirements is not only from customers, but also from other stakeholders that have a need or expectation with respect to system products or outcomes of their development and use."(Martin, 1997, 19) Stakeholder requirements are often stated in nontechnical terms (e.g., needs, wants, desires, and expectations) and are not normally adequate for design purposes. Also, whether or not stakeholder requirements have been satisfied may not be verifiable using the normal measures of effectiveness by which delivered end products will be judged by the stakeholder. Technical requirements must then be ***derived*** from stakeholder requirements and stated in clear, unambiguous, and measurable terms. These derived technical requirements are then verifiable and directly traceable to the technical problem to be solved. (Martin, 1997, 19)

To better understand the distinction between "stakeholders" and "customers" the commonly accepted, systems science definitions of these terms should be examined. "Stakeholders" are defined as potentially affected interests such as a special interest group, an agency as a whole or the general public. "Customers," on the other hand, comprise the individuals and/or organizations that use the end products of the system. For the purpose of safely transporting radioactive materials, the technical engineering and science disciplines have clearly demonstrated that they understand and can meet customer-driven requirements. The concept of meeting stakeholder requirements, however, is a fairly new, and in many cases a threatening one. It is the desire to expeditiously and reactively meet or exceed stakeholder requirements that has lead to the "excess perfection syndrome."

Commercial shippers of radiological materials routinely transport their cargos constrained only by the regulations and requirements set forth by the U.S. Department of Transportation (DOT) and the Nuclear Regulatory Commission (NRC). In the State of California for example more than 2,000 shipments of radiological materials are transported daily under these regulations. These shipments arrive safely with virtually no notice by the general public. What then drives stakeholders to demand

additional requirements for DOE shipments? The answers include lack of trust in DOE, association of these shipments with nuclear weapons, and the failure to involve potentially affected interests in the initial phases of the preparation process. This last point is, in our opinion, the essence of, and largest contributor to this phenomenon.

KNOW YOUR STAKEHOLDERS AND INVOLVE THEM EARLY

Identifying the stakeholders and involving them early is key to the development of an appropriate, derived requirements base. DOE and other federal agencies often fail to accurately identify the full set of stakeholders during preparations for shipping. We believe it is a mistake to suppose that simply satisfying the stakeholder involvement requirements set forth in federal codes will adequately address the stakeholder identification problem. Our studies also indicate that the codified procedures do little more than provide one-way information flow from DOE to the stakeholders. There is no formal, codified process to ensure that comments or issues raised by stakeholders are analyzed and included in the planning and decision-making process, or in the implementation of the shipping plan. For example, the National Environmental Policy Act (NEPA) requires that the Environmental Impact Statement (EIS) process incorporates an integrated approach involving both technical specialists and social scientists in an effort to ensure that nontechnical issues are addressed and stakeholders are adequately informed. Often, however, those stakeholder comments that are captured during this process are limited to technical issues regarding the options outlined in the impact study. To the engineer, a technical issue is one that can be addressed though an engineered change; to the scientist, a technical issue is one that can be addressed by pure science. For the social scientist a technical issue may also be how the public *perceives* the effect of the solution on his/her personal life, or more importantly the life of his/her family. Often, social scientists have not been involved in the planning process and the result has been stakeholder outrage.

On April 30, 1981 the Council on Environmental Quality issued a memorandum of guidance for General Counsels, NEPA Liaisons and Participants on the NEPA Scoping Process. This guidance was provided as "advice on what works and what does not, based on the experience of many agencies and other participants in scoping." It provided no new legal requirements beyond those presently in the NEPA regulations. The guidance states that, "This open process gives rise to important new opportunities for better and more efficient NEPA analyses, and simultaneously places new responsibilities on the public and agency participants alike to surface their concerns early. Scoping helps ensure that real problems are identified early and properly studied; that issues that are of no concern do not consume time and effort; that the draft statement, when first made public, is balanced and thorough; and that the delays occasioned by re-doing an inadequate draft are avoided. Scoping does not create problems that do not already exist; scoping ensures that problems that would have been raised anyway are identified early in the process."

GAINING INFORMED CONSENT

An iterative, systematic approach has been used successfully by the authors to identify potentially affected interests (stakeholders), develop an appropriate set of derived requirements, and ultimately develop a shipping plan that may be implemented with the informed consent of the stakeholders. This process is illustrated diagrammatically in Figure 1 and the steps discussed below.

1. Identify Stakeholders

It is vital that stakeholders be identified and involved early in the problem solving process. Some techniques that may be used to develop a valid list of stakeholders include:

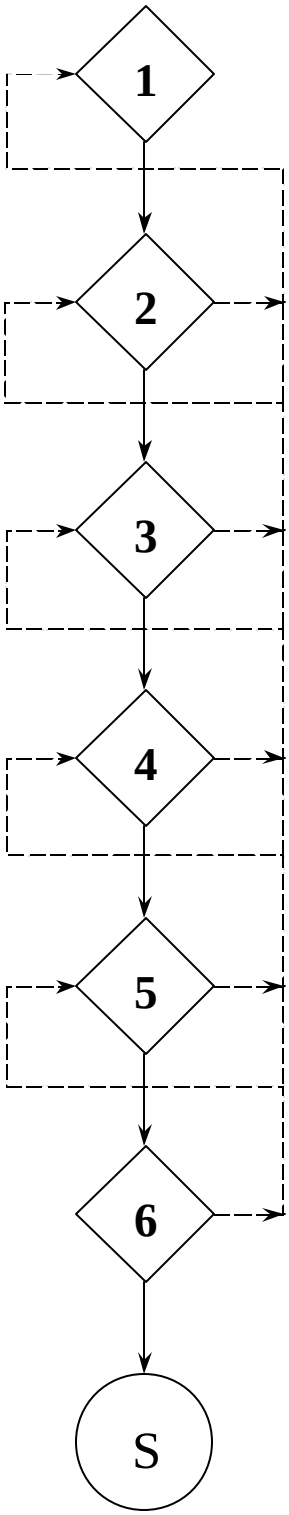
< Referencing historical stakeholder sets,

< Monitoring and analysis of news media reports,

< Monitoring and analysis of public meeting involvement,

< Identifying appropriate elected and appointed public officials,

< Identifying agencies and organizations with related, legally mandated responsibilities,



Process Steps

1. **Identify Stakeholders**
2. **Identify Stakeholder Roles and Responsibilities**
3. **Document Stakeholder Issues**
4. **Develop Derived Requirements**
5. **Develop Alternatives and Analyze to Choose Preferred Solutions**
6. **Implement the Shipping Plan**

S. **Informed Consent Achieved - Shipping Begins**

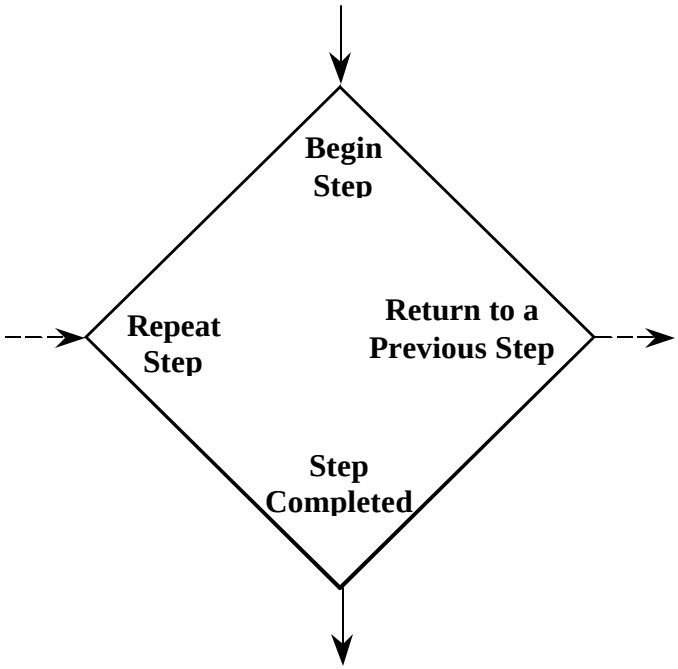


Figure 1. The Informed Consent Process

2. Identify Stakeholder Roles and Responsibilities

During this step, the related legal roles and responsibilities of each stakeholder are documented along with other connections to the planned activity. As roles and responsibilities are considered, it may become evident that all stakeholders have not been identified, necessitating a return to step one. Similarly, during any of the following steps, it may be found that previous steps must be reviewed and/or repeated.

3. Document Stakeholder Issues

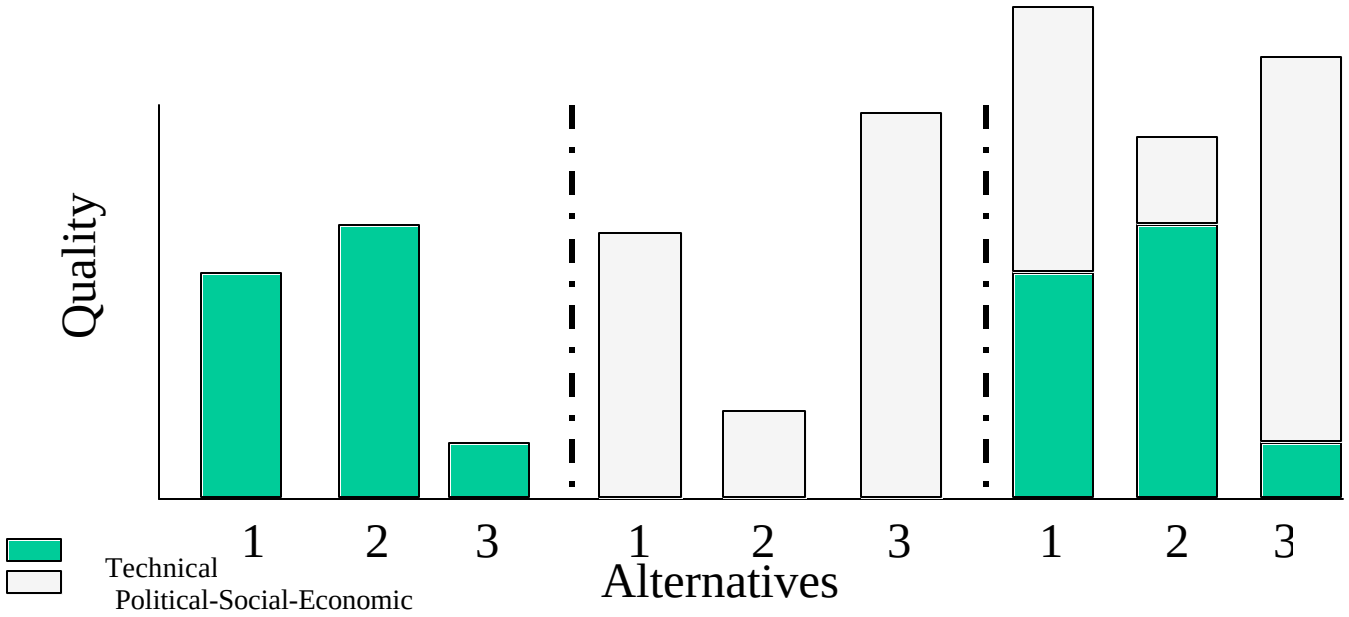
Stakeholder concerns, perceptions, needs, and causes are gathered and documented. This must be done without prejudice or reference to preconceived notions related to technical options or impacts. That is to say, concerns that have no technical merit, or that are easily addressed by technical solutions, are still concerns that must be addressed. Issues are gathered through public meetings and forums, monitoring news media, reference to previous shipping campaigns, working group discussions, and other appropriate means. Typically these issues will include safety, economic concerns, political considerations, and many others.

4. Develop Derived Requirements

Stakeholder issues are analyzed to develop a set of derived requirements. Here the concerns, perceptions, needs, and causes are translated into clearly stated requirements against which alternative solutions may be evaluated in a technically defensible manner. Stakeholders must participate in this process both to assure that the resulting derived requirements actually address their issues, and to assure that they feel that their issues have been acknowledged, understood, and considered. It is at this key step that emotional issues may be addressed and prevented from becoming unnecessary, expensive, and perhaps even detrimental requirements.

5. Develop Alternatives and Analyze to Choose Preferred Solutions

With the participation of the stakeholders, alternatives are identified to satisfy the full set of requirements - regulatory, technical and derived. Again, prejudices and preconceived notions concerning the final solutions must be set aside as alternatives are developed. Once alternatives have been formulated, each is evaluated against the appropriate requirements to arrive at the best total solution. The hypothetical evaluation case illustrated in Figure 2 demonstrates how the best total solution may differ from either the best technical solution or the best political-social-economic solution. Here, when three alternatives are evaluated only against technical requirements, alternative two appears to be the highest quality solution. When evaluated only against political-social-economic requirements, alternative three appears to be best. But when the derived political-social-economic requirements are combined with



the technical, alternative one emerges as the best total solution.

Figure 2. Hypothetical Alternative Evaluation

6. Implement the Shipping Plan

The alternatives selected in step five become the basis for the shipping plan. Once the plan is developed, efforts to implement are begun. If steps one through five have been adequately accomplished, implementation will be successful. If not, additional resistance will be encountered. This resistance may take many forms including lawsuits and injunctions, news media campaigns, protests and rallies, appeals to political figures, and even civil disobedience. Based on an analysis of the level, nature and causes of the resistance, it may be necessary to return to one of the above steps and again move through the process from that point.

CONCLUSION

As has been demonstrated many times, there is, within the DOE complex, the ability to develop a technically sound shipping plan and carry out a safe and successful shipping campaign. Unfortunately, it has also frequently been shown that when the technical work is completed internally before external interests are involved in the process, stakeholder outrage is encountered. Once outrage is evoked, it becomes necessary to directly address emotional issues, resulting in added requirements that, in many cases lead to greatly increased costs with little, no, or even negative impacts on factors of concern, particularly safety. A better approach in our experience, is to involve stakeholders in the problem-solving process in its earliest stages. When stakeholder concerns, perceptions, needs, and causes are identified early and translated into appropriate derived requirements against which alternative solutions may be evaluated, stakeholder outrage is minimized and informed consent can be achieved. It should be emphasized that it is not a realistic goal, nor is it necessary to attempt to gain the active support of all stakeholders. Stakeholders may grant informed consent in spite of continued objections when they have been shown that solving the problem is important for the greater good, that DOE is the proper agency to address the problem and has the technical competence to do so, and that DOE has acknowledged and addressed their issues in developing a solution. The iterative process outlined here

achieves informed consent by identifying stakeholders, involving them in the problem-solving process from its earliest stages, and assuring that their issues are appropriately incorporated into the final solution.

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