Transportation Implications for Various NWPA Program Options

Western Interstate Energy Board

High-Level Radioactive Waste Committee

March 1993

This white paper was prepared with the support of the U.S. Department of Energy under Cooperative Agreement number DE-FC02-88CH10367. Any opinions, findings, conclusions, or recommendations expressed herein are those of the authors and do not necessarily reflect the views of the U.S. Department of Energy.

TRANSPORTATION IMPLICATIONS FOR VARIOUS NWPA PROGRAM OPTIONS

INTRODUCTION

The High-Level Radioactive Waste Committee[1] (the Committee) of the Western Interstate Energy Board has been involved in a five-year cooperative agreement with the U.S. Department of Energy (DOE) to address transportation of spent fuel and high-level radioactive waste (HLW) under the Nuclear Waste Policy Act (NWPA). The cooperative agreement was undertaken to assure that the issues and decisions regarding the transportation of spent nuclear fuel and HLW are addressed knowledgeably and with an understanding of the concerns and responsibilities of both DOE and the western states. The purpose of this paper is to analyze the interrelationship between a safe, acceptable, economic and timely transportation system and the wide range of policy options that may be considered by the federal government for the storage and disposal of spent fuel and HLW. Of particular interest is the critical path activity schedule necessary for the development of such a transportation system and how these time frames affect various programmatic alternatives.

In the September 1991 *Draft Mission Plan Amendment*, and the program redirection announced with the December 17, 1992, release of "A New Strategy For Management of Commercial Spent Nuclear Fuel," DOE focused on policy options which fulfill legal and contractual obligations[2] to initiate waste acceptance by 1998. With the wide variety of policy options that may be considered in a program redirection, especially with the nearness of the January 1998 waste acceptance date, DOE must understand the interrelationship between transportation requirements and program alternatives. Similarly, states must know the comparative impacts of such program options on their responsibilities regarding the transportation of spent fuel and HLW.

These state transportation-related responsibilities include:

Emergency preparedness and response;
Inspection and enforcement of regulations governing shipments;
Determination of alternative shipping routes (pursuant to law);
Highway infrastructure improvements;
Law enforcement regarding safety and security; and
Protection of public health, safety and environment.

---

[1]The HLW Committee consists of persons with technical and/or policy expertise and responsibility for HLW/spent fuel shipments in the states of Arizona, California, Colorado, Idaho, Montana, Nebraska, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.

[2]The Standard Contract for Disposal of Spent Nuclear Fuel and/or High-Level Radioactive Waste, referred to in this document as the Standard Contract.

To fulfill these responsibilities, states must also be consulted regarding other spent fuel and HLW policy decisions, especially those related to storage/disposal siting and shipping cask design/selection. In particular, states must participate in decision-making discussions regarding:

Cask testing;
Cask availability;
Cask integration into the transportation system;
Mode analyses and selection;
Development of a routing process and criteria;
Carrier contract obligations; and
Prenotification procedures.

Lastly, since state, local, and tribal officials are held accountable by citizens, they must present complete, unbiased, and understandable information to the public. Their actions (and reactions to federal decisions) will have a significant impact on the public acceptability of any transportation system.

THE SEQUENCE AND SCHEDULE FOR STATE SPENT FUEL AND HLW TRANSPORTATION RESPONSIBILITIES

Since 1987, the Committee has examined the sequence, schedule, and priority of transportation activities required under different DOE-proposed HLW management initiatives. This activity includes the development and continuous revision of the Committee's *Strategic Plan and Schedule* (SPS). While the time frames differ under various program options, the sequence and interrelationships in the strategic plan have remained constant.

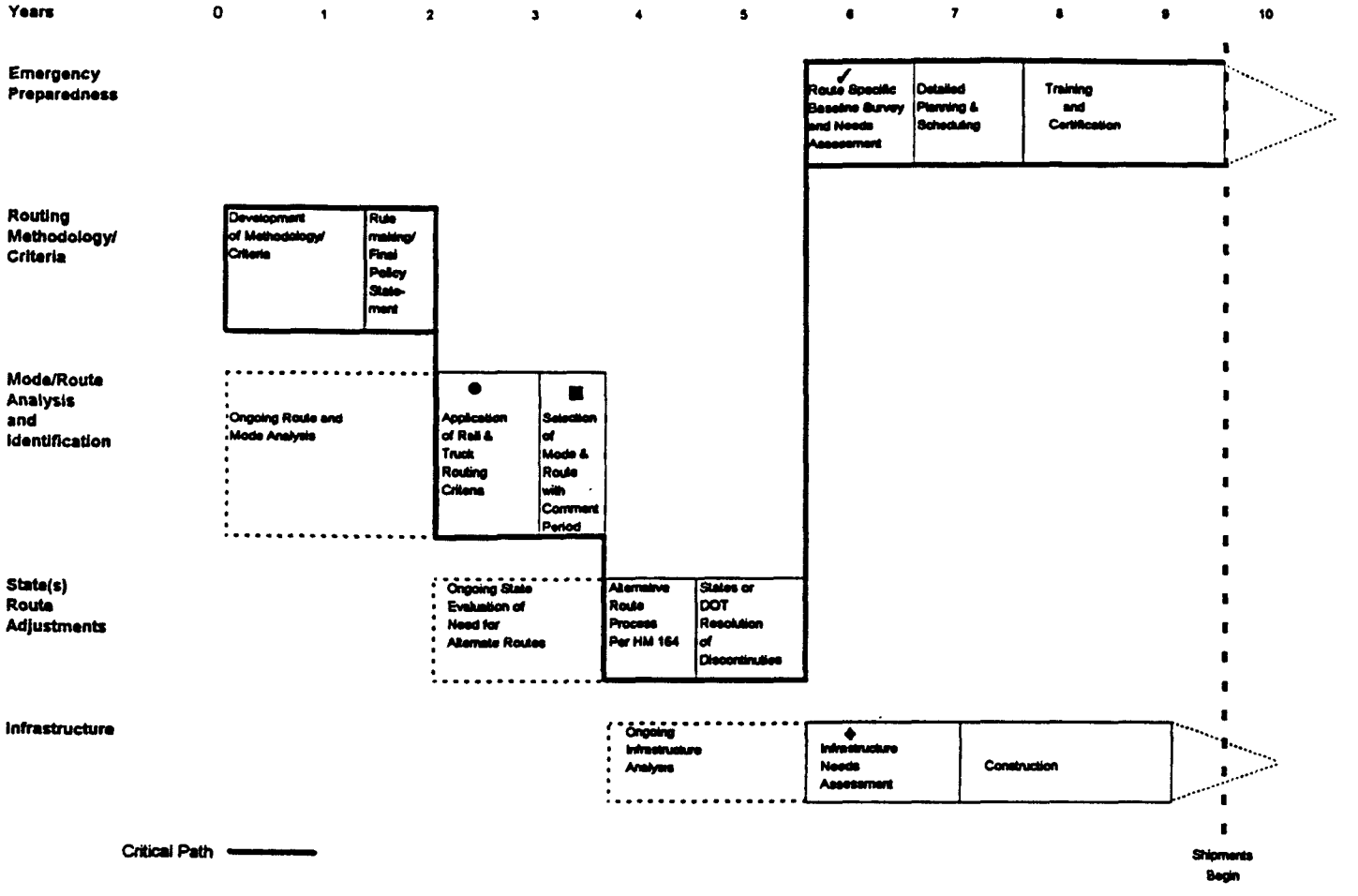
Based on this work, and the western states' WIPP experience, the Committee has developed the two "critical path activity schedules" shown in Figures 1 and 2 on the following pages. The critical path activity schedules depict the shortest time frames and the greatest consolidation of activities possible to meet states' legal spent fuel and HLW transportation responsibilities. Shortening the time frames or overlapping the activities any further would defy logical relationships, place untenable financial and resource burdens on the states or the federal program, and/or increase the likelihood of litigation or delaying activities. *The Committee emphasizes that these critical path schedules assume no institutional, legal, or political delays. They represent theoretical and optimistic schedules.*

The Committee has developed two versions of the critical path activity schedule. The schedule in Figure 1 applies when a state, or states, chooses to make route adjustments to preferred highway routes for shipments of route controlled quantities of radioactive materials pursuant to U.S. Department of Transportation guidelines (commonly known as HM-164).[3] The critical path activity schedule in Figure 2 applies when a state, or states, chooses not to make

[3]U.S. Department of Transportation, *Guidelines for Selecting Preferred Highway Routes for Highway Route Controlled Quantity Shipments of Radioactive Materials*, DOT/RSPA/HMS/92-02, August 1992.

Figure 1

Critical Path Activity Schedule
(With State Route Adjustments)



Note: Assumes the following federal activities and decision commitments are completed.

●
Commitments to having rail and truck casks available
Shipping origins fixed
Storage site(s) selected
State permit applications
EA completed

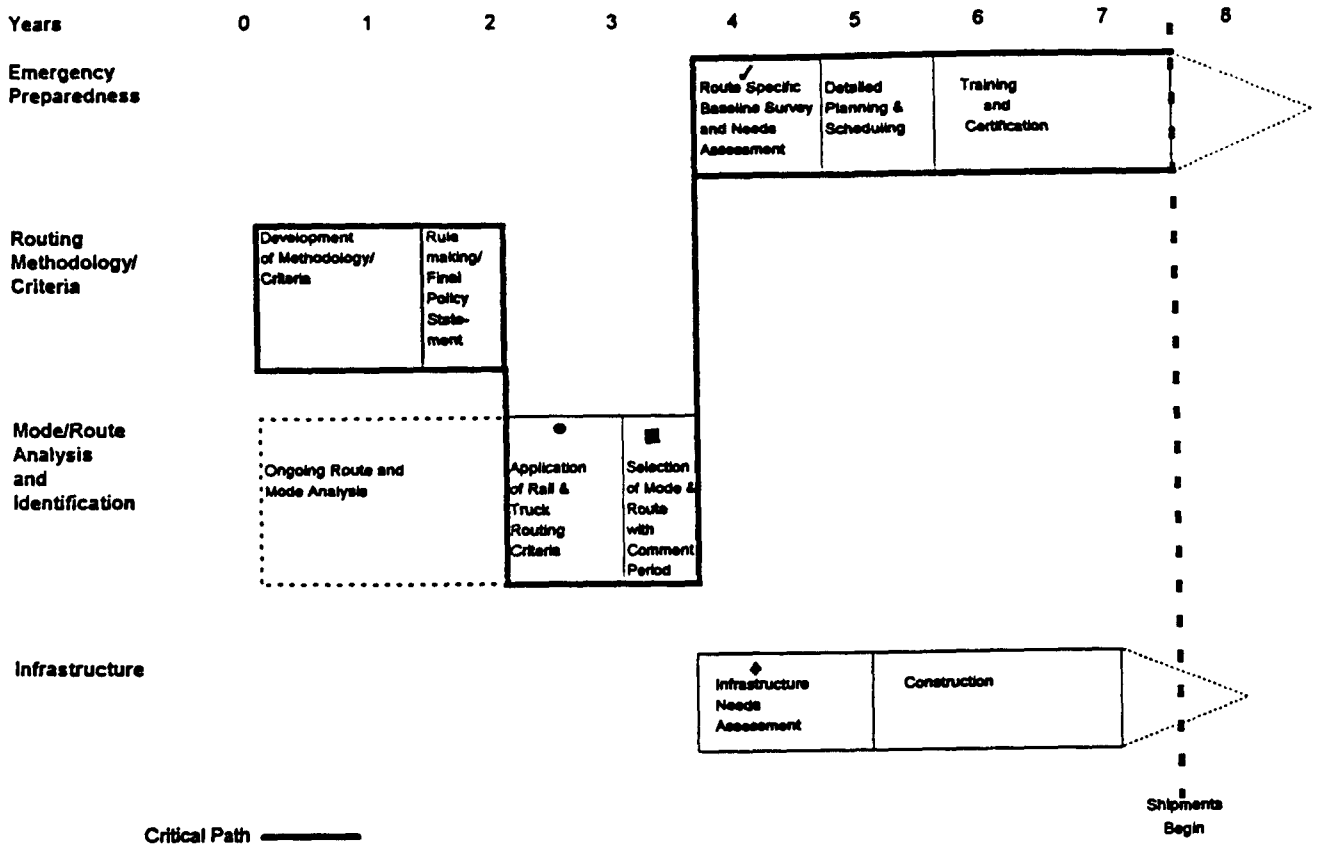
■
NRC license application
EIS completed

✓
180(c) funds available

◆
Cask size and weight determined

Figure 2

Critical Path Activity Schedule
(Without State Route Adjustments)



Note: Assumes the following federal activities and decision commitments are completed.

●
Commitments to having rail and truck casks available
Shipping origins fixed
Storage site(s) selected
State permit applications
EA completed

■
NRC license application
EIS completed

✓
180(c) funds available

◆
Cask size and weight determined

such route adjustments. The Committee believes that a state's decision to make route adjustments depends upon: the nature of the shipment (e.g., emergency shipment); the route and mode analysis completed by DOE; and the actual characteristics of the DOE-preferred transportation route (e.g., through a major populated area).

KEY FEATURES OF THE CRITICAL PATH ACTIVITY SCHEDULE

The sequence of activities in each critical path activity schedule is logical and fixed. For example, the route evaluation process cannot begin before the routing methodology and criteria are finalized. State adjustments to routes may not be made until DOE-preferred routes are identified. Infrastructure enhancements cannot begin until route adjustments are known. Route-specific emergency preparedness surveys cannot begin until final routes are selected and Section 180(c) funds are appropriately made available to affected jurisdictions.

In Figures 1 and 2, it is important to note the symbols ●, ■, ✓ and ♦ and the corresponding explanations. The critical path activity schedules depict the time frames and interrelationships of activities directly related to states' spent fuel and HLW transportation responsibilities. They do not depict the time frames of all federal activities and decisions that affect these state transportation-related activities. For example, the time frames necessary for environmental and regulatory compliance are not depicted on these schedules.

However, the symbols ●, ■, ✓ and ♦ identify the intervals when key federal activities must be completed, or federal decisions must be committed to, in order for the transportation-related activities outlined in the critical path activity schedules to take place. For example, rail routes and highway routes cannot be evaluated or compared if mode analyses or cask availability preempts preferred alternatives. Cask size and weight must be known to assess infrastructure needs. Points of origin (i.e., a well-defined acceptance schedule) must be known in order to develop routes and make route adjustments. Perhaps most significant is the fact that mode and route analysis and identification cannot begin until points of shipping destination (i.e., storage sites) have been identified and the associated environmental and regulatory compliance initiated.

The routing activities on the critical path activity schedules are purposefully divided into three integral steps: routing methodology/criteria; mode/route analysis and identification; and state(s) route adjustments. With "final action" on the routing methodology and routing criteria, in the form of rulemaking or a final policy statement, it may be possible to limit challenges to the methodology and criteria to a certain time frame under the Administrative Procedures Act. Later, when routes are actually identified, dissatisfied parties would not be able to challenge the methodology itself, e.g., how the factors were selected and weights were assigned. The only issue open to challenge at this stage would be whether the methodology was accurately applied. Under the critical path activity schedules, the total time required for the systematic selection of routes is reduced because of the early execution of this routing methodology/criteria step. In addition, the likelihood of state(s) route adjustments, is potentially reduced given the development and application of a routing methodology and routing criteria. Therefore, the

Committee believes this three-step process potentially requires the shortest possible amount of time needed to make an acceptable route selection.[4]

After the routing activities, the critical path includes four years for the development and implementation of emergency response requirements, beginning with route-specific baseline surveys and needs assessments, including detailed emergency response planning and scheduling, and concluding with the integration of training for NWPA shipments into ongoing state and local training programs. The time allotted on the critical path for emergency response activities is based on the experience and judgement of western states. The timing is confirmed by DOE's projected Section 180(c) implementation schedule.

APPLICATION TO FOUR SCENARIOS

The critical path activity schedules were applied to various federal government HLW management policy options. Four distinct scenarios were developed to explore the full range, but not all the complexities and nuances, of spent fuel and HLW transportation policy options.

Scenario One: Expanded interim storage at reactor sites, with transshipments between identical reactor types when necessary.

Scenario Two: One or more MRS sites at an existing federal facility.[5]

Scenario Three: One or more MRS sites at a DOE-designated facility (either by voluntary negotiation with the host community or by another DOE siting process).

Scenario Four: A federal repository, international repository, or technology approved for final isolation of spent fuel and HLW, without an MRS.

The first scenario was chosen for having the least impact possible regarding the transportation of spent fuel and HLW. The second scenario reflects the DOE program redirection announced December 17, 1992, "A New Strategy for Management of Commercial Spent Nuclear Fuel." The third scenario assumes the U.S. Nuclear Waste Negotiator would be successful in finding a voluntary host for an MRS or DOE would designate a new site or sites through a formal siting process. The second and third scenarios could occur with or without a repository. The last scenario addresses long-range spent fuel and HLW shipments for final isolation.

---

[4]The Western Interstate Energy Board and the Western Governors' Association have endorsed the Committee's recommended routing process in Resolution 88-001, readopted July 23, 1991.

[5]There are two variations of this scenario. Under the first variation, there would be a cap of 5000 MTU on the facility, as recommended by the MRS Review Commission in its 1989 report *Is There A Need for Federal Interim Storage?*. The facility would be used for spent fuel shipments from decommissioned reactors, reactors with no additional site storage capacity, and/or reactors demanding adherence to the 1998 waste acceptance date under the Standard Contract. Under the second variation, there would be a cap of 10,000 MTU on the facility, as embodied in former Energy Secretary Watkins's December 17, 1992 program redirection. Spent fuel would be accepted according to the priorities established in the Standard Contract.

The critical path activity schedules were applied to each scenario using probable dates. In most cases, the critical path activity schedules had to be extended beyond the years identified in Figures 1 and 2. This was necessary due to the probable dates for federal activities and decisions that affect the transportation critical path activity schedule (identified in the Figures 1 and 2 by ●, ■, ✓, and ♦).

Detailed descriptions of each scenario, complete with figures showing the revised transportation-related critical path activity schedules, are outlined in *Appendix A: Scenarios*. All assumptions used for the scenarios and calculations, such as shipment numbers and cask availability, are compiled and referenced in *Appendix B: Assumptions*.

CONCLUSIONS

DOE has been focusing on legal and contractual obligations to accept waste by 1998. Key concerns have included the availability of casks and the process for determining a storage site or sites. The former has been resolved theoretically by allowing the use of existing casks or casks based on existing technologies until new generation or multi-purpose casks are available. The use of existing federal facilities is being recommended as a way to address the latter concern. However, no DOE documents acknowledge that a logical, safe, and acceptable transportation planning and implementation process is also an impediment to a 1998 acceptance date. It is important that DOE recognize this constraint when considering policy options.

According to the Committee transportation-related critical path activity schedules, it is not possible to have 1998 waste acceptance under any program, other than limited transshipments (Scenario One) and/or emergency shipments. Even if all non-transportation activities (e.g., facility siting and cask development) were in place now, and no state route adjustments were made pursuant to HM-164, the earliest possible date for waste acceptance with an acceptable transportation program would be 2001. With state route adjustments, the earliest possible date for waste acceptance with an acceptable transportation program would be 2003. Furthermore, these dates are based on a theoretical and optimistic schedule, which includes no institutional, legal, or political delays.

When the transportation critical path activity schedules are applied to the scenarios, it becomes evident that non-transportation activities further delay the dates that shipments could begin. Most significant are potential delays initiating route analysis and selection due to the need to comply with environmental and regulatory requirements applicable to a shipping destination[6]. With the assumptions outlined in *Appendix A: Scenarios* and *Appendix B: Assumptions*, Scenarios Two, Three and Four resulted in shipments beginning no earlier than

[6]The HLW Committee believes there are other reasons why a 1998 shipping date may not be feasible, including the deployment of multi-purpose casks which may require additional licensing time, changes in infrastructure at reactor sites (such as crane enhancements or rail extensions), revised acceptance schedules, and additional regulatory and licensing requirements for storage facilities. The multi-purpose cask has not been addressed in detail in this paper due to the many uncertainties at this time.

2004. The following table outlines the earliest possible shipping dates for each scenario, assuming state route adjustments.[7]

Scenario	Earliest Possible Shipping Date
One	1998
Two	2004
Three	2004
Four	2010

It is important to recognize that shipping to an existing federal facility with existing casks would not shorten the critical path for transportation activities.

If DOE hopes to expedite waste acceptance, any program redirection must recognize the critical path activity schedules for a safe and acceptable transportation process. There must also be the following policy commitments to address the time frames required for transportation planning and program implementation:

1. Determine routing methodology and routing criteria, and develop rulemaking or a final policy statement immediately;

2. Identify points of destination as soon as possible, within legal parameters (voluntary negotiation or DOE site selection process);

3. Assure fixed points of origin (finalize acceptance schedule and shorten or abolish the window for trading acceptance rights);

4. Assure that both rail and truck casks are available;

5. Make firm commitments regarding the use of multi-purpose, dual-purpose, and new generation casks as soon as possible;

6. Place high priority on use of the safest casks, and on full-scale testing by nonfederal sources; and

7. Assure fulfillment of 180(c) requirements prior to shipment dates.

Addressing transportation system requirements now, including the states' needs and responsibilities, as part of program redirection will save time and resources in the future. This paper and the critical path activity schedules are designed to aid in this process.

[7]Again, note that these dates are based on a theoretical and optimistic schedule which includes no institutional, legal, or political delays.

Transportation Implications for Various NWPA Program Options

Appendices

Appendix A: Scenarios

Appendix B: Assumptions

APPENDIX A: SCENARIOS

This Appendix describes the elements of a spent fuel and HLW transportation system under four scenarios for federal HLW storage site selection. The elements include: casks, shipment numbers, modes, routing, infrastructure improvements, emergency preparedness and response, and environmental compliance and regulatory review.

The accompanying figures show the transportation-related critical path activity schedule under each scenario. The dates shipments begin are driven by the scenario, the Committee's critical path activity schedule, and/or federal activities or decisions that affect the critical path activity schedule. As with the generic schedules described in the paper, the scenario critical path activity schedules represent the shortest possible, although admittedly not probable, time frames.

For the assumptions and calculations pertaining to these transportation elements, see *Appendix B: Assumptions*.

SCENARIO ONE

Expanded interim storage at reactor sites, with transshipments between identical reactor types when necessary.

A. Casks

Only existing casks or casks based on existing technologies would be used. There would be no need for new designs or capacities for such limited shipments.

B. Shipment numbers

Shipments would be very limited in number.

C. Modes

Transshipments could be by truck or rail, depending upon the origin and destination handling and access capabilities.

D. Routing

The development of a national routing methodology and routing criteria would not be necessary. The points of origin and destination would be known well in advance of any transshipments. The time frame needed to analyze and identify routes would be shortened as route alternatives would be reduced and utilized for a limited number of shipments. Shipments would involve fewer states, lessening the need for interstate concurrence on the most appropriate route(s). States could consider special operating restrictions in lieu of state route adjustments to preferred highway routes under applicable U.S. Department of Transportation radioactive materials routing guidelines (HM-164).

E. Infrastructure improvements

With the limited number of transshipments, operating restrictions would be applied rather than making significant infrastructure improvements. If there were severe infrastructure deficiencies near the points of origin or destination, other alternatives would be considered, such as changing cask type, shipping mode, or routes. Major infrastructure improvements may not be cost-effective given the limited need and use.

F. Emergency preparedness and response/Inspection and enforcement

Because of the limited number of transshipments expected, certain emergency preparedness protocols could be more expeditiously implemented than a national training program. Affected states would, however, receive Section 180(c) funds for necessary training and technical assistance.

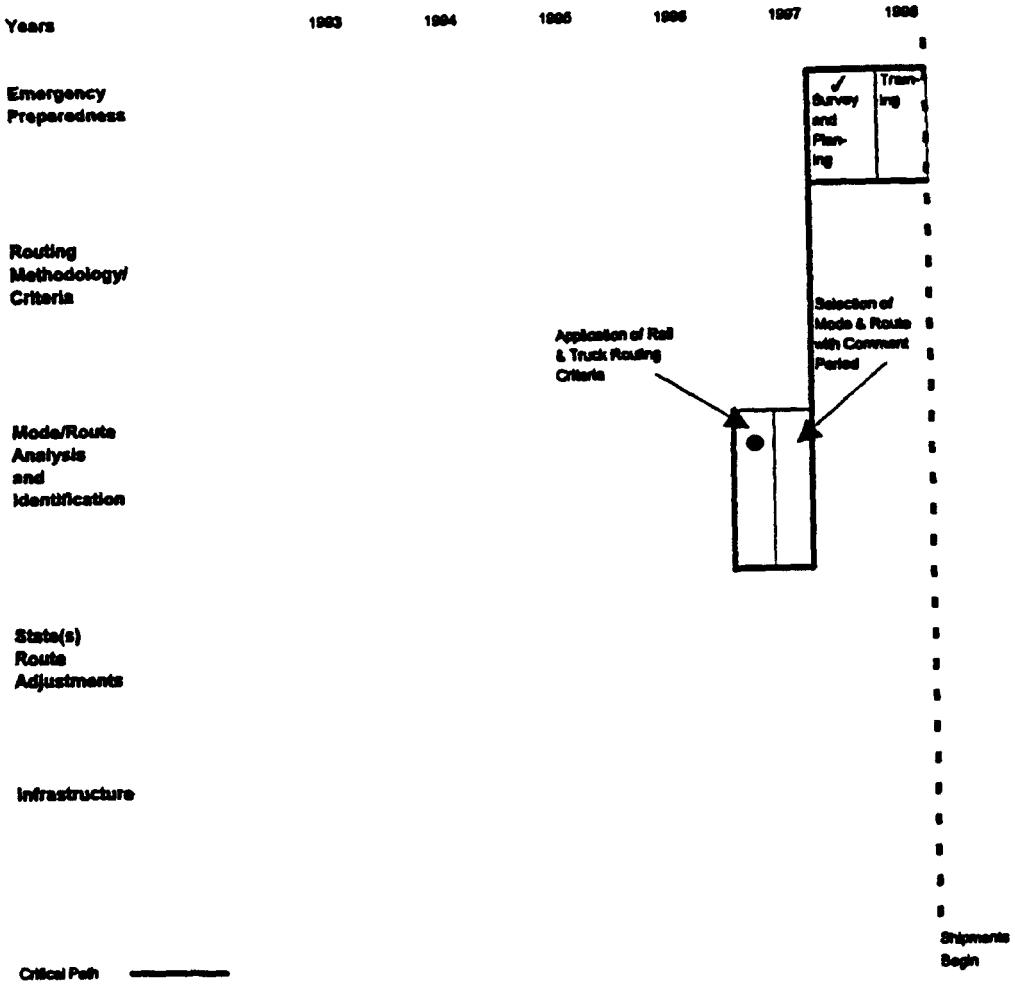
G. Environmental compliance and regulatory review

There would be no waivers of relevant environmental analysis and regulatory compliance requirements. An environmental assessment, but not an environmental impact statement, would be required under the National Environmental Policy Act.

Critical Path Activity Schedule

All time frames would be reduced due to the limited shipments. Critical path activities were backed up from a 1998 shipping date.

Scenario One



Note:	**Assumes the following federal activities and decision commitments are completed.**
●	✓
Commitments to having rail and truck casks available	**180(c) funds available**
Shipping origins and destinations fixed	
State permit applications	
EA completed	

SCENARIO TWO

One or more MRS sites at existing federal facilities.[1]

A. Casks

Initially, new generation casks would be used. The time required to develop and license dual-purpose or multi-purpose casks would delay shipping dates further.

B. Shipment numbers

Shipment of 5000 MTU would require approximately 2,330 truck cask shipments and 774 rail cask shipments. Shipment of 10,000 MTU, as allowed under the Nuclear Waste Policy Act (NWPA), would require approximately 4,312 truck cask shipments and 1,152 rail cask shipments.

C. Modes

DOE would consider all possible mode alternatives, simultaneously with all possible route alternatives, from each shipping site. Information from NSTI studies, FICA studies, utilities, and Delivery Commitment Schedules[2] would be important inputs in this analysis.

D. Routing

A storage site would be identified in 1994. For the second variation of this scenario, the Annual Capacity Report (ACR)[3] would determine the order of acceptance at shipping origins. However, the order of acceptance would not be altered for emergency situations, decommissioned reactors, or traded acceptance rights.[4] This

---

[1] There are two variations of this scenario. Under the first variation, there would be a cap of 5000 MTU on the facility, as recommended by the MRS Review Commission in its 1989 report *Is There a Need for Federal Interim Storage?*. The facility would be used for spent fuel shipments from decommissioned reactors, reactors unable to expand on-site storage, and/or reactors demanding adherence to the Standard Contract. Under the second variation, there would be a cap of 10,000 MTU on the facility, as embodied in former Energy Secretary Watkins's December 17, 1992, program redirection. Spent fuel would be accepted according to the priorities established in the Standard Contract.

[2] The Standard Contract provides for a utility to identify its proposed shipment mode when submitting a Delivery Commitment Schedule (DCS) to DOE, 63 months prior to shipment. A Final Delivery Schedule (FDS) is submitted to DOE 12 months prior to shipment. The FDS must include the shipping mode, assigned by DOE.

[3] U.S. DOE, OCRWM, *Annual Capacity Report*, DOE/RW-0331P, December 1991.

[4] Although the Standard Contract allows for these changes, shipping origins must be fixed prior to the application of rail and truck routing criteria. The Standard Contract under DOE final rulemaking does not limit "emergency situations" to true national emergencies.

restriction is necessary for shipping origins to be fixed prior to the application of rail and truck routing criteria.

For the first variation of this scenario, the shipping origins would be fixed prior to the application of rail and truck routing criteria. This could be accomplished by developing alternative acceptance criteria to accommodate the limited number of reactors unable to expand on-site interim storage capacity, or by utilizing an auction system.

E. Infrastructure improvements

With the number of shipments expected in this scenario, appropriate infrastructure needs assessments and improvements would be made on shipping routes and/or at facility sites.

F. Emergency preparedness and response

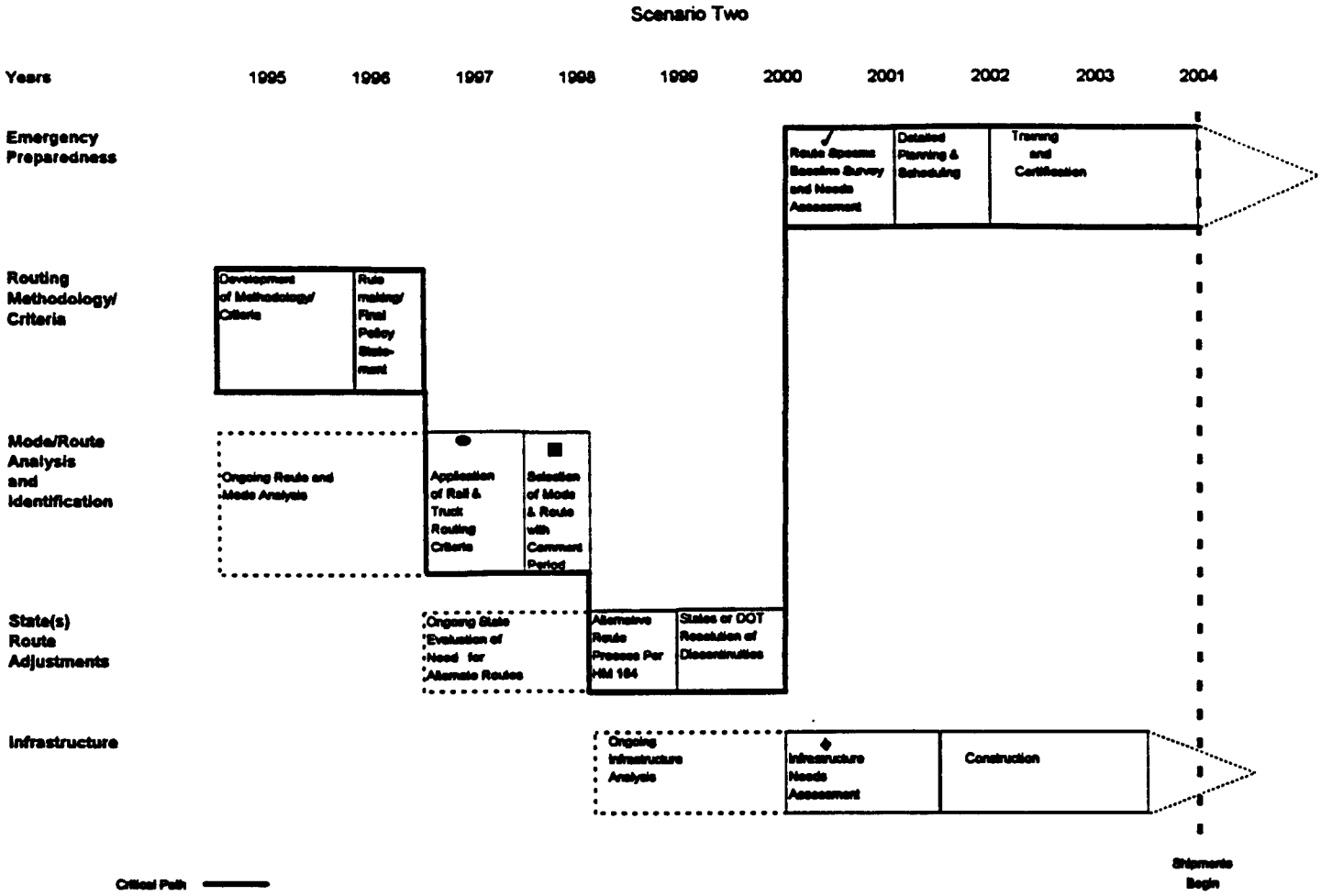
Full implementation of Section 180(c) requirements, with funds for training and technical assistance to states would be required. Provisions for ongoing training or retraining would also be required.

G. Environmental compliance and regulatory review

An environmental impact statement under the National Environmental Policy Act (NEPA) would be required, as would adherence to all applicable federal and state regulatory rules/procedures.

Critical Path Activity Schedule

The activity that most significantly affects this schedule is the final environmental impact statement. Under this scenario, a site, or sites, would be selected in 1994. Optimistically, the final environmental impact statement would be completed 40 months later, in 1997. The time frame for selection of mode and route would be delayed until this date.



Note: Assumes the following federal activities and decision commitments are completed.

●
Commitments to having rail and truck casks available
Shipping origins fixed
Storage site(s) selected
State permit applications
EA completed

■
NRC license application
EIS completed

✓
180(c) funds available

◆
Cask size and weight determined

SCENARIO THREE

One or more MRS sites at a DOE-designated facility (either by voluntary negotiation with the host community or by another DOE siting process).

A. Casks

Initially, new generation casks would be used. The time required to develop and license dual-purpose or multi-purpose casks would delay shipping dates further.

B. Shipment numbers

Shipments of 10,000 MTU would require approximately 4,312 truck cask shipments and 1,152 rail cask shipments.

C. Modes

DOE would consider all possible mode alternatives, simultaneously with all possible route alternatives, from each shipping site. Information from NSTI studies, FICA studies, utilities, and Delivery Commitment Schedules[5] would be important inputs in this analysis.

D. Routing

A storage site would be identified in 1994. The Annual Capacity Report (ACR)[6] would determine the order of acceptance at shipping origins. However, the order of acceptance would not be altered for emergency situations, decommissioned reactors, or traded acceptance rights.[7] This restriction is necessary for shipping origins to be fixed prior to the application of rail and truck routing criteria.

E. Infrastructure improvements

With the number of shipments expected in this scenario, appropriate infrastructure needs assessments and improvements would be made on shipping routes and/or at facility sites.

---

[5] The Standard Contract provides for a utility to identify its proposed shipment mode when submitting a Delivery Commitment Schedule (DCS) to DOE, 63 months prior to shipment. A Final Delivery Schedule (FDS) is submitted to DOE 12 months prior to shipment. The FDS must include the shipping mode, assigned by DOE.

[6] U.S. DOE, OCRWM, *Annual Capacity Report*, DOE/RW-0331P, December 1991.

[7] Although the Standard Contract allows for these changes, shipping origins must be fixed prior to the application of rail and truck routing criteria. The Standard Contract under DOE final rulemaking does not limit "emergency situations" to true national emergencies.

F. Emergency preparedness and response

Full implementation of DOE's Section 180(c) requirements, with funds and technical assistance to states, would be required. Provisions for ongoing training and retraining would also be required.

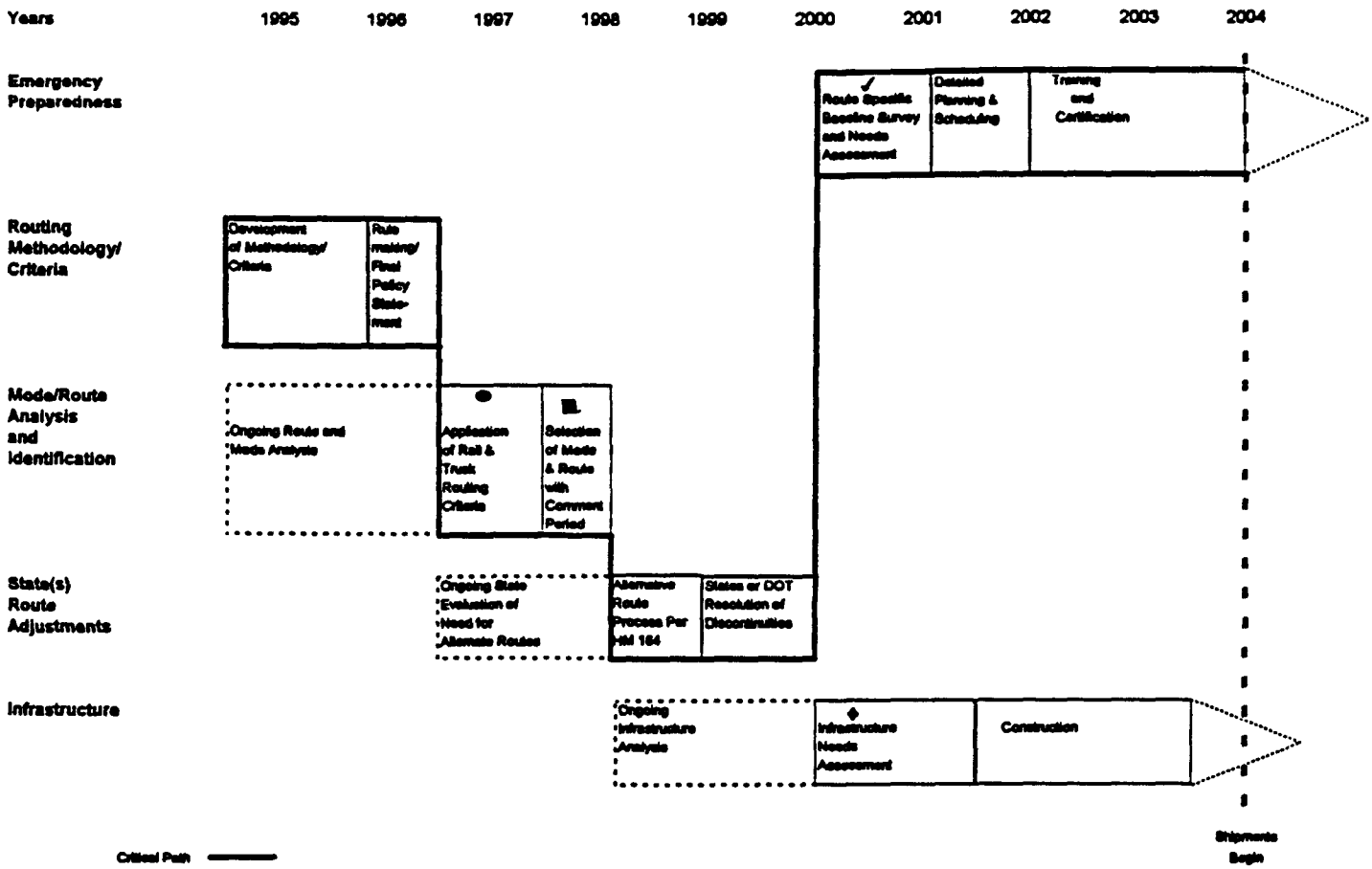
G. Environmental compliance and regulatory review

An environmental impact statement under the National Environmental Policy Act (NEPA) would be required, as would adherence to all applicable federal and state regulatory rules/procedures.

Critical Path Activity Schedule

The activity that most significantly affects this schedule is the final environmental impact statement. Under this scenario, a site, or sites, would be selected in 1994. Optimistically, the final environmental impact statement would be completed 40 months later, in 1997. The time frame for selection of mode and route would be delayed until this date.

Scenario Three



Note: Assumes the following federal activities and decision commitments are completed.	
●	■
Commitments to having rail and truck casks available Shipping origins fixed Storage site(s) selected State permit applications EA completed	NRC license application EIS completed
	✓
	180(c) funds available
	◆
	Cask size and weight determined

SCENARIO FOUR

A federal repository, international repository, or technology approved for final isolation of spent fuel and high-level radioactive waste, without an MRS.

A. Casks

All shipping cask options are feasible. There would be ample time to develop new generation, dual-purpose, or multi-purpose casks. However, since system disposal or technological requirements (e.g., thermal loading at the repository, reprocessing, etc.) may require design characteristics that are presently unknown, the design and development of new casks could be delayed beyond current estimates.

B. Shipment numbers

Shipment numbers would depend on cask capacity, disposal strategy, and/or other system characteristics which are undefined at this time. In all cases, shipment numbers would be very significant.

C. Modes

DOE would consider all possible mode alternatives, simultaneously with all possible route alternatives, from each shipping site. Information from NSTI studies, FICA studies, utilities, and Delivery Commitment Schedules[8] would be important inputs in this analysis. Mode selection would also depend on cask type, disposal/reprocessing strategy, and/or other system characteristics undefined at this time.

D. Routing

Under the most optimistic variation of this scenario, a repository at the Yucca Mountain study site, the shipping destination would already be identified. The Annual Capacity Report would determine the order of acceptance at shipping origins. A logical and timely routing process could be followed. However, due to the large number of cross country shipments, and potential alternative routes, the time frames for state(s) route adjustments have been extended.

E. Infrastructure improvements

Appropriate infrastructure needs assessments and improvements would be required. Use of dual-purpose or multi-purpose casks could require significant infrastructure improvements requiring longer construction times.

---

[8] The Standard Contract provides for a utility to identify its proposed shipment mode when submitting a Delivery Commitment Schedule (DCS) to DOE, 63 months prior to shipment. A Final Delivery Schedule (FDS) is submitted to DOE 12 months prior to shipment. The FDS must include the shipping mode, assigned by DOE.

F. Emergency preparedness and response

Full implementation of DOE's Section 180(c) requirements, with funds and technical assistance to states, would be required. Provisions for ongoing training and retraining would also be required.

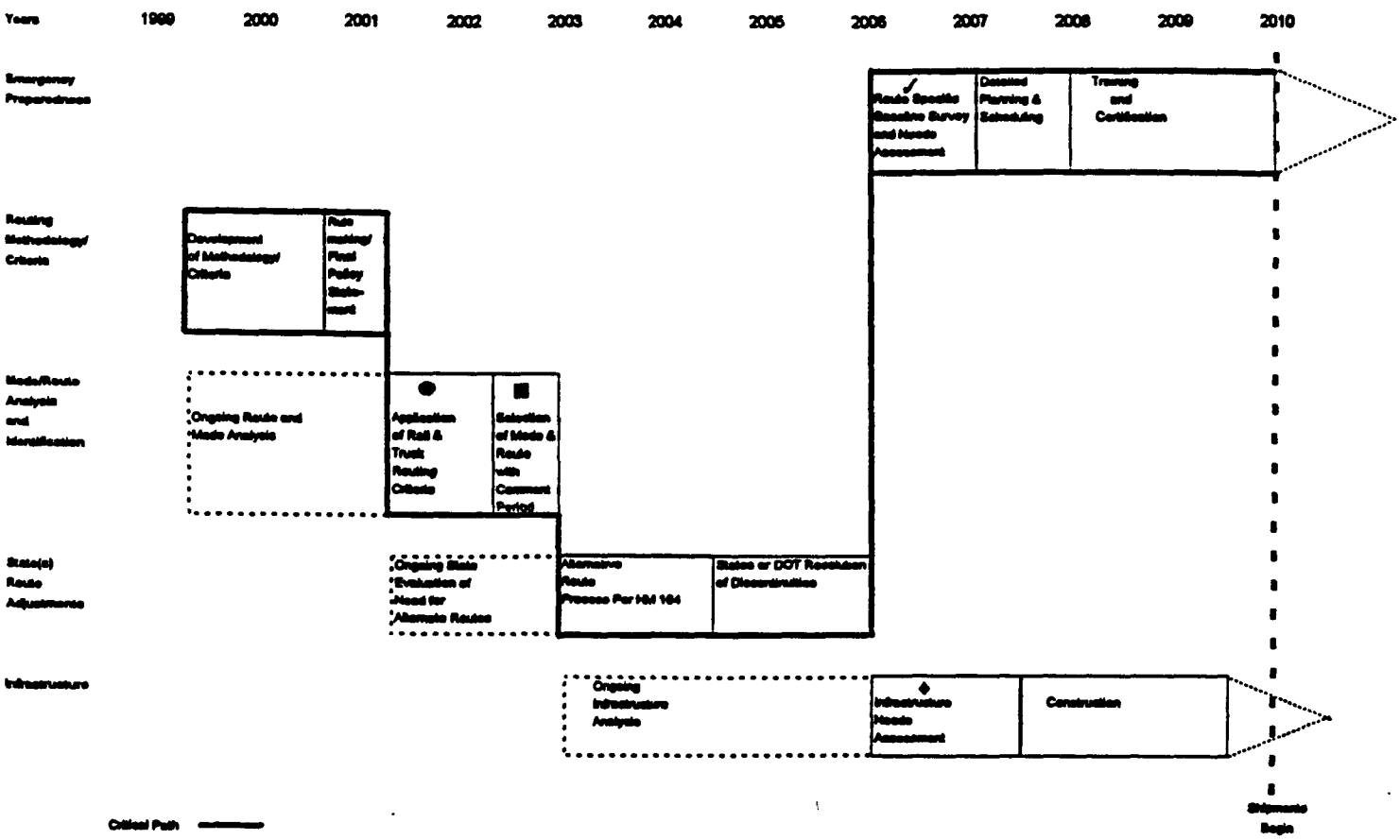
G. Environmental compliance and regulatory review

An environmental impact statement under the National Environmental Policy Act (NEPA) would be required, as would adherence to all applicable federal and state regulatory rules/procedures.

Critical Path Activity Schedule

Under the most optimistic variation of this scenario, a repository would be sited at the Yucca Mountain site. In this case, the final environmental impact statement could theoretically be completed by 2002. The critical path activity schedule uses this date to establish the start of mode and route selection. Since DOE uses 2010 as the earliest possible date for shipments to begin to a repository, the critical path activity schedule uses this date as well. Within these parameters, some critical path activity schedule time frames could be extended.

Scenario Four



Note: Assumes the following federal activities and decision commitments are completed.

●
Commitments to having rail and truck casks available
Shipping origins fixed
Isolation site(s) selected
State permit applications
EA completed

■
NRC license application
EIS completed

✓
180(c) funds available

◆
Cask size and weight determined

APPENDIX B: ASSUMPTIONS

This appendix outlines the assumptions used in the white paper: *Transportation Implications for Various NWPA Program Options* and *Appendix A: Scenarios*. The assumptions are based on published U.S. Department of Energy documents and schedules, and/or information or time frames estimated by western states. Estimates are conservative. Ranges are expressed when there is uncertainty about the most appropriate estimates to use. The longer time frames do not represent the worst case. Sources of information are referenced in endnotes. An asterisk (*) indicates a Committee estimate without an endnote.

A. CASKS

It is assumed that both truck and rail casks will be designed, developed, and manufactured. Cask type options have not yet been limited. The time frames for the availability of different cask types are assumed to be:

1. Cask design; prepare license application (1-3 years)
   - Existing cask with modified capacity - truck = 1 year*
   - Existing cask with modified capacity - rail = 2 years*
   - New generation cask = 2 years[1]
   - Dual-purpose cask = 2 years*
   - Universal or multi-purpose cask = 3 years*

2. NRC review, licensing, and full-scale testing (2-5 years)
   - Existing cask with modified capacity = 2 years*
   - New generation cask = 2 years[2]
   - Dual-purpose cask (two NRC review processes) = 4 years*
   - Universal or multi-purpose cask (three NRC review processes) = 5 years*

3. Cask prototype development and operational testing (3 years)[3]

4. Cask fabrication (1-3 years)
   - First cask = 1 and 1/4 years[4]
   - Casks sufficient to meet acceptance schedules = 1-3 years
     - To establish 1200 MTU capability = 3 years[5]
     - To establish 400 MTU capability = 1 year[6]

B. SHIPMENT NUMBERS

It is assumed that both rail and truck casks will be available. There are no partial cask loads in a shipment.

1. Cask capacities

   - Existing truck cask = NAC LWT or NLI 1/2 -- 1 PWR/2 BWR assemblies
   - Existing rail cask = IF-300 -- 7 PWR/18 BWR[7]
   - Existing truck cask with modified capacity = 2 PWR/5 BWR[8]
   - Existing rail cask with modified capacity = 10 PWR/21 BWR[9]
   - New generation truck cask (GA 4/9) = 4 PWR/9 BWR
   - New generation rail cask (B&W) = 16 PWR/37 BWR
   - No estimate for new dual or multi-purpose casks

2. Acceptance amounts

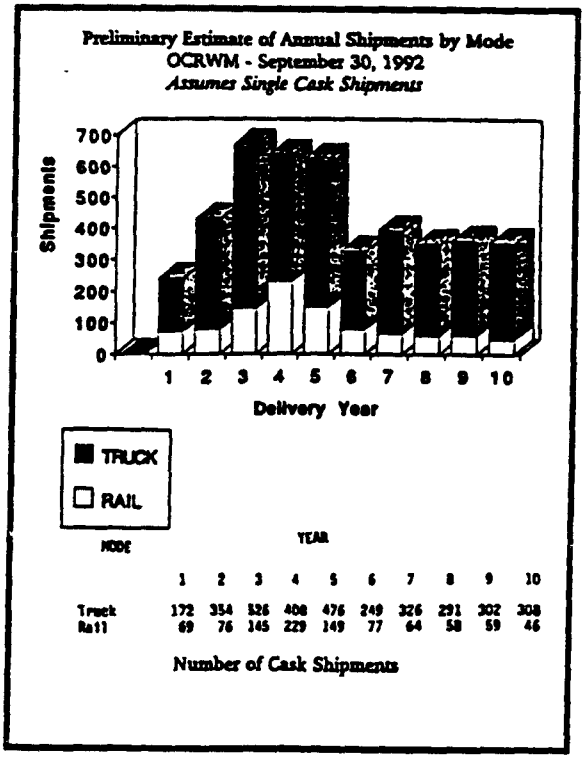
The amount of waste accepted by year is based on DOE's 1991 December *Annual Capacity Report* (ACR)(DOE/RW-0331P).[10] The total amount is consistent with statutory

limits on the amount of spent fuel which can be emplaced in an MRS (10,000 MTU) before repository operations can begin.[11]

1998 = 400 MTU
1999 = 600
2000 = 900
2001 = 900
2002 = 900
2003 = 900
2004 = 900
2005 = 900
2005 = 900
2006 = 900
2007 = 900
2008 = 900
2009 = 900
total = 10,000 MTU

3. Shipment numbers

At the September 30 - October 1, 1992 WIEB High-Level Radioactive Waste Committee meeting, DOE provided estimates of shipments by mode for the first ten years of shipments, based on the ACR report, shipping cask capacity estimates (described in section B. of this appendix), and preliminary infrastructure constraint information contained in the FICA and NSTI reports. According to DOE's estimates, existing casks (modified to increase capacities) would be used in years 1-5, while a new generation of higher capacity casks would be used in years 6-10. The numbers are:



These estimates are used to provide an approximate number for shipments under the various scenarios. Shipment estimates for years beyond year 10 in the box are calculated by averaging years 6-10.

C. MODES

It is assumed that both rail and truck casks will be available for spent fuel shipments and that DOE will consider all possible mode alternatives from each shipping site. Although utilities must indicate proposed shipping modes when they file Delivery Commitment Schedules with DOE, and must file Final Delivery Schedules with DOE-assigned shipping modes, it is assumed that DOE and utilities will choose shipping modes prior to these Standard Contract protocol requirements. Limits to specific cask (rail or truck) handling capabilities at specific reactor sites, and on infrastructure near reactors are described in DOE's FICA (*Facility Interface Capability Assessment*) and NSTI (*Near-Site Transportation Infrastructure*) reports. States' infrastructure needs assessments will define the limitations of rail or truck casks on specific routes. DOE has indicated its preference to ship by rail when possible.

D. ROUTING

It is assumed that DOE will undertake a route selection process which includes: the development of routing methodology and criteria (with state/local/tribal input); rulemaking or a final policy statement to implement the methodology and criteria; and the application of criteria to identify a national route. Criteria for route selection and the weights given to route selection factors will be finalized before routes are analyzed. All possible mode and route alternatives will be considered simultaneously.

A routing methodology and the development of route selection criteria will be developed prior to storage/disposal site identification. The application of these criteria and actual route selection will be made after such sites are identified.

Once a DOE-preferred highway route is selected, states will have the opportunity under HM-164 to designate alternate routes in their jurisdictions. States do not have the opportunity to adjust proposed rail routes under current law. However, states will compare rail alternatives to highway alternatives when analyzing various shipping routes within their jurisdiction.

1. Routing time frames (5 1/2 years or more)

Development of routing methodology/criteria = 18 months
Rulemaking or final policy statement to implement = 6 months
Application of criteria = 12 months
Selection of preferred mode and route (with comment period) = 6 months
State route adjustments per HM-164 = 12 months
Resolution of discontinuities = 12 months[12]

Some form of route analysis may take place prior to the application of routing criteria. Similarly, states may evaluate the need for alternative routes prior to DOE's selection of a preferred route. However, the time frames identified above are the minimum number of months necessary for such activities regardless of previous studies or analyses.

The following dates are assumed to be the earliest possible dates that storage sites would be identified. It should be emphasized that these dates are the "earliest possible case" for each scenario. They are extremely optimistic and not likely to be attained.

2. Identification of storage or final isolation sites

Existing federal facility for storage = 1994[13]
Voluntarily negotiated MRS site (U.S. Nuclear Waste Negotiator) = 1994[14]
Repository site - initial identification = completed
- formal recommendation to President = 2002[15]

E. INFRASTRUCTURE IMPROVEMENTS

The detailed assessment of route-specific infrastructure needs will not begin until after DOE designates a preferred route, states finish the alternative route designation process, and states and DOT resolve the discontinuities.[16] Some assessment of infrastructure constraints will be done before route identification, such as the DOE FICA and NSTI reports. States may also do certain infrastructure assessments when evaluating alternative routes. However, a full 18 months of needs assessment will be necessary after a final route is designated.

Given funding cycles, transportation planning requirements, and limited budgets, infrastructure improvements will take several years to complete. However, it is assumed that the construction time for these improvements will not be on the critical path.

Infrastructure time frames (3 and 1/2 - 10 years)

Needs assessment = 18 months[17]
Construction = 24 months or more[18]

F. EMERGENCY PREPAREDNESS AND RESPONSE

Implementation of emergency preparedness technical assistance and training under Section 180(c) will not begin until final route selection and modal analyses are complete. This is necessary to avoid the time and expense of developing emergency preparedness and response systems for shipments on nearly every interstate highway and most major rail routes in the nation. In the November 1992 *Strategy for OCRWM to Provide Training Assistance to State, Tribal, and Local Governments* (DOE/RW-0374P), DOE says it will begin providing training assistance three years before shipments to an MRS could begin.

According to western states, many activities required to prepare for eventual emergency response training can occur prior to actual route selection, such as: generic assessment of training courses; establishment of funding procedures; federal funding commitment; training and equipment standards; certification procedures for responders; development of mutual aid agreements; and incident cleanup procedures. These early preparations for training assistance are not included in the time frame below.

Emergency preparedness response time frames (4 years or more)

Route specific baseline survey and needs assessment = 12 months[19]
Detailed planning and scheduling = 12 months[20]
Training and certification = 24 months and beyond

G. ENVIRONMENTAL COMPLIANCE AND REGULATORY REVIEW

It is assumed that an EIS will be required and prepared for the storage, disposal, or isolation of spent fuel and HLW at a repository, a negotiated MRS, a sited MRS, or an MRS at an existing federal facility. It is assumed that the transportation aspects of storage and/or disposal will be integrated into the EIS.

1. Repository EIS (48 months)[21]

(EA = completed)
EIS scoping = 10 months
DEIS = 20 months
FEIS = 17 months
Recommendation to President = 1 month

2. Negotiated MRS EA/EIS (40 months)[22]

EA = 7 months
Congressional review = 3 months
DEIS = 17 months
FEIS = 13 months

3. Existing Federal Facility MRS EA/EIS (40 months)[23]

EA = 7 months
Congressional review = 3 months
DEIS = 17 months
FEIS = 13 months

NOTES

1. A range of estimates for designing new casks exists. The Committee's SPS indicates it takes 2 years. According to the August 24, 1992 report of DOE's Independent Management Review Group, "Past relevant experience suggests that a minimum of five years is required from cask concept to first-unit delivery." Under the current DOE new cask (Initiative 1 or Phase 2) program, the RFP was issued in 1987 and cask designs have yet to be finalized. Therefore, recent experience indicates it could take up to five years to design new casks. For this paper, the Committee's estimate was used.

2. Based on schedules in DOE's September 1991 *Draft Mission Plan Amendment* (DOE/RW-0316P)

3. *Draft Mission Plan Amendment*

4. *Draft Mission Plan Amendment*

5. *Draft Mission Plan Amendment*

6. According to DOE's waste acceptance schedules in the 1991 *Annual Capacity Report*, it will accept 400 MTU's during the first year of MRS operation (1998).

7. While the IF-300 cask is identified as the existing rail cask, it is assumed not to be reproducible. According to DOE, there are design features of the cask which makes it unlikely that new IF-300 casks would be manufactured. There are, however, 4 in existence (2 - VP&L, 2 - Pacific Nuclear) which could in theory be used for OCRWM shipments.

8. DOE presentation at WIEB September 30 - October 1, 1992, High-Level Waste Committee meeting.

9. DOE presentation at WIEB September 30 - October 1, 1992, High-Level Waste Committee meeting.

10. The ACR report lists a projected waste acceptance schedule for the first ten years of shipments (through 2007). The schedule included here adds two years at 900 MTU/year for a total of 10,000 MTU.

11. Public Law 100-203, Section 5021 amending Public Law 97-425, Section 148(d)(3).

12. This number represents a minimum time frame for state route adjustments (e.g., in the case of a single state). Route adjustment among several states could be very lengthy.

13. *Draft Mission Plan Amendment*, updated by Committee estimate.

14. *Draft Mission Plan Amendment.*

15. *Draft Mission Plan Amendment*, updated by Committee estimates due to known delays.

16. WIEB High-Level Radioactive Waste Committee *Strategic Plan and Schedule* and 1988 paper *Route Selection for Shipments to a High-Level Radioactive Waste Repository.*

17. WIEB High-Level Radioactive Waste Committee *SPS* and *Routing* paper.

18. WIEB High-Level Radioactive Waste Committee's *SPS.*

19. WIEB High-Level Radioactive Waste Committee, *Timing of Emergency Response* ....., 1990.

20. WIEB High-Level Radioactive Waste Committee, *Timing of Emergency Response*....., 1990.

21. *Draft Mission Plan Amendment.*

22. *Draft Mission Plan Amendment.*

23. Committee estimate based on the *Draft Mission Plan Amendment.*