State of Wisconsin / Department of Administration

Lee Sherman Dreyfus
Governor

June 4, 1980

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Mr. I. C. Roberts
Assistant Director for Siting Standards
Office of Standards Development
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

RE: Disposal of High-Level Radioactive Wastes in Geologic Repositories: Proposed Licensing Procedures

Dear Mr. Roberts:

Enclosed are the attachments containing our suggested amendments to 10 CFR 60 and the referenced comments on DOE/EIS-0046-D which were inadvertently omitted from my letter of May 27.

If you have any questions, please call me at 608/266-9810.

For the Wisconsin Ad Hoc Radioactive Waste Disposal Committee.

Sincerely,

DIVISION OF STATE ENERGY

Robert J. Halstead

Robert J. Halstead
Energy Policy Analyst

RJH/db

enc.

Acknowledged by card. 6/12/80 mdv

8007110257

101 South Webster Street • Madison, Wisconsin 53702

Suggested Amendments to NRC Proposed Licensing
Procedures for HLW Repositories
10 CFR Part 60

Subpart B - Licenses

Section 60.11 Site Characteriziation Report

(a)(6) [Footnote at end of phrase] To satisfy this requirement, the Commission has established the following criteria regarding public notification by the Department:
(1) Contacting the Governor or his designee;
(2) Coordinating with appropriate state and local agencies; and
(3) Holding public meetings in the vicinity of the proposed site(s) to explain the proposals and process to be employed by the Department.

(b) [Insert at beginning of paragraph] Immediately upon receivng a site characterization report, the Director shall notify the Governor of the State in which the site to be characterized is located.

(d) [Insert after first sentence] The Director shall transmit copies of the draft site characterization analysis to the Governor of the affected state and to the chief executive of the affected municipality or county.

(e) [Insert after first sentence] During this period, a public hearing shall be held in the county seat of the county in which the site to be characterized is located.

Section 60.22 Filing and Distribution of Applicat

(d) [Insert at end of paragraph] Copies of the application, environmental report, and other amendments shall also be filed with the officials designated by the Governor of the affected State.

Section 60.23 Elimination of Repititic

[Strike last section of paragraph and replace with the following]

Provided, That such references are clear and specific and that copies of the information so incorporated are reasonably available to each recipient of the application, environmental report, or site characterization study.

Subpart C - Participation by State Governments

Section 60.62 Filing of Proposals for State Participation

(e) [Insert after paragraph (d)] If a State desires to have its representatives accompany NRC personnel on site visits, under Section 60.11(g), the designated contact agency and person(s) shall be specified in the proposal.

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STATE OF WISCONSIN
OFFICE OF THE GOVERNOR

STATE CAPITOL
MADISON, 53702

LEE SHERMAN DREYFUS

Telephone Number
(608) 266-1212

July 27, 1979

Dr. Colin A. Heath
Division of Waste Isolation
Mail Stop B-107
U. S. Department of Energy
Washington, D.C. 20545

Dear Dr. Heath:

Re: DOE/EIS-0046-D-Management of Commercially Generated Radioactive Waste

The State of Wisconsin is aware of the sometimes conflicting, but urgent, issues related to the nuclear industry since we rely on nuclear power plants to provide 30 percent of our electrical energy.

While we recognize the primary Federal role in these issues, the problem of nuclear power and radioactive waste disposal are also state concerns and we will accept our responsibilities in these matters.

Wisconsin has a long history of accountable government involvement in proposals affecting the welfare of its citizens. I intend to maintain and improve this trust especially for nuclear waste disposal because of its serious implications to the energy and environmental future of Wisconsin and the Nation.

The responsibility over nuclear power and disposal of radioactive wastes must be a state and federal partnership. The Federal Government must make a special effort to recognize and comprehensively involve the states, local units of government and citizenry in all phases of the nuclear decision-making process.

The information contained in this Draft Environmental Impact Statement has serious overtones toward the future of our state, region and the Nation. The attendant problems will require our full and thorough attention. In order to begin a partnership approach of resolving these problems, I have directed several state agencies to provide my office with an interdisciplinary review of this Draft Environmental Impact Statement. These comments are attached.

Our review of the DEIS identified several serious inadequacies.

I feel the objectives to provide evidence supporting a specific program have not been substantiated by the information provided in this text.

I am confident that our comments will prove useful in preparing a final document which will be considered adequate within the spirit and intent of the National Environmental Policy Act, case law and the guidelines of the President's Council on Environmental Quality.

We are prepared to assist in any way possible to fulfill our obligations in this matter.

Sincerely,

Lee Sherman Dreyfus
GOVERNOR

Attach.

cc: Honorable Jimmy Carter, President
Harold R. Denton, Director, Nuclear Regulatory Commission
Honorable Albert Quie, Governor of Minnesota
Members of National Governors Association
Douglas Costle - EPA, Washington
John McGuire - EPA, Region V, Chicago
Honorable Gaylord Nelson
Honorable William Proxmire
Members, Wisconsin State Legislature
Stanley York - PSC
Donald C. Percy - H&SS
Robert Durkin - H&SS
Lowell Jackson - DOT
Mike Early - DLAD
Ken Lindner - DOA
M. E. Ostrom - Geo. & Natural History
Honorable Bronson LaFollette - Attorney General
John Stolzenberg - Leg. Council Office
Anthony Earl - DNR

Review of Comments Provided for DOE/. .5-0046-D

Management of Commercially Generated Radioactive Wastes

The Review Committee providing the following comments was formed at the Governor's request and embraced the following state disciplines and jurisdictions:

1. Public Service Commission
2. Department of Transportation
3. Department of Health & Social Services
4. Geological and Natural History Survey
5. Department of Administration, Office of Energy & Planning
6. Department of Local Affairs and Development
7. Department of Natural Resources

For your convenience and ease of response, we have subdivided agency comments into five major categories.

A. GEOLOGICAL/NATURAL ENVIRONMENT - General Comments

1. In view of recent news articles from Mississippi reporting accidental releases of radioactive material from weapons testing sites, how does DOE view the integrity of salt as a waste repository media?

2. Substantial literature has been generated on the "multi-barrier" concept. The DEIS relies on this concept (p. 1.5) to achieve the necessary level of isolation. Yet its application as presented in the document is suspect. There exists serious challenges to the effectiveness of each of the five barriers listed in the report.

a. The effectiveness of canisters as a barrier has been criticized by a number of sources. The Earth Science EPA report, 520/4-78-004, lists several questions relative to the integrity of the canister system itself. In the DEIS (3.1.59), it is stated that it has not been within the U.S. philosophy to consider canisters as barriers beyond initial emplacement. Furthermore, the DEIS states that an adequate data base has not been developed to support it as such. While the Swedish system is presented as a possible viable alternative, it is designed for reprocessed waste, not spent fuel rod assemblies, the currently accepted U.S. waste form.

b. The projected performance of the waste form itself to act as a barrier has been challenged by both the Office of Science Technology, and Policy (OSTP) and EPA. Both agencies have suggested that leaching of glass (the commonly discussed form) is a real problem and that its effectiveness as a barrier may not last beyond a decade.

c. The effectiveness of absorptive overpack to act as a barrier has not been sufficiently documented and serious reservations exist with regard to its sorptive qualities at elevated temperatures below 300°C (those expected in repositories).

d. Reliance on "the institutions of man" is contradictory to the principle of developing safe waste disposal systems which are not dependent on the changes in social and political systems.

e. The effectiveness of the host rock itself to act as a barrier is dependent on site specific qualities and cannot be attested to at this time.

For these and other reasons, the multiple barrier concept as applied in the DEIS should be reexamined.

3. The final document should address the interrelationship between deep and shallow groundwater aquifers and surface water systems and potential for transport of radioactive nuclides between the systems.

SPECIFIC COMMENTS

Page 3.1.2, last paragraph - Glaciation is identified as the greatest potential impact on the depth of isolation and erosion. Locally, such as along weak formations and fractured rocks, glaciation will in fact scour to great depths (but not to the depth of a repository). The general impression for the Precambrian Shield is that on an average about two meters of bedrock have been removed. The greatest consequence of glaciation is not erosion, but rather strain induced in the bedrock by the overlying ice column. Depending on the loci of the glacial edge, the stresses induced may be either compressive or extensive. The resultant compression or uplift should be investigated on in situ stress, and the formation or activation of fractures and faults.

Page 3.1.3, fourth paragraph - In addition to adding material on top of a repository, deposition would also lead to a change in the in situ stresses. What effect, if any, would increased compressive stress have on the repository design?

Page 3.1.9, Table 3.1.9 - Hydrologic properties are not adequately summarized with respect to fractures in bedrock. Both waterwell investigations and petroleum exploration have been drilling in fracture traces to great depth (below repository design) in the successful search for appropriate fluids. The argument that all fractures will seal due to high stress in the deep environment is probably not correct. Some fractures will be oriented such that the maximum in situ stress is not oriented perpendicular to the fracture, but rather the fracture may be oriented perpendicular to the least compressive stress, and effectively be open, or can be opened by rather low stress fields.

Page 3.1.9, first paragraph - Recent salt petrography and fluid inclusion work strongly suggests that many salt deposits have been recrystallized, in some cases by local groundwater. The presence of salt does not testify to their isolation from water, but merely testifies that water has not removed significant quantities of salt. The salt may well have been carried some distance and recrystallized.

Page 3.1.11, Figure 3.1.2 - Even as a generalized map, this figure is incorrect. We would disagree with the location of granitic rocks, particularly for Wisconsin. Recent geological mapping in Wisconsin indicates that much of northern Wisconsin is underlain by metavolcanic rocks of Middle Precambrian age. Similarly, the known granitic area of the Beartooths in Montana, and the Adirondacks in New York are not shown. The map could be improved by showing the general distribution of granitic bedrock at depths less than 300 meters, inasmuch as the repository design will be below that depth.

Page 3.1.13, second paragraph - We strongly disagree with limited porosity in basaltic rocks. The Keweenawan volcanic rocks of Michigan, Wisconsin and Minnesota are the host for hydrothermal copper ore deposits, attesting at least locally to rather high porosity.

Page 3.1.13, last paragraph - Rather than granitic, it might be more appropriate to refer to these rocks as igneous and metamorphic crystalline rocks.

Page 3.1.14, Figure 3.1.4 - Keweenawan lavas are incorrectly located on map. Also, Triassic lavas are much more extensive along the East Coast than depicted. Perhaps metabasaltic rocks should also be depicted on this diagram.

Page 3.1.17, third text paragraph - Two site selection criteria are identified: (1) scientific/technological basis, and (2) presently owned government property. Certainly, federally-owned property may be an easy way to select a site, but that site must satisfy all of the critical technological constraints.

Page 3.1.20, bottom of page - We strongly concur that the site specific investigations should look at a regional framework to better assess the reliability of the repository.

Page 3.1.41, fourth paragraph - Approximately 50 million tons of rock will be left on the surface during operation of the repository. This is 70 million yards of material, or a mound of material 60 feet high occupying one square mile. Has the leaching consequences of this pile been addressed? Can suitable acreages be identified in the model site area to accommodate this material? How will the residual waste rock at the surface be reclaimed?

Page 3.1.48, third paragraph - Anisotrophies in the rock body are identified (bedding, etc.). This is contradictory with the avowed goal of an homogeneous host rock. Anisotropies, whether in horizontal or inclined units are anisotropies. Even in horizontal units, lateral anisotropies are common. Horizontal bodies may have greater roof problems than an equivalent weakness along the footwall of the repository.

Page 3.1.56, general sections - Has the Eh-pH dependency of the waste form been investigated? The waste itself, having multiple oxidation states, will have different solubilities with differing Eh-pH. Can we adequately characterize the Ep-pH of groundwaters after they have reacted to some extent with wall rocks? We are not talking of an hypothetical distilled water interaction. Appendix I does not seem to consider water quality.

Page 3.1.72, fourth paragraph - Please discuss the relevance of the EPA Assessment method cited here?

Page 3.1.107, and other pages - What is the volume of material for permanent onsite storage? How does this affect the projected site area? The suggestion is given that the total volume of the mine complex will be completed in seven years. This is approximately 30,000 tons per day, as large as the largest underground metal mines. Is it reasonable to assume that such a large tunnel system can be excavated in such a short time with the available shaft system? Are you sure that there will be few material handling problems?

Page 3.1.122 - State and Federal discharge parameters should be discussed in the section. Ph is not the only controlling factor.

Page 3.1.241, first paragraph - We would hope that airborne and ground electromagnetic systems (INPUT, SLINGAM, etc.) be a standard part of the site investigation. These systems can provide critical detail on fractures, rock type, etc.

Page 3.1.244, (Table 3.1.94 - If your zero corresponds to the year 1986, this project was started in 1973. Is this assumption correct?

Page 3.2.2, third paragraph - Monazite may be a poor example to use to defend the mineralogic options. Geochronologic methods (U-Pb systematics) clearly document that monazite is normally discordant, typically through the loss of uranium. The stability of these minerals should be addressed through geochronologic methods such as U-Pb dating, and uranium disequilibria methods. We think that this kind of an approach will identify that many minerals lose uranium and other elements. Once radioactive decay has occurred (and many daughter elements are radioactive), the new element no longer has the ion size to fit precisely in the crystalline mineral structure.

Page 3.2.13, first paragraph - Detrital metamict grains are not a basis for determining stability. As discussed above, we are not interested in the integrity of the mineral, but rather whether or not the radioactive elements are retained within the structure. Of the minerals tabulated on Table 3.2.11, most, if not all, when analyzed by geochronologic methods are commonly discordant.

Page 3.3.7, first paragraph - Fracture porosity should not be discounted. Fracture traces are systematically used in the exploration of oil and gas to at least three kilometers. In areas of the crystalline shield, water well drilling commonly uses the concept of fracture traces to develop high capacity water wells.

Page 3.4.9, Rock Melting process - A major point missed with rock melting is the consequent melt cooling. Differentiation will result, and the last formed liquids will concentrate elements such as uranium. This will form late hydrothermal liquids of extreme radioactivity. Whether or not this might result in criticality should be investigated.

Section 3.7, Ice Sheet disposal - This entire section should be rewritten. Additional data from the Dry Valley Drilling Project, and the Ross Ice Shelf Project provide significant additional geologic scenario.

Page 3.7.4, third paragraph - A small body of data have been advanced in the past few years of more recent local glaciations (alpine type) and flooding of the dry valleys. Glacial permafrost drift locally exceeds 300 meters in Taylor Valley.

Page 3 3.7, Transportation - How many tons per year are we talking about? The realistic shipping season is two-three months (more like two months). Can the ground transport system handle the projected volume? In recent years, about one aircraft accident per year has occurred. The safety records, although enviable for harsh environmental areas, are still not good enough for carrying large quantities of waste.

Page 3.7.9, Table 3.7.1 - The cost figure seems too low. Recent purchases of C-130's for polar work are expensive. Logistics support is extremely high. The present USARP (NSF) program is about $40 million per year to support about 1,000 men and women in the summer and about 40 in the winter. About 90 percent of the costs are in logistics, and less than 10 percent is useful science. The environmental impact of large scale technology in polar regions may be too much to pay.

Page 3.7.10, last two paragraphs - Elsewhere in the text sub-ice lakes are identified. Present hydrogeologic studies strongly suggest that the sub-ice lakes provide the groundwater for the discharges in the dry valleys. One drill hole by the Dry Valley Drilling Project (DVDP 13) identified upward moving groundwater at -16°C at a depth of 150 meters. The water appears to have moved through fractures in the crystalline bedrock. Preliminary heat flow studies by DVDP suggest high heat flow (equivalent to the basin and range province of the U.S.), and the possibility that uranium has been leached to a depth of 300 meters.

Section 3.8, Inclusive, "Reverse Well Disposal" - The section adequately enumerates the advantages, disadvantages, and potential problems that must be addressed if well injection is to be used as a method of radioactive waste disposal. There are several considerations which, although briefly mentioned in the report, realistically cast serious doubt on the entire concept of utilizing well injection as a safe method of radioactive waste disposal.

Beginning with the shale-grout method, the critical aspects are the control of the orientation of fractures in which the waste is implaced, the leachability of the shale-grout mixture and its stability over time in a groundwater environment, the relatively shallow depth at which the waste is stored and the problems in maintaining an undisturbed or unpenetrated geologic environment over long periods of time.

In isotopic homogeneous model studies, control of hydrofracture orientation is accomplished in a relatively straight-forward manner. In a real geologic environment, anisotropy and inhomogeneity are the rule. In addition, existing fracture systems controlled by post depositional stress on the rock units and later tectonic forces are present in rock units from granite to poorly consolidated glacial till. Those zones of weakness are difficult to detect in rock cores but will be the controlling factor in the orientation of artificially induced fracture systems, as important as the vertical and horizontal stress components discussed in Section 3.8.

The effects of existing fracture and joint systems should be addressed in a much more specific manner. It is probable that the presence of fracture systems will be found in any proposed repository zone and that their presence would be cause for the elimination of the shale-grout disposal method.

A further note here which is also applicable to the other following points of discussion is that in groundwater flow through shales of low permeability it is the fracture system which will control the amount of water flowing through the unit and not the low permeability of the shale itself.

This leads to the leachability and stability of the grout mixture. The binding agent is a combination of calcium carbonate and calcium silicate, both of which will be under-saturated in most flow systems encountered at the shallow depths required for this system. The stability of this binding agent should be addressed in more detail. It is not sufficient to rely on the presence of the shale to sorb any ions released by the dissolution of the cementing agent as most flow will be occurring in fractures created in the shale-grout mixture.

The relatively shallow depth of 300 to 500 meters required for the shale-grout method is within the normal depth of local to intermediate groundwater flow systems. As such it is a common depth to which water wells are drilled. It would be difficult to ensure that no wells have been drilled in an area prior to its selection as a waste disposal site and to guarantee that the site will continue to be safe over the time scale considered. This requirement is much more critical for the shale-grout method because of its shallow depth.

The deep well injection concept has many apparent advantages over other more costly concepts. One point which must be kept in mind in evaluating this method is that the waste, once it enters the reservoir rock, is completely mobile and free to move in response to thermal and chemical gradients, as well as hydrostatic gradients. In deep sedimentary basins, flow paths may be as long as 500 miles and travel times in excess of 10,000 years, if the flow system is undisturbed. If waste is injected into these zones, radically different thermo-chemical-hydrostatic gradients are created instantly. The flow system response to this type of stress is not fully understood and inadequately modelled with the numerical tools available at present.

The deep sedimentary basins represent the most suitable environment for disposal using the deep well injection system. However, if it is necessary to site a waste processing facility on an area which is not underlain by a groundwater flow system having very low gradients and extremely long residence times, then the deep well injection concept should be eliminated as a viable method of waste disposal.

Appendix D Models Used in Dose Calculations - The following is stated in the Draft Environmental Impact Statement, page D.1: Dose to Regional Population. Calculational models and parameters used in evaluating the radiological dose from both chronic and accidental releases of gaseous and liquid effluents from the facilities and processes investigated in this study have been selected to give a realistic but conservative appraisal. These models represent the state of the art, keeping in mind that, because of the natural variability of the input parameters, excessive sophistication does not necessarily lead to more accurate results.

The following questions concern the input parameters for models used in dose calculations:

1) What accuracy is required for input parameters derived from environmental measurements of radioactivity?

2) Can the computer programs FOOD and PABLM noted on page D.3 use existing data from nuclear power plant environmental measurements to assess doses to the population? If so, could the Department of Energy make these calculations using facility or state data?

Appendix F A Reference Environment for Assessing Environmental Impacts Associated with Construction and Operation of Waste Treatments, Interim Storage and/or Final Disposition Facilities - This section contained a variety of data relevant to land use, hydrology, meteorology, ecology, and wildlife. However, no baseline data relevant to existing radiation background levels is cited. Perhaps this is not a critical omission in the Draft Environmental Impact Statement but examples of existing natural radioactivity levels would be helpful to the reader. Examples of existing radioactivity levels for man-made or naturally occurring radionuclides in surface water, drinking water, air, and other sampling media would illustrate conditions prior to existence of a radioactive waste disposal site. A discussion on natural background for the reference site might also be helpful to the reader in understanding the radiological significance of measurements from monitoring data.

Further significance of the pathway parameters used on pages F.15-17 could be demonstrated if referenced to a model radioacitivity surveillance program. Examples of the sampling media could be more directly related to the discussion in Appendix D, Models Used in Dose Calculations, concerning Ingestion of Food Crops and Animal Products and Accumulated Doses from Foods.

The reference environment in Appendix F seems rather specific. Although this is supposed to be a "generic" site, the geology, hydrology, topography seems to describe the Waupaca/Shawano County area of Wisconsin, with the major metropolitan area the Fox River Valley including the metropolitan Green Bay to Oshkosh area. If this in fact is close to the reference site, consideration should be given to the glacial rebound in the area. This rebound will change the in situ stress at the site, and could lead to changes in the surface drainage. The rocks in this area are part of a rapakivi massif (the Wolf River Batholith). This general rock type is noted for its ease of weathering to reasonably deep depths.

An alternative area that would satisfy many of the "generic" site requirements is Waushara County, about 100 kilometers south of the Waupaca area. The bedrock in this area is massive red granite, a granite that has high compressive strengths, and is commonly studied for rock mechanic properties. Miarolitic cavities reportedly have been found in this granite, but their presence has not been confirmed. This area is close to the cryptovolcanic structure at Glover Bluff in Marquette County, and lies close to a major gravity gradient that may reflect major crustal differences to the north and south. This zone is also the loci of several Wisconsin earthquakes.

Inasmuch as other "generic" sites were not extensively described, the rather extensive description of the north central site suggests that some studies have been undertaken, and serious consideration is being given to sites other than salt, Hanford and NTS.

An additional alternate area that satisfies all the information of the generic site is in Sherburne County, Minnesota, northwest of Minneapolis, and in the vicinity of the Monticello power plant of NSP. The Precambrian bedrock in this area is the Reformatory Granite, a relatively massive rock, but almost every exposure contains inclusions of hornblende schist, biotite schist, or garnetiferous biotite schist, gross inhomogeneities in terms of homogeneous granite.

The point in the preceeding paragraphs is that a number of sites in the Upper Midwest satisfy the engineering criteria for a repository, and (albeit possibly small) engineering data to exist for "generic sites" in the Upper Midwest, that some site specific studies may well have been undertaken. If, in fact, siting may be directed towards the Upper Midwest, consultation should be made with appropriate state agencies to adequately identify suitable areas, rather than DOE proposing a site that may well have serious drawbacks when viewed from a state perspective.

Why was the reference environment described in Appendix F used in this document and no other additional reference environments included? Does this imply crystalline disposal is DOE's preferred alternative?

Appendix P, page P-42 - See earlier comments on monazite. Consideration particularly in the discussion of zircon, should be directed toward the mechanisms for discordancy in the geochrologic systems (U-Pb). Two mechanisms are pertinent: the diffusion loss mechanism of Tilton, and the dilatancy loss mechanism of Goldich and Mudrey. Diffusion models have the daughter lead isotopes diffusing from the zircon at a rate proportion to the amount of uranium in the sample through various radiation damage models. A large body of data support this model. The dilatancy model has lead loss due to low temperature effects related to uplift and release of stress. Both models suggest that various ions are not held quantitatively in the structure, although the main framework of the zircon may remain intact. Similar models can be advanced for other radioactive minerals.

B. TRANSPORTATION - General Comments

1. The evaluations of the various technologies for waste management discussed in the body of this report fail to deal directly with transportation details in connection with the wastes discussed. Although it is apparent that the document is intended to present the advantages and disadvantages of the various methodologies for disposing of commercially generated radioactive wastes, it seems that the concept of waste transportation should be an important factor in judging the feasibility and impacts of these options. The evaluations made include such things as socio-economic factors and increases in demands for services. However, there is no reference to the factors involved in transporting wastes, such as, adequacy and availability of present systems, risk, safety, etc.

2. Some of the concepts discussed in Chapter 3.0 "Technology Alternatives for Final Disposal" are much more transportation dependent than others. Even though it appears that island disposal, subsealed geologic disposal, ice sheet disposal, and space disposal are not the concepts that are the most likely to be readily available for commercial usage, they are nonetheless the ones that would probably have the most substantial transportation related impacts. The feasibility of accomplishing the required transportation as well as the impacts associated with them should be studied and presented as part of the development of each concept.

3. In Wisconsin, transportation considerations would include both land and water routes. The Great Lakes system could possibly be used to reach a northern location. Both rail and highway facilities would be possible corridors throughout the state. Obvious considerations such as capacity of facilities, ability to serve a new demand, availability of equipment, etc., would have to be studied. Also, a very important factor is that of public reaction to transportation of hazardous wastes. This is a serious obstacle to overcome and deserves to be very carefully considered. Public awareness and concern is very strong today and is especially likely to be aroused in a rural area.

4. It would seem reasonable to give serious consideration to locating repositories near adequate existing rail facilities to potentially maximize transportation efficiency.

5. In judging environmental impact from transportation connected with moving radioactive wastes, it is important to evaluate the standard environmental impacts associated with any transportation, such as air pollution, noise, and water quality impacts.

SPECIFIC COMMENTS

Page 3.1.25 (fourth paragraph) - Transportation demands are not adequately addressed. What grade of highways and railroads will be needed? How frequent will shipment be? Will this disrupt the normal traffic flow? What would be the routing from the various power reactors to the disposal site? How might transportation routing affect major metropolitan areas? Will vehicles be escorted?

Page 3.1.116, Tables - Denormalize the values. Exactly, how many tons of materials are we talking about? How many cubic meters of concrete (total) etc.? Can the transportation and power grid handle the amount of material, or will additional roads, rails and high-power lines be needed? What is the daily electrical use, and what percentage of the model site is this? Will additional local power facilities need to be built? Or is this covered in Table 3.1.85 on page 3.1.217?

Appendix F - Although it is clearly stated that the reference environment is hypothetical, it appears from a cursory overview of the description that such a site could very possibly be located in Wisconsin. From a transportation viewpoint there would have to be serious consideration given to the transportation problems associated with development of any of the facilities described for this reference environment. Again, these factors are not considered in the description given. There is no reference to existing transportation facilities in the region or of the problems likely to be involved in placing the wastes at that particular site for disposal.

Appendix N - This section deals generically with some of these transportation issues. However, they are treated entirely separately and not as a part of the total cumulative impacts of a particular method of management. It would be difficult from this appendix to determine a direct impact relationship between the transportation factors discussed there and the disposal techniques discussed in the body of the document.

C. NUCLEAR GROWTH ASSESSMENT - General Comments

1. One of the documents stated objectives were to "exhibit neutrality regarding nuclear growth." (p.vi) As the reference scenario, your agency has chosen a high growth projection which assumes 400 GWe of installed nuclear capacity (approximately 400 reactors) by the year 2000. (Pp. 1.5, 1.7, 2.3, 2.1.2) The choice of an alternative scenario, a low growth projection, is unclear. In the Summary, an alternative scenario assumes 225 GWe installed nuclear capacity in the year 2000. (Pp. 1.5 and 1.11)

Throughout the remainder of the DEIS, the alternative scenario assumes 250 GWe installed nuclear capacity. (Pp. 2.3 and 5.6) Is this a typographical error?

In order to meet its stated objective of presenting all analysis from "the standpoint of alternative nuclear growth futures which will bracket what is now thought reasonably possible," (p.vi) consideration should be given to:

a. A high growth scenario of 550 GWe installed nuclear capacity by the year 2000: The Atomic Industrial Forum has projected that 550,000 megawatts of installed nuclear capacity by the end of the year 2000 is achievable, given "regulatory reform, resolution of fuel-cycle and proliferation questions and the electric utilities ability to compete more favorably in the money markets for capital." (AIF, "The Nuclear Industry in 1978," News Release dated January 17, 1979, p.8).

b. A low growth scenario of 150 GWe installed nuclear capacity by the year 2000: This would bring the stated low growth scenario into agreement with that of the Interagency Review Group on Nuclear Waste Management which examined a low growth scenario of 148 GWe in its March, 1979, Report to the President (Appendix D, p.3). According to data provided by the Atomic Industrial Forum, a low growth scenario assuming 150 GWe would reflect the capacity of the 72 existing reactors with operating licenses (52.4 GWe) plus the capacity of 92 reactors with current construction permits (101.1 GWe) as of June 30, 1979. (Telephone conversation with Mary Ellen Warren, AIF Statistician, June 28, 1979)

2. The discussion of the effects of different energy projections in the DEIS is contradictory and misleading. At several points the document states that "the quantity of wastes can be directly scaled to the total energy generated during operating reactor life cycles." (p.1.5; see also Pp. 1.1, 2.1.26, and A.47) The DEIS further states that the alternative growth scenario, which assumes an installed nuclear capacity of 250 GWe in 2000, would generate HLW or spent fuel canisters at a ratio of 0.64 compared to the reference scenario, which assumes installed capacity of 400 GWe. (Pp. 2.1.27, A.47, and A.55)

From this information, a reader could logically assume that the alternative growth scenario would generate one-third less waste, and require one-third less waste storage capacity, than the reference growth scenario. A reader could therefore conclude that the number of repositories required for the alternative growth scenario would be one-third less than the three to ten repositories (depending upon fuel cycle and geologic media) which Tables 3.1.84 to 3.1.87 (Pp. 3.1.215 3.1.222) indicate are required for the reference scenario. However, the DEIS does not provide any information on the specific number of ultimate repositories required under the alternative scenario. This is a serious omission, since environmental impacts will vary according to the number of repositories which are actually constructed.

The DEIS not only omits the required number of repositories for the alternative scenario, it is misleading with regard to the required number of predisposal facilities. At three points in the DEIS, the discussion of the scaled relationship between total energy generated and the resulting waste quantities is immediately followed by statements which might lead a reader to suppose that the total number of predisposal facilities required is not significantly reduced under the alternative growth scenario. (Pp. 1.5, 2.1.27, A.47) The reader is referred to Appendix A for details. The information provided in Appendix A, Tables A.46 and A.47, however, indicates a significant reduction in the number of predisposal facilities required for the alternative growth scenario. For the once through fuel cycle, the ratio of Independent Spent Fuel Storage Facilities and Spent Fuel Packaging Facilities (5 of each, compared to 8 of each) is 0.63 compared to the reference scenario. For the Uranium and Plutonium recycle, the ratio of Fuel Reprocessing Plants (5 compared to 7) is 0.71, the ratio of Mixed Oxide Fuel Fabrication Plants (6 compared to 10) is 0.60, as compared to the reference scenario. Please calculate the number of ultimate repositories required for the alternate growth scenario.

In order to clarify the effects of different energy projections:

a. Specify the number of ultimate repositories required for both the reference and alternative scenarios for each fuel cycle and geologic media.

b. Specify the number of ultimate repositories required for a high growth scenario assuming 550 GWe installed nuclear capacity by the year 2000, and for a low growth scenario assuming 150 GWe installed capacity.

3. The lack of a waste disposal policy has brought into question the viability of existing and future nuclear power programs. Economic as well as environmental uncertainties regarding waste disposal have contributed to the unattractiveness of nuclear program expansion, while existing plants face concerns of shutdown and/or additional expenditures due to spent fuel storage inadequacy.

D. SITE SELECTION - General Comments

1. The DEIS endorses the IRG recommendation for a regional site selection approach to radioactive waste management (p.iv, 1.2, 4.32-4.33), but does not provide a comparative analysis of the regional (multiple) and national (single) repository approaches. The final IRG Report (p. 53) specifically directs the DEIS to provide this analysis to support its contention that regional siting would reduce waste transportation requirements and provide redundancy that would hedge against the possibility of an unexpected repository shutdown. The DEIS, however, does not present sufficient information to substantiate the transporation and redundancy advantages which are claimed, thereby weakening the entire case for regional site selection.

2. In early 1977, the Energy Research and Development Administration pledged to include State Officials in any site investigations conducted in Wisconsin. G.W. Cunningham, then Director of ERDA's Division of Waste Management, made the following commitment in a letter dated April 13, 1977, to Commissioner Matthew Holden, Public Service Commission of Wisconsin:

> "We at ERDA understand the public concern that the solution we implement be safe and environmentally acceptable. We would like to reassure you of our commitment to work with you and other state officials to develop the siting criteria in achieving these objectives. We would propose to initiate our investigations of the geology in coordination with the state geologist and to keep you advised of the progress of the geological investigations. Simultaneously, we would like to outline whatever mechanism for joint discussion of the program that you feel needs to be addressed for the longer range procedures regarding potential siting of such a facility in Wisconsin."

At every major decision-making point since 1977, the State of Wisconsin has reiterated its support for maximum state participation in the siting process. A number of Wisconsin representatives stressed the importance of state involvement during the September, 1977, NRC workshops on State Review of Site Suitability Criteria for High-Level Radioactive Waste Repositories. During the spring and summer of 1978, the State of Wisconsin provided technical assistance to the Nuclear Power Subcommittee of the National Governor's Association, and concurred in the policy statement drafted by the Subcommittee and adopted at the 1978 NGA annual meeting. That statement reads:

> Early in the process of preparing environmental impact statements for specific sites or facilities, the Department of Energy should involve state and local officials. State and local officials should assist in furnishing the information needed for these activities. DOE must obtain state concurrence prior to final site determinations.

In December, 1978, the State of Wisconsin again emphasized its position in comments upon the IRG Draft Report. While in agreement with the IRG approach under which the States "would continue the involvement begun in the planning phase by reviewing early site characterizations and potential sites of disposal facilities," (IRG Draft Report, p.52), Wisconsin expressed dissatisfaction with the IRG's ambiguous definition of state "concurrence." In a letter of December 11, 1978, to IRG Chairman John Deutsch, the Director of the Wisconsin Office of State Planning and Energy, Victoria Potter, urged that "provision be made, in whatever process of consultation and concurrence is developed, to ensure that states already having adequate siting programs for construction and/or disposal be minimally disrupted." The Wisconsin Legislature is currently considering a proposal (Assembly Bill 212) which would require a state Certificate of Compatability for construction of radioactive waste disposal facilities in the State.

To address these institutional issues, the final DEIS must:

a. Specify a firm mechanism for state and local participation prior to detailed site investigations in Stage III of the proposed site selection process; and

b. Identify the "socioeconomic" and "sociopolitical" factors which the DEIS states will be evaluated early in Stage III. Provision should be made for public participation in these evaluations.

3. Environmental analysis cannot be done in detail until the site is specifically defined. While use of the reference site concept is useful for a generic comparison of several alternative courses of action, unique site characteristics which are outside the scope of the environmental criteria contained in the DEIS must be evaluated when specific sites and project designs are selected.

E. GENERAL AGENCY CONCERNS/COMMENTS

1. The DEIS is a step in the process of developing a national program for radioactive waste disposal.

2. The foreward or background sections of the DEIS should have a discussion of the process and schedule being used to resolve radioactive waste problems. The reader is told that this document provides the required environmental analysis for the selection of a national strategy for disposal of high level radioactive wastes from the commercial fuel cycle. The reader is forced to presume that the final EIS will be followed by: 1) a decision on a particular national strategy for waste management, 2) research and development activities (including those defined in Section 3.16), 3) a public site identification and selection process, and 4) a site specific licensing process including the development of a site specific EIS. There is not a concise statement of the likely sequence of events, or of what final outcomes are likely.

3. The assessments of impacts through abnormal sequences as well as routine operations produce a false sense of predictability. In reality the information contained in most of the tables between Table 3.1.29 and 3.1.92 are based on a series of nested assumptions beginning with an assumed initiating event (e.g., meteorite, nuclear warheads, encroachment by drilling, leaching, earthquakes, etc.), followed by an assumed transport mechanism (e.g., groundwater ingestion, inhalation of airborne radioactivity, etc.), and followed by an assumed environment to be affected. These are very difficult to predict over the long term, although their significance can be assumed away through statements such as "At about 1.4 million years after disposal, assuming the region and its population remain unchanged. . ." (pg. 31.162). Regarding the quantitative analysis, it is unclear from the DEIS as to what assumptions are made and what their effect is. This deficiency might be alleviated through the use of sensitivity analysis for assumed variables to determine how substantially they affect the outcome. (This type of analysis was performed for portions of the cost estimates.) The reason for the selection of certain assumed values should have been stated. Additionally, while the document was too massive to check each

table for consistency, a spot check identified an error in the calculated dose from a repository breach in Table 3.1.37, where the dose received after one million years is greater than the dose received after one hundred thousand years.

4. From the aspect of a utility regulatory commission, the DEIS inadequately described the cost of radioactive waste management. There was insufficient information to determine whether the projected costs of the various options are realistic.

5. We interpret the objectives of this DEIS to be two-fold:

   1. To provide evidence supporting the IRG's March 1979 recommendations on this subject.

   2. To replace the DEIS (WASH-1539) prepared September 1974 by the Atomic Energy Commission concerning the program for developing interim and permanent repositories for high-level and transuranic radioactive wastes.

   In the reviewers opinion these objectives have <u>not</u> been met.

6. In the summary contained on page 1.1 of Volume one it is stated:

   "In evaluating the various technical strategies, issues and environmental impacts have been analyzed as best understood currently. Based on the analysis presented here, and in the light of the greater depth of knowledge on geologic disposal, DOE proposes that: (1) the disposal of radioactive wastes in geologic formations can likely be developed and applied with minimal environmental consequences, and (2) therefore the program emphasis should be on the establishment of mined repositories as the operative disposal technology."

The reviewers feel that the above conclusions have not been substantiated by the information provided by the text. Such conclusions are at this time premature.