Statement of Don U. Deere

Chairman

Nuclear Waste Technical Review Board

before the

Subcommittee on Energy and Water Development

Committee on Appropriations

U.S. House of Representatives

March 7, 1991

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Fiscal Year 1992

Mr. Chairman and Members of the Subcommittee:

I am Don U. Deere, Chairman of the Nuclear Waste Technical Review Board (NWTRB or the Board). On behalf of the entire Board, I would like to thank you and the Subcommittee on Energy and Water Development, Committee on Appropriations, United States House of Representatives, for the opportunity to present the Board's appropriation request for fiscal year 1992. With me today are two people who make invaluable contributions to our small agency, Dr. William D. Barnard, Executive Director, and Mr. Dennis Condie, our Deputy Executive Director. Bill has been with us for almost a year now, and Dennis has been with us since our start-up in January 1989.

Mr. Chairman, the Nuclear Waste Technical Review Board is very young. In fact, this is the first time we have come before you with an appropriation request. I have prepared a short statement that outlines the Board's mission, activities to date, and future plans to help acquaint the Subcommittee members with our agency. I also will submit a detailed document containing the specifics of our request and supporting data for the record.

Appropriation Request

On behalf of the Board, I am submitting a request for $3,294,000 to continue our Congressionally mandated mission of evaluating the scientific and technical validity of the activities of the Department of Energy (DOE) as it designs and develops a system to manage the Nation's commercial high-level radioactive waste. Our request reflects projections of funding levels necessary to support Board activities based on our experience of the past two years.

The Problem Facing the Nation

Mr. Chairman, by the year 2000, the United States will have a projected 40,000 metric tons of spent fuel to dispose of. By 2035, after all existing nuclear plants have completed 40 years of operation, there will be approximately 85,000 metric tons. The DOE has been assigned by Congress the responsibility of developing a system to manage the disposal of this spent fuel, plus approximately 8,000 metric tons of defense high-level waste from reprocessing.

The DOE must find a place for this waste, design and construct facilities that will safely contain the waste for thousands of years, and develop a nationwide transportation system to safely convey the waste to the facilities, once they have been built. This is a major undertaking *and* a task of major importance to the Nation—now and for the future. The successful completion of this program will require a monumental effort on the part of the DOE, as well as other federal and state agencies.

There is currently a worldwide scientific consensus that a deep geologic repository is the best option for the disposal of high-level waste. In 1987, in the same legislation that created our Board, Congress designated a site at Yucca Mountain, Nevada, as the only site to characterize for potential repository development. Should the site prove suitable and meet licensing criteria, an underground repositoiy would be constructed.

Current plans call for a repository consisting of more that 100 miles of tunnels excavated approximately 1,100 feet below the surface of Yucca Mountain. The repository would cover about two square miles.

The development of a geologic repository is a complex task. First, there are the scientific and technical challenges of designing above ground and underground facilities to handle radioactive waste. Second, we must be sure that the waste will be disposed of safely for generations to come without significant releases of radionuclides to the accessible environment. Finally, a waste management system can only be developed if it has the support of the Nation. There is much to be done and in its short life, the Board already has been able to make important contributions to this major effort.

NWTRB's Unique Role in this Major National Effort

Congress clearly recognizes the complex nature of the technical and scientific issues that must be resolved before the United States can achieve safe, long-term disposal of its high-level radioactive waste. Congress created the Nuclear Waste Technical Review Board because it recognized the need to establish an *independent* source of expert advice on the scientific and technical aspects of the DOE's work. Since we are the *only* such agency, we believe we play a unique and vital role in this effort.

Our Board currently consists of nine Board members; two positions are as yet unfilled. Board members work on a part-time basis. We currently have four, full-time senior technical professionals and 13 administrative and support staff. Our professional and support staff will probably expand somewhat with the appointment of two additional Board members sometime in 1991. Despite our small size and short history, we already have sponsored more than 25 meetings and technical exchanges with the DOE and its contractors and with other Federal agencies, the national laboratories, as well as with the State of Nevada. The goals of our meetings have been to review the DOE's work in the

technical areas pertinent to high-level waste management and to promote better communication among the technical people involved in the waste management program.

To help us gain a better understanding of the public arena in which nuclear waste management technology is being developed, we also have solicited the views of the public and environmental organizations on a variety of issues. Members and staff have attended a variety of technical conferences, symposia, and workshops. They have participated in numerous field trips to examine geologic formations in the State of Nevada.

Various Board members and/or staff also have met with key Congressional representatives and their staff; Nevada's Governor Miller; the Nuclear Waste Negotiator; as well as the Chairman, commissioners, and staff of the Nuclear Regulatory Commission (NRC).

Last summer Board members spent a week investigating Swedish and German programs on HLW management. The Board has found the information gathered from technical experts in other programs helpful in evaluating the soundness of the technical approaches being proposed for the United States. We are planning a similar trip to Canada in the coming months.

We have submitted two reports to Congress and the Secretary of Energy, in March and November 1990, and our third report will be released in May. Recommendations, primarily to the Secretary of Energy, form the core of our reports. In addition, I testified before the Subcommittee on Nuclear Regulation, Committee on Environment and Public Works, U.S. Senate, on October 2, 1990.

NWTRB Accomplishments to Date

The Board members met for the first time in March 1989. At that time we discovered that although we possessed considerable expertise in our respective disciplines, we commanded only a general knowledge of the DOE's waste management program. Consequently, activities during our first year were designed to gather information on the waste program while providing us the opportunity to comment in specific areas of our expertise.

An important role we play as a Board is that of catalyst. By scheduling meetings, requesting technical exchanges, and asking questions, the Board is able to positively affect the DOE's scientific and technical program as it unfolds. The Board helps the DOE to continuously evaluate and reevaluate its own activities; to examine and reexamine the fundamentals of the program; and to define and redefine the program's technical objectives. There is *no other independent agency* currently filling this role. Based on conversations with Members of the Congress and their staff, we believe we are fulfilling our Congressional mandate in this regard.

Since our first year, the Board has expanded its expertise considerably. Our efforts have significantly increased communication and promoted cooperation within the DOE, and among the DOE and the other organizations involved with high-level waste disposal issues. This has resulted in a very welcome increase in integration of activities throughout the civilian waste management program.

The Board has provided concrete contributions to the DOE program in the form of important technical recommendations. For example, the Board has strongly urged the use of tunnel-boring machines, instead of drill-and-blast methods, for excavating tunnels. The advantages associated with modem tunnel-boring are considerable, and the DOE has embraced the idea.

We have helped the DOE and its contractors sort out and prioritize key issues. For example, one of our initial efforts was to encourage the DOE to determine as soon as possible whether or not the site at Yucca Mountain is suitable for repository development. We will continue to evaluate and reevaluate DOE studies on the suitability of the Yucca Mountain candidate site.

Another issue the Board has addressed in both of its reports is its concern about some of the standards and regulations that provide the framework for repository development and licensing. The Board has provided impetus to clarify regulatory questions, and encouraged productive interaction among the Environmental Protection Agency (EPA), the NRC, and the DOE on this issue.

As a result of its evaluation of the DOE's waste handling and transport program, the Board recommended that the DOE include human factors and system safety principles in its program to maximize public safety.

Drawing on the significant expertise of its members, the Board has provided in-depth review of the DOE's waste program, in areas including seismology, hydrology, geochemistry, risk and performance assessment, and public health and safety.

Focus of Future Activities

Board activities during the past months have revealed areas on which the Board plans to focus in the future. We will, for example, continue to evaluate the DOE's analysis of the risks that natural hazards, such as earthquakes or volcanic activity, could potentially pose for a repository located at Yucca Mountain.

We have been and will continue to advocate the development of a long-lived engineered barrier system that *together* with the natural geologic barriers could greatly

enhance the ability of a repository to safely contain radioactive waste for thousands of years.

Transportation casks and disposal containers would be part of such an engineered barrier system. The Board wants to evaluate progress being made in developing casks. It also is interested in evaluating the DOE's program to test container materials and to determine the effects of corrosion on such materials.

Mr. Chairman, I have been favorably impressed with the amount of work the Board has been able to accomplish since its formation two years ago. However, there is still much more to do. We believe that the Board has a vital role in the progress of the DOE's scientific and technical program. As the program to manage high-level waste proceeds, it is our responsibility to the Nation to help ensure that future waste management decisions rest on a firm scientific and technical foundation.

Mr. Chairman, that concludes my remarks. I would be pleased to address any questions that you or any of the other subcommittee Members may have.

Nuclear Waste Technical Review Board

Fiscal Year 1992

Estimate of Appropriation

Subcommittee on Energy and Water Development

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Nuclear Waste Technical Review Board

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Estimate of Appropriation

The Problem Facing the Nation

By the year 2000, the United States will have a projected 40,000 metric tons of spent fuel to dispose of. By 2035, after all existing nuclear plants have completed 40 years of operation, there will be approximately 85,000 metric tons. The DOE has been assigned by Congress the responsibility of developing a system to manage the disposal of this spent fuel, plus approximately 8,000 metric tons of defense high-level waste (HLW) from reprocessing. The disposal of HLW, including commercial spent fuel, has been an issue of long-standing importance.

In 1955, the National Academy of Sciences (i.e., the Committee on Earth Sciences of its National Research Council) first examined the problems associated with the disposal of HLW. At the time, it recommended permanent isolation of the waste in mined geologic formations. This basic approach for disposal is still being pursued by the United States. There is currently worldwide scientific consensus that a deep geologic repository is the best option for the disposal of HLW.

The development of a geologic repository is a complex undertaking. First, it involves scientific and technical challenges in many diverse areas. Second, there needs to be assurance that HLW will not pose a threat to public health and the environment for periods of several thousand years. Finally, waste management decisions are made substantially more difficult by nontechnical and political problems generated by considerable public interest and apprehension about anything related to nuclear energy and radiation.

Description of the Board

Congress clearly recognizes the complex nature of the technical and scientific issues that must be resolved before the United States can achieve safe, long-term disposal of its HLW. Congress created the Nuclear Waste Technical Review Board because it recognized the need to establish an *independent* source of expert advice on the scientific and technical aspects of the DOE's work. Since we are the only such agency, we believe we play a unique and vital role in this national effort.

The NWTRB was established as an independent agency within the Executive Branch of the Federal government by the Nuclear Waste Policy Amendments Act (NWPAA) of 1987, signed into law on December 22, 1987.

The Board is charged to evaluate the technical and scientific validity of nuclear waste disposal activities undertaken by the Secretary of Energy, including

(1) site-characterization activities, and
(2) activities related to the packaging or transport of high-level radioactive waste or spent nuclear fuel.

The Board is required to report its findings, conclusions, and recommendations no fewer than two times each year to the U.S. Congress and the Secretary of Energy.

At full strength, the Board is composed of 11 members, who are eminent in a field of science or engineering, including environmental sciences, and are selected solely on the basis of distinguished service. The law stipulates that members shall represent a broad range of scientific and engineering disciplines related to nuclear waste management. Members are appointed by the President from a list of candidates recommended by the National Academy of Sciences.

The NWPAA prohibits the nomination of a person who is an employee of (a) the Department of Energy, (b) a national laboratory under contract with the Department of Energy, or (c) an entity performing high-level radioactive waste or spent nuclear fuel activities under contract with the Department of Energy.

On January 18, 1989, eight members, including the Chairman, were appointed to the Board; a ninth member was appointed in May 1990. Three initial members, whose terms expired in 1990, have been reappointed. The Board currently has nine members:

Dr. Don U. Deere, the Chairman of the NWTRB, is a civil engineer and an engineering geologist, who specializes as an international consultant in the design and construction of tunnels, shafts, and dams. He is also an adjunct professor of civil engineering and geology at the University of Florida, Gainesville, and was formerly a professor for 19 years at the University of Illinois.

Dr. Clarence R. Allen is professor of geology and geophysics emeritus at the California Institute of Technology, Pasadena.

Dr. John E. Cantlon is vice president for research and graduate studies emeritus and former dean of the graduate school at Michigan State University.

Dr. Melvin W. Carter is professor emeritus at the Georgia Institute of Technology, Atlanta, and an international radiation protection consultant.

Dr. Patrick A. Domenico is the David B. Harris Professor of Geology at Texas A&M University, College Station.

Dr. Donald Langmuir is professor of geochemistry in the Department of Chemistry and Geochemistry at the Colorado School of Mines in Golden.

Dr. D. Warner North is a principal of Decision Focus, Inc., in Los Altos, California; a consulting professor at Stanford University; and associate director of the Stanford Center for Risk Analysis.

Dr. Dennis L. Price is a professor in the Department of Industrial Engineering and Operations Research, and is director of the Safety Projects Office at the Virginia Polytechnic Institute and State University in Blacksburg.

Dr. Ellis D. Verink is Distinguished Service Professor of Metallurgy and former chairman of the Department of Materials Science and Engineering at the University of Florida, Gainesville.

There are two unfilled positions on the Board. A slate of candidates for each of these positions has been forwarded by the National Academy of Sciences to the White House for screening and subsequent appointment by the President.

The Board's Organization

At its first meeting in March 1989, the Board was organized into panels to more efficiently review the different areas of the DOE's HLW management program. Each panel is composed of three to six Board members and has its own chair. Based on their review activities, the panels report their conclusions and recommendations to the full Board for inclusion in the Board's semi-annual reports. The Board is now composed of the following seven panels.

1. Panel on Structural Geology & Geoengineering
   Chair: Dr. Allen

2. Panel on Hydrogeology & Geochemistry
   Co-Chair: Dr. Domenico
   Co-Chair: Dr. Langmuir

3. Panel on Engineered Barrier System
   Chair: Dr. Verink

4. Panel on Transportation & Systems
   Chair: Dr. Price

5. Panel on Environment & Public Health
   Chair: Dr. Carter

6. Panel on Risk & Performance Analysis
   Chair: Dr. North

7. Panel on Quality Assurance
   Chair: Dr. Cantlon

The Board's Washington Office

The NWPAA limits the size of the Board's professional staff to ten. To date, we have filled seven of these slots. In addition, we have hired ten other full-time employees to support the Board and its professional staff. At full strength, ten senior professionals and about 12 staff will be supporting the Board's activities.

The first executive director, William W. Coons, resigned in April 1990 after a year of dedicated service that focused on activating the Board. He was replaced by Dr. William D. Barnard, who came to the Board from the Congressional Office of Technology Assessment, where he worked on policy studies dealing with a variety of topics including high- and low-level radioactive waste and mixed waste.

In June 1990, the Board moved into its permanent offices in Arlington, Virginia. Since that time, an effort has been underway to furnish and equip the office.

The Board's Reporting Requirements

The Board is required by the NWPAA to report to the U.S. Congress and to the Secretary of Energy twice each year. This is done in the spring and the fall. The Board's first two reports were released in March and November 1990, respectively. Our third report will be released in May.

In its first two reports, the Board made almost four-dozen recommendations on the DOE's program to manage the disposal of HLW. The DOE responds to previous Board recommendations in each Board report.

In addition, Dr. Deere testified before the Subcommittee on Nuclear Regulation, Committee on Environment and Public Works, U.S. Senate, on October 2, 1990.

To increase public access to Board activities, we periodically publish a newsletter, which is mailed out to about 1,800 individuals and/or groups.

Major Activities of the Board

Since its first meeting in March 1989, two months after the first appointments, the full Board has met four times a year, or a total of nine times. Two full Board and five panel meetings have been held in the State of Nevada, the location of the candidate site for a geologic repository. At least one full Board meeting will be held in Nevada each year. Other Board/panel meetings have been held in major cities located in seven states.

During the last two years, the Board has sponsored more than twenty-five panel meetings and technical exchanges with representatives from the DOE and its contractors, the Environmental Protection Agency (EPA), the National Park Service, the Soil Conservation Service, the State of Nevada, the U.S. Geological Survey, and utilities. Furthermore, members and staff have attended a variety of related technical conferences, symposia, and workshops. They have participated in several field trips to examine geologic formations in the State of Nevada, especially the area around the candidate repository site at Yucca Mountain.

The Board and its panels have received briefings from the DOE on most of its HLW management activities. Additionally, at its June 1989 meeting in Las Vegas, Nevada, the Board received a detailed briefing by the State of Nevada regarding its technical and scientific concerns about site characterization at Yucca Mountain. Various Board members and/or staff also have met with key Congressional representatives and their staff; Nevada's Governor Miller; the Nuclear Waste Negotiator; as well as the

Chairman, commissioners, and staff of the Nuclear Regulatory Commission. The goals of our meetings have been to review the DOE's work in the technical areas pertinent to HLW management and to promote better communication among the technical people involved in the waste management program.

To help us gain a better understanding of the public arena in which nuclear waste management technology is being developed, we also have solicited the views of the public and environmental organizations on a variety of issues.

Last summer NWTRB members spent a week investigating Swedish and German programs related to HLW management. In each country the Board met with key technical experts and heard presentations on overall program activities, ongoing research and development, transportation systems, and waste packages. In Sweden the Board visited the Stripa mine and Forsmark facility; in the Federal Republic of Germany, the Board visited facilities at Gorleben and Asse. A similar trip to Canada is planned for the upcoming summer.

The Board is now engaged in a more detailed technical analysis of different elements of the DOE's HLW management program. In addition to the four full Board meetings, we have so far scheduled over a dozen panel meetings for the upcoming year. To provide a broad perspective within which to evaluate the DOE's HLW management program, the Board also plans to tour the Waste Isolation Pilot Plant in New Mexico. This latter facility will serve as the repository for defense transuranic waste.

In conducting its activities, the Board has attempted to maintain an openness and sensitivity to the public's interest in HLW management. Our panel and Board meetings are announced in the *Federal Register* four to six weeks prior to each meeting. Press releases also are issued on most of the Board's activities. We have held three public hearings in Nevada to solicit the views of the public on transportation and the potential effects associated with repository development activities. A fourth hearing on HLW transportation is scheduled for August in Denver. The Board has held two press conferences, both of them in Las Vegas, Nevada. Finally, transcripts of our open meetings and minutes of our business meetings are also available to the public through the Board's library.

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The Board members met for the first time in March 1989. At that time we discovered, that although we possessed considerable expertise in our respective disciplines, we commanded only a general knowledge of the DOE's HLW management program. Consequently, activities during our first year were designed to gather information on the waste management program while providing us the opportunity to comment in specific areas of our expertise.

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Since our first year, the Board has expanded its expertise considerably. Our efforts have significantly increased communication and promoted cooperation within the DOE, and among the DOE and the other organizations involved with HLW disposal issues. This has resulted in a very welcome increase in integration of activities throughout the HLW management program.

The Board has provided concrete contributions to the DOE program in the form of important technical recommendations. For example, the Board has strongly urged the use of tunnel-boring machines, instead of drill-and-blast methods, for excavating tunnels. The advantages associated with modem tunnel-boring are considerable, and the DOE has embraced the idea.

We have helped the DOE and its contractors sort out and prioritize key issues. For example, one of our initial efforts was to encourage the DOE to determine as soon as possible whether or not the site at Yucca Mountain is suitable for repository development. We will continue to evaluate and reevaluate DOE studies on the suitability of the Yucca Mountain candidate site.

Another issue the Board has addressed in both of its reports is its concern about some of the standards and regulations that provide the framework for repository development and licensing. The Board has provided impetus to clarify regulatory questions, and encouraged productive interaction among the EP A, the NRC, and the DOE on this issue.

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Focus of Future Activities

Board activities during the past months have revealed areas on which the Board plans to focus in the future. The Board will, for example, continue to evaluate DOE's analysis of the risks that natural hazards, such as earthquakes or volcanic activity, could potentially pose for a repository located at Yucca Mountain.

The Board has been and will continue to advocate the development of a long-lived engineered barrier system that *together* with the natural geologic barriers could greatly enhance the ability of a repository to safely contain radioactive waste for thousands of years.

Transportation casks and disposal containers would be part of such an engineered barrier system. The Board wants to evaluate progress being made in developing casks. It also is interested in evaluating the DOE's program to test container materials and to determine the effects of corrosion on such materials.

The Board believes that substantial amounts of time and resources will be required to resolve the many emerging technical issues involved with the Nation's efforts to dispose of HLW. The Board has already made valuable contributions to the DOE's scientific and technical program. The Board has a vital role to play in the progress of this program. As the program to manage HLW proceeds, it is the Board's responsibility to the Nation to help ensure that future decisions rest on a firm scientific and technical foundation.