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before the

Subcommittee on Energy and Environment  
Committee on Science  
United States House of Representatives

July 25, 2000

Mr. Chairman and members of the Subcommittee, I am Jim Duderstadt, President Emeritus and University Professor of Science and Engineering at the University of Michigan. This afternoon I wear the hat of chairman of the Nuclear Energy Research Advisory Committee (NERAC) of the Department of Energy.

As you may be aware, NERAC was established in 1998 to provide independent advice to the U.S. Department of Energy (DOE) on complex science and technical issues that arise in the planning, managing, and implementation of DOE's nuclear energy program. NERAC assists DOE by reviewing the research and development (R&D) activities of the Office of Nuclear Energy, Science and Technology (NE) and providing advice and recommendations on long-range plans, priorities, and strategies to effectively address the scientific and engineering aspects of these efforts. In addition, the committee provides advice on national policy and scientific aspects on nuclear energy research issues as requested by the Secretary of Energy or the Director, NE. The committee operates in accordance with the Federal Advisory Committee Act (FACA) and has a diverse membership with a balance of disciplines, interests, experiences, points of view, and geography from academia, industry, and national laboratory communities. A list of the current membership of the Committee is provided as an appendix to my testimony

Last year DOE requested that NERAC assist the Department in developing a long-term nuclear energy R&D plan, identifying priorities and possible programs along with an assessment of funding and infrastructure needs. Furthermore, the Committee was also tasked to evaluate DOE's physical infrastructure for nuclear energy research (e.g., research reactors, hot cells, and accelerators) in light of the needs suggested by the long range nuclear energy R&D plan. In addition, NERAC was asked to assess the current crisis in university nuclear engineering programs and campus-based research facilities in light of the growing human resources needs of the nation.

To conduct these long range planning activities and provide timely advice concerning ongoing or proposed DOE programs in nuclear energy research, NERAC works through a series of subcommittees:

Long-Range Nuclear Technology Research and Development Plan  
 Nuclear Science and Technology Infrastructure Roadmap Committee  
 Long Term Isotope Research and Production Plan Subcommittee  
 NERAC Blue Ribbon Panel on the Future of University Nuclear  
     Engineering Programs and University Research Reactors  
 Technology Opportunities for Increasing the Proliferation Resistance  
     For Civilian Nuclear Power Systems (TOPS) Task Force  
 Accelerator Transmutation of Waste Subcommittee  
 Operating Nuclear Power Plant Research, Coordination, and Planning  
     Subcommittee

Here it should be noted that the formation and activities of NERAC are directly related to the concern about the future of this nation's capability in nuclear energy technology expressed in a 1997 report of the Energy R&D Panel of the President's Council of Advisors on Science Technology. The federal government's investment in research and development of nuclear technology declined substantially in the 1980's and 1990's and programs such as the Advanced Light Water Reactor program and Integral Fast Breeder Reactor were completed or phased out. In fact, by 1998, the funding for nuclear R&D had declined to zero, prompting the PCAST panel to note:

"Fission's future expandability is in doubt in the United States and many other regions of the world because of concerns about high costs, reactor-accident risks, radioactive-waste management, and potential links to the spread of nuclear weapons. We believe that the potential benefits of an expanded contribution from fission in helping address the carbon dioxide challenge warrant the modest research initiative proposed here (the Nuclear Energy Research Initiative), in order to find out whether and how improved technology could alleviate the concerns that cloud this energy option's future. *To write off fission now as some have suggested, instead of trying to fix it where it is impaired, would be imprudent in energy terms*

*and would risk losing much U.S. influence over the safety and proliferation resistance of nuclear energy in other countries. Fission belongs in the R&D portfolio.”*

Of related concern was the erosion in academic programs and facilities necessary to produce the human resources needed by the nation’s nuclear industry and nuclear defense programs. Over the past decade the number of nuclear engineering programs in this country have declined by half (from 80 to 40), the number of university research and training reactors by two-thirds (from 76 to 28), and enrollments have dropped by almost 60% (from 3,440 to 1,520). As noted in a recent planning study:

“Nuclear engineering programs in the United States are disappearing. Without concerted action by DOE, supported by OMB and the Congress, most of the existing nuclear engineering programs will soon evaporate or be absorbed and diffused in other engineering disciplines.”

“It is important that the United States maintain a strong commitment to the education and training of nuclear scientists and engineers that to support a wide range of nuclear activities. One of DOE’s primary responsibilities is to assure the country has the supply of nuclear scientists and engineers that will be needed to provide worldwide leadership in scientific, nonproliferation, commercial, and other uses of nuclear science, technology, and materials. This leads to the need to support undergraduate and graduate students, faculty, and both university and DOE infrastructure as well as to fund long-term nuclear-related R&D that is in the national interest.”

To address these concerns, NERAC, through its various subcommittees, has undertaken over the past two years a major planning effort to determine the investments in human resources, research and technology, and infrastructure necessary to restore the nation’s capability in nuclear energy. In May we received the initial reports from our various

planning subcommittees. I have appended to this testimony the executive summaries from each of these reports. In my testimony I wish to summarize the primary conclusions and recommendations we have made to the Department of Energy.

#### Principal Conclusions of the Long-Range Planning Activities

Although these planning efforts are intended to be ongoing and evolutionary, they do provide a strong sense of priorities for DOE/NE in the years ahead. Put simply, the reports stress the importance of adequate investment in ideas (research), people (education), and tools (facilities):

Ideas: There is an urgent sense that the nation must rapidly restore an adequate investment in basic and applied research in nuclear energy if it is to sustain a viable United States capability in the 21<sup>st</sup> Century. The Long Range Planning Study has recommended a set of program and funding priorities ramping to a level of \$240 million by FY2005, including a growth in funding of the Nuclear Energy Research Initiative (NERI) to achieve the goals set by PCAST. NERAC believes that such funding levels are not only necessary but realistic in view of the funding provided other DOE research programs such as fossil energy (\$293 M), renewable energy (\$410 M), nuclear physics (\$370 M), and high energy physics (\$715). It is also recommended that at least a part of this program accommodate investigator-initiated basic research projects, selected on the basis of scientific merit rather than confined to DOE programmatic needs.

People: The report of the Long Range Planning Subcommittee reflects the views both of the other committees and NERAC membership when it states: “Perhaps the most important role for DOE/NE in the nuclear energy area at the present time is to insure that the education system and its facility infrastructure are in good shape.” It is clear that United States nuclear engineering programs and university reactor facilities are at great risk and require immediate and concerted attention in DOE funding priorities. The NERAC Blue Ribbon Panel has made a number of important recommendations concerning the nature of DOE programs and support necessary to preserve and strengthen

these important national resources. In particular, the Panel recommends an increase of the Nuclear Engineering Educational Research (NEER) program to \$20 M/y, a new competitive research grant aimed at sustaining university research reactors at a level of \$15 M/y, and a graduate fellowship/traineeship program at \$5 M/y. The Panel believes that the plight of nuclear engineering education in this nation is sufficiently serious that the Department should take substantial steps in its FY2002 budget request to move toward these targets.

Tools: Finally, the Long Range Planning subcommittee, Infrastructure Roadmapping Subcommittee, and the Isotope Subcommittee stress the need for DOE facilities to sustain the nuclear energy research mission in the years ahead. Of particular need over the longer term are dependable sources of research isotopes and reactor facilities providing high volume flux irradiation for nuclear fuels and materials testing. NERAC recognizes the serious funding and policy issues associated with such facilities (including the use of existing facilities such as FFTF). However it is also important to state NERAC's view that without an adequate investment in basic and applied research programs and in human resource development, such expensive facilities will be useless. Again put most simply, the *tools* are useless without the *people* and *ideas* to make use of them. NERAC believes that these priorities should—indeed, must—guide the Department of Energy's and Administration's funding requests for DOE/NE.

It is important to recognize that these reports represent the efforts, consideration, and wisdom not only of NERAC committee members but as well of the hundreds of members of the broader scientific and engineering community who participated in the various workshops and drafting sessions associated with these studies. As such we believe that the Department of Energy, the Administration, and the Congress should give careful consideration and significant weight to the recommendations in these reports as they frame the programmatic planning and funding requests for the nuclear energy research activities of the Department of Energy.

I look forward to discussing with you the role of nuclear energy in our nation's future and the federal investments necessary to preserve the nuclear option for this country.