TESTIMONY OF JERALD L. SCHNOOR BEFORE
THE SUBCOMMITTEE ON INVESTIGATIONS AND OVERSIGHT
AND
THE SUBCOMMITTEE ON ENERGY AND THE ENVIRONMENT
OF
THE HOUSE COMMITTEE ON SCIENCE AND TECHNOLOGY
The Department of Energy's Support for the
Savannah River Ecology Laboratory (SREL), Part I

July 17, 2007
Room 2318
Rayburn House Office Building
10:00 a.m. - 12:00 p.m.

Chairman Miller and Chairman Lampson, Ranking Member Sensenbrenner, Ranking Member Inglis, and subcommittee members: I thank you for the opportunity to testify regarding the recent funding crisis facing The University of Georgia's Savannah River Ecology Laboratory (SREL), located on the Department of Energy's Savannah River Site (SRS), near Aiken, SC.

My name is Jerry Schnoor. I am Professor of Civil and Environmental Engineering and Occupational and Environmental Health, and Co-Director of the Center for Global and Regional Environmental Research at the University of Iowa. I am also a member of the National Academy of Engineering, inaugurated in 1964 to provide technical advice to the nation, and I serve on the U.S. Environmental Protection Agency's Science Advisory Board (SAB). As Editor-in-Chief of the leading journal in the field, *Environmental Science and Technology*, I manage the peer-review process for thousands of scientific papers which are submitted each year, including several from SREL. One of my personal areas of research expertise is groundwater and hazardous wastes remediation, especially phytoremediation, the use of plants to help clean the environment, which remains a

promising long-term technology for some contamination problems at the Savannah River Site. I do not have any public or private research grants related to SREL, stock or stock options held in publicly traded and privately owned companies, nor have I received any form of payment or compensation from any relevant entity connected with this testimony. Therefore, I believe I am qualified to testify about the quality and importance of the scientific research being performed at the Savannah River Ecology Laboratory and its relevance to DOE's Strategic Initiatives.

The information I am providing is based largely on my professional interaction with SREL faculty and a visit to the laboratory, a review of the institution's publication history and the faculty's research accomplishments (available on UGA website), and other DOE documents that are readily available in the public record. Due to time constraints, greater detail and additional supporting documentation has been provided in my written testimony.

Since it's founding in 1951, SREL's research emphasis has constantly evolved to meet the changing needs of DOE and the SRS in particular, which is reflected in even a cursory review of SREL's scientific publications and site reports. In response to the growing cost associated with environmental cleanup at DOE and DOD facilities, the National Academy of Sciences issued a report entitled "Groundwater & Soil Cleanup: Improving Management of Persistent Contaminants" (NRC, 1999). In the report, the committee clearly recognized the value of SREL, noting:

> "Ecological risks are better characterized at the Savannah River Site than any other DOE installation, due in part to the designation of the site as a national environmental research park and the presence of the *Savannah River Ecology Laboratory.*"

Despite such praise, the discussion concerning the current funding crisis has directly called into question the technical expertise of the SREL faculty, and indirectly the overall quality and relevance of their research. First, I want to address some

misconceptions concerning the type of research conducted by SREL. Over the last decade or so, there has been a clear shift in research emphasis at the lab with an increasing focus on contaminant fate and transport, largely in response to a more-focused DOE cleanup mission. SREL faculty have demonstrated expertise in several active fields of research that are directly relevant to SRS remediation efforts.

In addition to the clear practical benefit, SREL's support for the SRS pump-and-treat system resulted in 4 refereed articles in *ES&T*, 2 in the *Vadose Zone Journal*, 1 in *Groundwater*, and 1 in the *Journal of Contaminant Hydrology*. In addition, SREL researchers have developed three other patented technologies, including a system that combines both contaminant immobilization with phytoextraction (U.S. No. 6719822), and they have submitted initial paperwork for an automated environmental monitoring system. SREL also plays an important role in the regulatory process by providing the independent scientific credibility necessary for site management to propose and receive approval for alternate, cost-effective remediation strategies. In some instances SREL faculty have been asked to accompany site contractors to regulatory negotiations in case certain questions arise for which their technical expertise is required.

My candid overall opinion is that the Savannah River Ecology Laboratory is providing the DOE and the nation with high quality research in a very cost effective manner. It has long been recognized as perhaps the foremost laboratory in terrestrial ecology in the country, and in recent years it is performing extremely useful research related to the fate, transport, effects, and remediation of chemical contaminants relevant to SRS. During the past 30 months alone, SREL researchers have published eight rigorously peer-reviewed articles in ES&T on nickel, uranium, mercury, radio-cesium, and lead, all important contaminants at the site. (The references are listed at the end of this written testimony.) In light of these accomplishments, I strongly believe that SREL's funding should be continued. The survival of SREL as an independent academic institution on the SRS ensures that long-term management and remediation scenarios will be developed and implemented based on independent, verifiable science.

DOE management in Washington may not be aware that SREL researchers have assisted in the choice, refinement, and even the implementation of several high-profile SRS remediation efforts. For example, SREL researchers actively supported the F- & H-Area pump-and-treat groundwater remediation system, the Mixed Waste Management Facility's (MWMF) tritium remediation system, the 488D Ash Basin reclamation, and reclamation and closure of the SRL basins to name a few. SREL research was used in designing the water treatment facility for the $120 million dollar F- and H-Area pump-and-treat operation. These efforts further led to the development of a patented pump-and-treat technology for enhancing the extraction of contaminants from aquifers (U.S. No. 5,846,434).

As documented in the latest renewal of the Cooperative Agreement, SREL research "provides a further understanding of the environmental effects of SRS operations." More specifically, however, the Cooperative Agreement lists nine responsibilities in Appendix A, including the following (see the attached Appendix A from the Coop Agreement):

> SREL will assess the impact of site operations on the environment, and will continue to provide the public and DOE with an *independent* view of the environmental management of the SRS.
>
> SREL will continue *basic and applied environmental research* with emphasis upon expanding the understanding of ecological processes and principles, and upon evaluating the impacts of site activities, new missions, and land use practices on the environment.
>
> SREL will use the information collected in the environmental research to develop and test hypotheses that will contribute to the *scientific foundation* necessary to conduct meaningful ecological risk assessments and to understand the environmental consequences of energy technologies, remediation efforts and other SRS activities.
>
> SREL scientists will work closely with SRS personnel to assist DOE and other SRS contractors in making *wise and informed decision*s concerning land and facilities management. SREL will continue to publish its scientific findings

in peer-reviewed scientific journals to aid the public and to assist DOE in making policy decisions by providing a basis of *independent, verifiable science*.

Although SREL is well positioned to fulfill these responsibilities and more, one must note the inconsistency between the language of Appendix A and the assertion that all DOE funding will be provided only on a task-by-task basis based on "mission critical" needs in the current year. Two obvious questions quickly come to mind.

How does DOE define mission critical needs?

Through what process does DOE review SREL's research activities to determine if they are consistent with such needs?

In preparing for today's testimony, I studied the research task matrix that DOE instructed SREL to provide for the FY07 "funding review" (see attachment), and compared it with the April 2007 Draft version of the DOE-Office of Environmental Management's Engineering & Technology Roadmap: Reducing Technical Risk and Uncertainty in the EM Program, which is available on the DOE-EM website (http://www.em.doe.gov/pages/emhome.aspx). As noted in the document's introduction (see attachment), the Technology Roadmap was developed by DOE-EM, Deputy Secretary for Engineering and Technology, Mark Gilbertson, under congressional direction within the FY2007 House Energy and Water Development Appropriations Report to identify technology gaps and develop a strategy for funding proposals that address such needs.

It is clear that several ongoing SREL research programs (e.g., support for the tritium phytoremediation facility and characterization of grouts and other engineered waste isolation materials) and the proposed research tasks included in the task matrix, indeed, directly address many of the strategic initiatives identified in the DOE-EM Technology Roadmap.

The local public's response to the SREL funding crisis is indicative of the areas general support for DOE activities, a support that I contend has been fostered by SREL's presence on the site since it was established in the 1950s. Given this support, I want to draw attention to the general consistency between the DOE-EM Technology Roadmap and the NRC report drafted almost ten years earlier. Both documents clearly indicate that we lack the technical expertise required for the safe and cost-effective cleanup of the legacy wastes and facilities in the DOE complex. As the Roadmap notes:

> "… the remaining [cleanup] challenges will require a strong and responsive applied research and engineering program."

Although considerable progress has been made in the last decade, the DOE-EM Roadmap acknowledges that numerous challenges remain. However, environmental research over the last two decades indicates that following some initial intervention, like removing the pollutant source, many environmentally degraded systems will recover through natural biogeochemical processes, an observation that forms the basis for the widely adopted concept of Monitored Natural Attenuation (MNA). Furthermore, adopting a costly, highly invasive remediation strategy can result in ecosystem disruption that is far worse than the original contamination. It is my opinion that SREL's presence on the SRS has easily resulted in continued DOE cost savings that far outweigh the institutions annual operating budget.

Despite the apparent disconnect with respect to DOE-HQ's perception of SREL expertise, there are additional reasons for DOE to reinstate SREL's long-term funding. In contrast to the primary site contractors that must focus on more immediate management and remediation deadlines, often dictated by regulatory agreements, SREL's academic independence allows scientists to focus on more long-term remediation and stewardship concerns so that the required background information is available to support responsible decision-making now and in the future.

Research institutions like SREL are largely evaluated based on publication record and external grants. Despite the recent loss of several faculty positions due to budget cuts, SREL has averaged ≈ 85 refereed publications a year for the last 6 years, which is a very good rate of scientific productivity considering SREL's number of full-time faculty and the declining budget situation. Earlier this year SREL reached a significant milestone with the publication of the 3,000th peer reviewed article. Since 1991 alone, SREL researchers have published 44 articles in ES&T, a journal ranked #1 in total citations and articles published out of 140 journals in the field of environmental sciences, and #4 in Impact Factor, a measure of the relative number of times a specific manuscript within a journal is cited. Even a cursory review of the article titles verifies that they are directly relevant to our understanding of the fate, transport, ecological impact, and remediation of contaminants on the SRS, including major contaminants of concern (COC) such as chromium, uranium, plutonium, cesium, tritium, and chlorinated solvents, such as TCE and PCE, to name a few. The same is true of the work published in other journals as well.

Any summary of faculty accomplishments is sure to overlook numerous outstanding contributions, and so I encourage the committee to review the concise two-page CV's, typical of the format that is submitted with funding proposal, that have been attached to my written testimony. However, a few specific examples are worth noting that are relevant to the current discussion. SREL researchers have served as associate editors for the *Journal of Environmental Quality*, the *Soil Science Society of America Journal*, and *Water Air and Soil Pollution*. Members of the SREL faculty regularly provide scientific reviews of manuscripts submitted to ES&T and other scientific journals. Dr. Lee Newman is the editor of the *International Journal of Phytoremediation*. A recent publication in *Geochemical Transactions* by Dr. A. Neal et al., (2007) was recognized as the most accessed paper for June 2007 and is the eighth most accessed for all time in the journal. Another publication by Neal, Rosso, Geesey, et al. (2003) was listed in top 25 most downloaded papers for 2003-2004 in *Geochimica Cosmochimica Acta*. These accomplishments are evidence of a vibrant and productive faculty who are publishing articles of high impact in the best journals in the world.

Recently, Dr. John Seaman served as the guest editor for a special edition of the Vadose Zone Journal showcasing remediation activities at the SRS, and he coauthored with Drs. Mary Harris and Brian Looney of SRNL the introductory article entitled "Research in support of remediation activities at the Savannah River Site", which highlighted collaborative research activities of SREL, SRNL, the US-Forest Service, and other universities in addressing DOE needs. Furthermore, SREL research activities in support of SRS cleanup were also recently highlighted in several submissions to a special SRS edition of Environmental Geosciences. Representative from SREL have served as technical advisors to the Citizen's Advisory Board (CAB), a local independent organization established by DOE to provide local stakeholder input regarding operations and environmental issues associated with the SRS.

In summary, SREL research activities clearly support DOE's ongoing site remediation and long-term stewardship goals. The lab's presence fosters a more open dialogue that promotes stakeholder consensus when choosing an eventual course of action with respect to federal lands and resources. As demonstrated in the past, SREL's research efforts can reduce the long-term cost associated with site management and cleanup, lessen the public's anxiety concerning possible health risks associated with continued site operation, improve our fundamental understanding of subsurface processes that can be applied to other impacted sites, both government and commercial facilities, and prevent or greatly lessen the possible impact of future site activities on the environment and the surrounding public. The quality of SREL's science, the faculty's research productivity, and the relevance of the science to the DOE and SRS argues strongly for continued funding of the laboratory.

Appendices:

DOE-EM Technology Roadmap (April 2007 Draft)

SREL FY07 Funding Matrix

UGA Cooperative Agreement Appendix A

Two Page Summary CVs for each SREL Faculty member

References

Van Nostrand, J.D., Khijniak, T.J., Neely, B., Abdus Sattar, M., Sowder, A.G., Mills, G., Bertsch, P.M., Morris, P.J. (2007). Reduction of nickel and uranium toxicity and enhanced trichloroethylene degradation to *Burhholderia vietnamiensis* $PR1_{301}$ with hydroxyapatite amendment. *Environ. Sci. Technol.* **41**:1877-1882.

Unrine, J.M. Jackson, B.P., Hopkins, W.A. (2007). Selenomethionine biotransforamtion and incorporation into proteins along a simulated terrestrial food chain. *Environ. Sci. Technol.* **41**:3601-3606.

Rodriguez-Navarro, A. B., Romanek, C.S., Alvarez-Lloret, P., Gaines, K.F. (2006). Effect of *in ovo* exposure to PCBs and Hg on Clapper Rail bone mineral chemistry from a contaminated salt marsh in coastal Georgia. *Environ. Sci. Technol.* **40**:4936-4942.

Hinton, T.G., Kaplan, D.I., Knoz, A.S., Coughlin, D.P., Nascimento, R.V., Watson, S.I., Fletcher, D.E., Koo, B-J. (2006). Use of illite clay for in situ remediation ^{137}Cs-contaminated water bodies: field demonstration of reduced biological uptake. *Environ. Sci. Technol.* **40**:4500-4505.

Jackson, B.P., Williams, P.L., Lanzirotti, A., Bertsch, P.M. (2005). Evidence for biogenic pyromorphite formation by the nematord *Caenorhabditis elegans*. *Environ. Sci. Technol.* **39**:5620-5625.

Shaw-Allen, P.L., Romanek, C.S., Bryan, A.L. Jr., Brant, H., Jagoe, C.H. (2005). Shifts in relative tissue del^{15}N values in snowy egret nestlings with dietary mercury exposure: a marker for increased protein degradation. *Environ. Sci. Technol.* **39**:4226-4233.

Stepanauskas, R., Glenn, T.C., Jagoe, C.H., Tuckfield, R.C., LIndell, A.H., McArthur, J.V. (2005). Elevated microbial tolerance to metals and antibiotics in metal-contaminated industrial environments. *Environ. Sci. Technol.* **39**:3671-3678.

Jackson, B.P., Ranville, J.F., Bertsch, P.M., Sowder, A.G. (2005). Characterization of colloidal and humic-bound Ni and U in the "dissolved" fraction of contaminated sediment extracts. *Environ. Sci. Technol.* **39**:2478-2485.