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No. s-99-31

“NUCLEAR REGULATORY RESEARCH IN THE NEW MILLENNIUM”

by

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Water Reactor Safety Information Meeting
27th Annual Meeting
Bethesda, Maryland

October 26, 1999

INTRODUCTION

Good morning, ladies and gentleman. I am pleased to have the opportunity to speak to you at this conference. After looking at the technical sessions on the agenda yesterday, and the talent assembled in this audience, I am particularly pleased to address you knowing that you must have already resolved all of the issues associated with risk-informed regulation and the integrity of primary coolant pressure boundaries! Seriously, I wanted to share with you my thoughts on where our research program is today, and the role of research in the new millennium.

CHANGING REGULATORY ENVIRONMENT

Before I begin my comments about the research program, I need to first describe the NRC's regulatory environment to provide the context for my views of research in the future. As you may know, in the last year, the NRC has been transforming itself, with sweeping changes to many of our regulatory functions. Why are we doing this? We are doing it because the industry's environment is changing, and we must change with it if we are to carry out our mission effectively. We have taken a hard look -- helped by input from our stakeholders -- at the way we are doing business, and we have embarked on a path to change and to improve our regulatory programs. We are seeking greater efficiencies and effectiveness in our processes, and trying to eliminate unnecessary regulatory burdens where they may exist. At the same time, we are continuing to maintain safety and public confidence. This is no small undertaking, and I can tell you that the NRC staff and the Commission have devoted a great deal of time and energy to accomplish it.

We are doing this at a time when our resources are constrained by several years of "rightsizing." I believe that efforts to maintain a balanced Federal budget will continue, which will necessitate that we continue our streamlining efforts. For example, the NRC's FY2000 budget was just approved for the same dollar amount as in FY1999, which means that it actually represents a budget reduction after inflation is considered. In addition, last month I submitted the NRC's FY2001 budget to the Office of Management and Budget, and it is the lowest budget when adjusted for inflation that the NRC has submitted in more than 20 years.

The U.S. nuclear industry has accumulated a great deal of operating experience. The issues that we are dealing with today are more likely to be variations on issues that we are familiar with, rather than the new licensing issues that were present when we were forming our regulatory framework. For the near future, the issues of concern are those associated with aging, renewal of expiring licenses, and decommissioning. Although we have certified several advanced reactor designs, and stand ready to license new power reactor facilities, no orders are projected in the foreseeable future.

As a result of industry restructuring, several difficult issues have emerged. For example, cost-cutting measures and reduced staffing must be done in a manner that maintains safety; the availability of funds for decommissioning must be ensured when companies consolidate or split; the extent of foreign ownership must be considered on purchases to ensure the nation's security is protected; the extent of control by non-owner or contract operators of nuclear power plants must be evaluated to determine compliance with licensing requirement. Moreover,

increased numbers of independent system operators supplying power to the North American grid can affect the reliability of offsite power supplies and increase the importance of emergency diesel generators.

NRC INITIATIVES IN RESPONSE TO THE ENVIRONMENT

I turn now to a discussion of some of the more significant initiatives that the NRC has undertaken in response to the changing environment. In each of these, the NRC's research program has been an important contributor to our technical basis and analytical methods.

First, we have just launched a pilot version of our new power reactor oversight program. The new program offers sweeping changes to our inspection, assessment, and enforcement processes. We received feedback from our stakeholders that our processes were too subjective, difficult to understand, and therefore not predictable. In addition, our processes did not adequately recognize the improving performance of the nuclear industry as a whole. The new framework is designed to address these issues. We have worked closely with industry and our stakeholders to develop a concept of "cornerstones"-- key areas of licensee performance that must be monitored to ensure that unacceptable public risks do not arise from nuclear reactor operations. We utilized the results of our ongoing research in measures of performance to develop quantitative performance indicators in each of these cornerstones. This will allow both licensees and the NRC to more easily identify areas that need attention, and to focus our resources accordingly. These indicators, as well as the NRC's current assessment of licensee performance, will be communicated more clearly to the public by posting them in graphical form on our web site (www.nrc.gov) on a quarterly basis. We began testing this pilot program at nine sites in June of this year, and we are optimistic that the program will be able to be implemented for the entire industry in April 2000. Early feedback from licensees on the pilot program is encouraging, but we have more work to do before the program is ready for full implementation.

Another focus area for the NRC has been the renewal of licenses for our older plants, and I am very pleased to report to you on the progress that we have made. We have aggressively worked through literally hundreds of technical issues on the first two applications by Calvert Cliffs and Oconee, and the projected time to review a license has been reduced from over five years to about 24 months. I need to credit the NRC staff for this success story. The staff developed a technical basis for the reviews through research on aging issues, then reached regulatory resolution on the issues by working closely with industry. It really is a good example of firm, fair regulation, while considering stakeholder concerns. In fact, *Inside NRC* published a story recently discussing how licensees are jockeying to be next in line for staff review. So what we have apparently done to reward ourselves is to bring on more work! But I think this a good problem. From a *resource perspective*, the NRC is gearing up to handle this increased number of applications. From a *process perspective*, we will continue our efforts to streamline the license renewal process, develop clear review schedules and milestones, and refine the scope of our reviews. From a *technical perspective*, the NRC staff is examining whether some issues can be resolved generically for all future license renewal applicants, and is consolidating lessons learned from the pilot reviews into revised regulatory guidance that will be published in the next few months.

You may have heard a good deal about "risk-informing" our regulations, but you may not be too sure what that means. In general terms, it represents a philosophy whereby risk insights

are considered, along with other factors, to establish requirements that better focus attention on issues commensurate with their importance to public health and safety. Looking back, our regulatory framework was established years ago using experience, testing programs, engineering margins, and a philosophy of defense-in-depth, but without the benefit of quantitative estimates of risk. That framework has served our nation quite well for many years, and we don't expect to throw it out and start over. Rather, we are researching the technical basis for our current regulations, with an objective of reducing unnecessary conservatism where appropriate and possibly identifying areas with insufficient conservatism. Specific areas that we are looking at include parts of the ASME Code, In-Service Inspections, improved allowed outage times for technical specifications, and a more systematic approach to fire protection. Is this easy? Absolutely not! But that doesn't mean we should not do it. I expect that we will approach this very carefully, and as our methods of analyzing risk improves, we will continue to refine our approach. The U.S. has taken a leadership role in this area, and I can tell you that the rest of the world is watching to see what we will come up with.

Decommissioning appears to be a growth area. We all recognize that our nuclear facilities are aging. Those that cannot demonstrate their value or are not economical will be shut down and decommissioned. We have recognized that there may be inefficiencies in our current regulatory framework, since we hold our decommissioned facilities bound by regulations that were designed primarily for operating facilities. As a result, in the power reactor area, the NRC is taking a formal look at our whole approach to decommissioning to see if we need to create a new regulatory framework, and to see if we can focus on the areas of greatest risk. Research is contributing by examining various analytical tools and studying the viability of possible approaches to decommissioning, such as entombment.

In developing these initiatives, the Commission has actively worked with our stakeholders to implement new processes that are commensurate with increased regulatory insights, improved industry performance, and continuing advancements in risk assessment methodology. I believe that we have demonstrated the willingness to re-examine our existing programs in a fundamental manner. However, this does not mean we are bowing to industry complaints and political pressures! In all of our efforts, we have not lost sight of our focus on the most safety significant aspects of facilities. We will not promise that our efforts will satisfy all of our stakeholders. However, we are committed to considering all inputs in making our regulatory decisions, and we strive to ensure that our stakeholders understand how we arrived at our decisions. My experience is that even if our stakeholders don't always agree with our decisions, if the process is understood, then their confidence in the NRC is enhanced. At the end of the day, we believe that what we are doing will both ensure safety and provide stability, clarity, and predictability to our regulatory processes. The key to ensuring this happens is having a solid technical basis for our decisions, a basis that is established by our research program.

NRC RESEARCH YESTERDAY AND TODAY

How should research continue to support our initiatives? To address this question, I will provide some historical perspective on our research program. The NRC has funded research on nuclear issues for all of its existence, but not always at the same level. In the early 1980's, the NRC's budget for the Office of Research peaked at over \$200 million. At the time, this research supported the development of the technical basis for many broad areas, including

Three Mile Island items, severe accident phenomena, formulation of the NRC's Safety Goal and Severe Accident Policies, and modeling of thermal-hydraulic behavior. Many of these endeavors required the use of large scale experimental facilities. Subsequently, the focus of research shifted to issues such as the development and application of risk methods, revising the source term, aging research, and support of advanced reactor design reviews and certifications. However, this research has been less resource-intensive, and with no new plants being ordered in this country over the last two decades, the funding for research has gradually declined.

Today, as I look at where we are, I see that our research program still spans a wide variety of relevant technical issues. We categorize our research into two broad areas. The first is what we call Confirmatory Research, and it constitutes perhaps 80% of our budget. This area supports user needs requests from our front-line regulatory offices, and therefore focuses on current safety issues. This purpose of this type of research can generally be described as to remove unnecessary conservatism in our regulations and to provide assurance that our regulatory judgements are valid. Examples of this in the reactor area includes risk-informing our regulations in 10 CFR Part 50, independently reviewing industry operating experience (a function previously performed by the old NRC Office of Analysis and Evaluation of Operational Data, or AEOD), ongoing research into structural and geological engineering issues, and radionuclide transport and health effects.

A second area of NRC research is called Anticipatory Research, and it constitutes the remaining 20% of our research budget. The purpose of this type of research is to anticipate future needs, and to provide the technical basis to support future regulatory actions for emerging safety issues. Examples of this type of research include addressing PRA limitations as the NRC transitions to a risk-informed regulatory process, development of risk-based performance indicators, assessing links between performance and plant safety, and deregulation and its impact on plant safety.

From a program perspective, I believe that we are focusing our research in appropriate areas, and we are anticipating our future needs. From a resource perspective, we are operating with a FY2000 budget for research of around \$40 million. We are actively pursuing opportunities to leverage our research funds through cooperative efforts. We are prioritizing our research activities in consideration of risk, uncertainties, and future challenges. And yet, I feel that we can do more, and I will elaborate on that in just a minute.

RESEARCH IN THE NEW MILLENNIUM

What is a vision for research for the new millennium? The challenge in answering this question is to be able to successfully project yourself into the future based on trends today. Of course, if I could do that consistently, my stock portfolio would be much healthier than it is, so you must treat any predictions with that fact in mind. Nonetheless, I shall attempt this rather lofty goal.

For trends, I think the industry is maturing and will focus on optimizing their current plant configurations rather than developing new and innovative designs. I also think that industry consolidation will continue, thereby reducing the number of utilities as well as the number of

companies supporting the utilities. In addition, commercially available parts and hardware may be used more often rather than parts with a long Quality Assurance pedigree. Finally, the use of computers for modeling in lieu of actual experimentation will likely increase.

The NRC has already taken action to address some of the trends, and these are the new NRC initiatives that I had previously described to you. But these are just the start. New technology, such as advanced instrumentation and controls, can certainly have an impact on plant safety. For example, advancement in computers and information technology are coming at a rapid pace today, but research is needed on the reliability of this technology before it can be widely applied to nuclear power plants. Advancements in fuel design and materials are an emerging area, particularly the use of high burnup and mixed oxide fuels. In addition, although the NRC is nearing a decision on issuance of the first renewals of licenses, research into aging and associated materials research will continue. Finally, risk-informing our regulations will require research to establish a sound basis in both technical issues and probabilistic risk assessment (PRA) techniques. I must also briefly mention high-level nuclear waste disposal, which remains a difficult problem that will only be resolved with continued research. Let me say that the Commission remains firmly convinced that a permanent geologic repository is the appropriate mechanism for the U.S. to ultimately manage spent fuel and other high-level radioactive waste. We are continuing to develop a Yucca Mountain review plan and to resolve key technical issues to prepare for reviewing the DOE license application expected in 2002.

Earlier I said that I would elaborate on ways I thought we could continue to improve our research processes. I believe that we must reassess the way we do our research, just like we have done in other regulatory areas. Let me say at the outset that I believe in the value of research, and believe that the budget for it should be maintained as a minimum, and perhaps should even be increased. As a regulatory agency, we must preserve our independence and maintain a broad perspective to fulfill our mission of maintaining safety. Nonetheless, I also recognize that the environment is changing, and we do not have the ability to conduct extensive exploratory research. Long term research has a place, but many things today do not lend themselves to that. Instead, we must develop feedback mechanisms so that our programs can be continuously examined to ensure that the research is relevant. We must develop and refine our prioritization processes to ensure that our resources are being focused on the most significant issues. We must ensure that our research is linked to the needs of our stakeholders. In other words, our research programs must have a certain agility to respond to the environment.

Our research programs must be timely and responsive to both internal and external stakeholders. Too many times I have seen a well-thought out and well-executed research project completed, but not really used because it was either not timely or not responsive to user needs, or both. I recognize that high quality research takes time, so the challenge is to focus our available resources in a way that ensures a quality product in a timely manner. In addition, we must emphasize delivering products that contain recommendations for applicability. Again, I cannot tell you how many fine two-inch thick research projects I have seen that do not provide relevant recommendations and leave it up to the reader to figure out how the research should be applied. One way to improve our programs is to adopt the approach the NRC has learned in responding to the changing environment: listening carefully to its stakeholders. We recognize that our stakeholders have very valuable insights, and we have also found that they are not

bashful about volunteering them! These insights can be used to help focus our resources and to shape our efforts in the future.

My vision of the Office of Research in the new millennium would be a center of excellence and source of expertise. This center would maintain a cadre of reactor safety specialists in various key areas, with independent and unbiased expertise across a broad spectrum of advanced nuclear technology, to provide the technical basis for robust and transparent regulatory decisions. Experimental facilities and resources would be maintained to ensure our ability to respond in a timely manner to new or emerging issues. The Office would complement the front-line regulatory activities of the agency and independently examine evolving technology and anticipated issues.

Finally, new and creative approaches to research will increasingly be used. Partnerships with industry, foreign organizations, and other government agencies will become more common. Our joint research with the European Union, and the recent Memorandum of Understanding with DOE on Cooperative Nuclear Safety Research are good examples of this. As the costs of large-scale experimentation rise, we will have an increased need to leverage the work of others, even while maintaining our necessary independence on regulatory matters.

IV. CONCLUSION

I would like to close by noting that Dr. John Ahearn, a past Chairman of the NRC, recently headed up a comprehensive review of NRC processes for the Center for Strategic and International Studies. The review was co-chaired by Senators Pete Dominici and Bob Graham, and Representatives Joe Knollenberg and John Spratt, and received inputs from a wide range of organizations in the nuclear field. During a briefing to the Commission on the final report, Dr. Ahearne noted that research must be a vital part of the NRC's programs. I consider that to be a good example of valuable and timely input from our stakeholders, and I would like to emphasize that the NRC needs continuing input such as this to help us shape the future of our research programs. I believe that this input is essential to furthering a mutual understanding of the issues affecting the safety of nuclear power. I appreciate the opportunity to speak with you today.

Now I will be glad to answer any questions you may have.