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"The Changing Nuclear Workforce"

by

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INTRODUCTION

I thought I would talk with you today about the changing nuclear workforce and some of the challenges that we have ahead of us. I hope to tie it all together by discussing how that workforce may affect the future of the nuclear industry, particularly in the area of research.

POTENTIAL NUCLEAR RESURGENCE PRESENTS ADDITIONAL WORKFORCE CHALLENGES

We are at a very exciting time for nuclear power in the world and in the United States. I believe that one day, in the not too distant future, there will be a resurgence in interest in nuclear**.** That day may be today. Acquisitions and mergers are occurring at a record pace and Wall Street and foreign investors are more bullish on nuclear power investment opportunities. For example, Exelon Corporation, the name of the company that resulted from the merger of PECO and Commonwealth Edison, has formed one of the largest operators of nuclear power plants in the United States. Excelon is actively interested in emerging technology associated with the advanced Pebble Bed Modular Reactor and has made 10-15% investment in the project. They have began preliminary discussions with the NRC on the process for licensing a new plant in the United States.

A resurgence in nuclear power is not a certainty. It will be driven by economics. No US company is likely to invest in a new nuclear power plant unless they foresee the ability to return a profit to their investors. However, should a resurgence occur and take hold, attracting young college graduates to a career in nuclear-related fields should be easier.

But whether there is resurgence of nuclear power or not, the changing nuclear workforce provides enormous management challenges that must be addressed today. The current inflow of new talent does not equal the outflow of experienced workers. Even when we are able to attract talented young men and women, the lack of upward mobility or lack of variety in career paths may result in segments of the workforce moving outside the nuclear area. Maintaining and cultivating core competencies in nuclear-related areas is a key concern for the industry and the NRC.

RECENT NUCLEAR LABOR MARKET STUDIES

Annually, NRC and DOE contract with the Oak Ridge Institute for Science and Education to prepare labor market trends for nuclear engineers and health physicists. Anybody here work on that contract? The latest reports provide some important insights that I would like to share with you.

First for Nuclear Engineers, the current labor market continues to improve substantially since the mid-1990s. Starting salaries for nuclear engineers in the nuclear energy/nuclear weapons fields increased 6.0% for B.S. level graduates, 5.5% for M.S. level graduates, and 5.5% for Ph.D. level graduates between 1999 and 2000. According to the report, this was the third consecutive year that annual salary increases for new nuclear engineering graduates were larger than any of the annual increases experienced between 1991 and 1997.

However, the decreasing trend in the number of engineering degrees continued for the fifth consecutive year. Over the past five years, there has been almost a 50% decrease in the number of nuclear engineering degrees. Supply goes down.

But, the decline in the employment of nuclear engineers in the nuclear field that occurred for much of the 1990s appears to have stopped. A simple economic analysis of supply and demand yields not too startling results: namely that nuclear engineers are again in demand and finding employment in nuclear related areas. Do not get me wrong. The picture is better, but still unstable as utilities still face the future effects of deregulation.

For health physicists, in 1999 the total number of degrees earned in health physics had decrease of over one-third in just two years. Enrollments also decreased in a similar manner.

The continuing decreases in enrollments and degrees in the late 1990s resulted in just over 100 new graduates entering the labor supply annually. At the same time, employment stabilized or decreased only slightly in 1998 and 1999, providing approximately 100 job openings annually for new graduates during 1998 and 1999. Thus, after several years of somewhat excess supply of new graduates, the demand for and supply of new graduates now appears to be fairly balanced.

OUR MATURING WORKFORCE

With a tight labor market for nuclear engineers and a workforce with a large percent of personnel eligible to retire , the NRC is faced with some significant workforce challenges. I suspect that these challenges are not unique, and in fact, are shared with some other nuclear-related government agencies and with industry.

With appropriate attribution to my colleague, Chairman Meserve, I want to reiterated some points that he made during a recent speech at the Institute for Nuclear Power Operation Conference several weeks ago.

The ratio of NRC employees who are over 60 years of age to those under 30 is 6:1. The same ratio at NASA, for comparison, is 2:1. Moreover, seventeen percent of NRC's engineers are already eligible for retirement and another four percent of the current workforce of engineers will become eligible for retirement each year for the next few years. Twenty-five percent of the employees in the Office of Nuclear Regulatory Research and twenty percent of the employees in the Office of Nuclear Reactor Regulation are eligible for retirement today.

Despite our efforts to hire new engineers, we have experienced a net loss of engineers over the past five years. That loss is equivalent to roughly eight percent of our engineering workforce. The bottom line is that we are losing expertise and, along with it, valuable institutional knowledge.

The combination of these long-term trends raises a red flag: how will NRC be able to maintain its core technical competence into the future? We need to plan for turnover and retirements, as any employer would, but we also need to judge carefully what expertise we must have among our employees. The Chairman recently asked our Executive Director for Operations to begin the process of developing such a plan.

CHANGING WORKFORCE NEEDS TO ADAPT TO CHANGING ENVIRONMENT

Let me shift gears and talk about why it is essential for NRC to maintain core competencies. Simply stated, we need to able to respond to emerging technology, deal with emerging issues, and deal effectively in the international environment. Our credibility as an effective competent regulator hinges on maintaining a strong technical expertise. We need to flexible in meeting the demand for our technical expertise. A brief history of NRC research program provides useful insight on the breath of issues and technical expertise needed to deal with these issues.

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, 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.

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. Finally, risk-informing our regulations will require research to establish a sound basis in both technical issues and probabilistic risk assessment (PRA) techniques. So you can see that using just these few examples, we need to have in-house or readily available expertise on advanced instrumentation and control, fuel design, and probabilistic risk analysis.

If we are to adapt our workforce to the changing environment, then I believe that we must reassess the way we do our research. As a regulatory agency, we must preserve our independence and maintain a broad perspective to fulfill our mission of maintaining safety. We do not have the resources 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. Where we may have had one person who was an expert in one area, today, we may ask that same person to be fungible and provide expertise in other related areas.

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. 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.

My vision of the NRC Office of Regulatory 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.

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. In other words, our expertise and workforce would be leveraged internationally.

CONCLUSION

So I hope you can see that the NRC and nuclear industry are at an exciting time. Excitement brings new challenges. A potential resurgence in the nuclear-industry may make the labor market tight. As recent trends show, the labor market is balanced but arguably already teetering on demand outpacing supply - - particularly for nuclear engineering expertise. Even if there isn't a resurgence, NRC is deeply concerned about the loss of experience and expertise as our workforce ages and retires and is taking steps to proactively address the issue. And finally, our workforce is ever changing in response to a changing environment. It will take smart management with foresight and a workforce that is technically agile to deal with the challenges of the future. I believe that we not only need to leverage our expertise internally, but internationally as well.

Again, thank you and I would be pleased to answer any questions.