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Constructive Engagement Between the Nuclear Industry and the NRC

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Seventh NRC/ASME Symposium on Valve and Pump Testing

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Good morning. I am very pleased to add my welcome to all of you, particularly those who have traveled here from overseas. I hope that you are able to enjoy some of the many attractions of the Nation's capitol during your stay here.

My theme this morning relates to the benefits of constructive engagement between the industry and the NRC, and how such engagement benefits everyone. Let me begin by reflecting upon how such engagement, as exemplified by this symposium, correlates with the overall progress made by the nuclear power industry in the past decade. I will then turn to the changes at the NRC. I will also have some observations regarding the value of consensus codes and standards to the NRC's regulatory mission.

1. The Improvement of Performance

The testing of pumps and valves might seem like a very specialized topic, of interest to a relatively small number of people. But I see that more than 50 papers on this subject are being presented at this meeting – the seventh of its kind. That fact, along with the size of this audience, provides a clear indication that the performance of these components continues to be a matter of significant interest to those in the nuclear power community, including utilities, vendors, testing firms, and regulators. And I have to add that I am quite pleased, as one of those regulators, to see this breadth of interest. It indicates to me that the industry understands the importance of attention to these sorts of issues as it strives to improve its collective performance. Let me provide some historical perspective to help illustrate my point.

In 1990, around the time of the first meeting of this symposium, the U.S. nuclear industry's overall performance was mediocre. The average plant's capacity factor was under 70 percent, and the average number of unplanned reactor scrams per year was nearly two per unit. At the same time – and not surprisingly – the safety performance of the industry was lackluster. One might expect, for example, that a high number of scrams would lead to increased challenges on safety systems, and that trend was illustrated by an average of about one safety system actuation per plant in 1990, along with almost 4 safety system failures. On average, nearly half of all U.S. plants experienced one "significant event" during that year. It is therefore not surprising that, with the beginning of economic deregulation of the electric utility industry in the mid-1990s, most "pundits" were predicting that economic pressures would result in the early closure of a substantial percentage of the U.S. operating fleet. The NRC was advised to start planning for a large number of applications for decommissioning.

A funny thing happened on the way to the shutdown of the nuclear industry. In the mid-1990s, the industry's performance started to improve significantly, a trend that has continued as we have moved into the 21st century. Average capacity factors have risen to around 90 percent, and the average number of scrams per plant has fallen by a factor of around 4. Safety performance has followed suit, with rates of safety system challenges and failures less than one-half of their 1990 values. Most impressive is the reduction in the number of significant events, which is now less than one-tenth of what it was in 1990. All of these factors have combined to make the production cost of nuclear-generated electricity less than that of coal or natural gas plants. Thus, rather than decommissioning their operating plants, many electric generating companies have sought – or have told us that they will be seeking – to renew the licenses of their facilities. Over the last several years, there has even been increasing interest in the possibility of building new nuclear plants. One might ask, what happened? What could cause such a complete reversal of fortune? I believe that this symposium, and others like it, provide at least part of the answer.

Pumps and valves are common elements of industrial hardware. Certainly, they are basic components in virtually any sort of machine that involves flowing fluids. Nuclear power plants are no exception; the typical plant has dozens of pumps of various shapes, sizes, and designs, and hundreds of valves. But some of these components must operate in extremely challenging environments – temperatures, pressures, chemical conditions, and radiation fields – that could cause their performance to degrade. If such degradation affects a pump or valve that is important to safety, and progresses to the point that the component fails, the degradation can have serious impacts on overall plant operation and safety. Superior plant performance thus dictates that attention must be paid to the performance of these components, so that degradation can be avoided, or if it occurs, so that it can be diagnosed and remediated before failure occurs.

A key contributor to this process of improving plant performance is the careful attention to operating experience. That is, the systematic evaluation of experience is a time-tested element of performance enhancement. But it is also essential that these experiences be shared as widely as possible, so that the entire industry may benefit from the lessons learned by each of its members. This symposium stands as an outstanding example of what can be accomplished when operating experience and related information is exchanged and discussed. It also represents cooperation between the industry and its regulator, under the auspices of an independent professional society. The exchanges fostered by this symposium and others like it have played a significant role in the vast improvement in both operational and safety performance that the nuclear power industry has accomplished in the last 10 years.

Of course, now that the industry has achieved the high level of performance that it currently enjoys, the challenge is to maintain that performance and – if possible – continue to improve it. Since we are approaching a performance asymptote, any improvements will clearly not be as dramatic as in the past. But the role of information exchange and experience sharing is no less important now than it has been in the past. There are two reasons for this. First, as the industry becomes increasingly sophisticated, new procedures for accomplishing necessary inspections, testing, and maintenance of plant components will undoubtedly be developed that increase the effectiveness and efficiency of such operations, and – most important for the NRC – further improve plant safety performance. I am thinking here, for example, of advancements in modeling component performance and thereby anticipating problems, permitting action to be taken before those problems actually arise. Communicating these improvements will allow implementation across the industry.

The second reason is less visionary and more pragmatic: no matter how much we know and how much we learn, there is still the possibility – in fact, the likelihood – that something we had not anticipated will arise. A recent example of such an occurrence, not directly related to the subject of this symposium but instructive all the same, is the corrosion of the reactor head at Davis Besse. When these types of unanticipated events arise, the sharing of pertinent information is indispensable in helping to determine what happened, whether other plants may be similarly vulnerable, and how to prevent such problems from arising in the future.

2. Change at the NRC

It is also imperative that the NRC participate in the sharing of information with the industry because in this way we can improve our accomplishment of our regulatory mission. It is not enough to react to problems once they become evident. We need to develop processes that will allow our inspection and oversight programs to help identify potential problems before they occur. Although we perform research to help us do our jobs better, there is no way that our studies can duplicate the learning that can arise from careful examination of the hundreds of reactor-years of experience that the industry accumulates each year. It is thus essential that we learn along with you, to allow us to improve our performance as the industry does.

The industry's operational experience is also of substantial value as we implement an important and potentially far-reaching modification of our regulatory process: risk-informed regulation. As most of you are aware, the NRC has undertaken an initiative to use the experience gained by the agency and the industry, along with knowledge gained from quantitative risk assessment, to restructure our regulations to provide a better focus on aspects of nuclear plant design and operation that are most important to risk. We are guided in this effort by the belief that overall plant safety is improved when both our licensees' resources and the NRC's regulatory attention are directed primarily toward issues that are safety-significant.

This effort will result in fundamental changes in the NRC's regulatory approach. Some requirements will be relaxed, but it is clear that there will also be areas in which risk insights show that our regulatory requirements need to be strengthened. I should note that since our past deterministic practices have tended to be very conservative, the opportunities for reducing unnecessary regulatory burden are likely to outnumber those areas in which requirements must be enhanced. Nonetheless, I must emphasize that the goal of this effort is not to deregulate the industry, but rather to provide a sound technical basis for regulatory oversight. We will continue to insist on adequate safety margins, consistent with the NRC's traditional defense-in-depth philosophy.

Some of our current regulations involve risk as one of their elements. For example, the maintenance rule requires licensees to assess and manage any increase in risk that might result from maintenance operations. Our recently revised reactor oversight process also has a major focus on risk, both in allocating inspection resources and in analyzing the results of inspections and performance indicator data. And we have undertaken a risk-informed approach in the assessment of changes to technical specifications and inservice inspection and testing requirements.

One of our most significant initiatives is still unfolding: risk-informing the so-called "special treatment" requirements imposed on nuclear plant systems, structures and components, or SSCs. By special treatment, I mean regulatory requirements in such areas as technical specifications, quality assurance, and environmental qualification requirements or SSCs. I cannot discuss this effort in detail, since there are technical and policy issues that must be resolved; the Commission is looking forward to receiving the NRC staff's recommendations on the final form of the new rule within the next couple of months. However, I can say that the outcome of the effort is expected to be a fundamental change in the criteria used to determine when special treatment requirements should be imposed. Rather than relying solely on our traditional classifications of "safety-related" and "non-safety-related," special treatment will be keyed primarily to the risk significance of a given system, structure, or component. Consistent with my earlier comment, we have found many SSCs classified as safety-related that are of low risk significance. But we have also found a few non-safety-related SSCs that are highly risk significant, so the sword really does cut both ways.

Our accomplishments to date in our efforts to risk-inform our regulations represent only a few baby steps, but we are committed to pursue these initiatives over the long term. Your engagement, along with that of our other stakeholders, is essential as we move forward.

3. Constructive Engagement through Consensus Codes

I would like to address one other area today that is related to my theme of constructive engagement and the exchange of information: the development of consensus codes and standards.

In preparing to address this symposium, I had the opportunity to reflect on the extent to which codes and standards contribute to the NRC's regulatory process. It is not an exaggeration to say that consensus codes and standards form the foundation for a large part of the NRC's reactor regulations. ASME's Boiler and Pressure Vessel Code and the Code for Operation and Maintenance of Nuclear Power Plants are incorporated into the NRC's regulations in 10 CFR 50.55a and underpin many of the issues that will be discussed at this symposium. Other examples include a wide variety of standards developed under the aegis of other professional societies, such as the IEEE standards on instrumentation and control systems, also cited in Section 50.55a, and the ANS decay heat standard used for accident analysis codes that conform to the requirements of 10 CFR Part 50, Appendix K.

These codes and standards are essential to the NRC not only in a technical sense, but also because they enhance public confidence in our agency's regulatory processes. They are developed by broadly based groups of experts representing all of the sectors of the relevant technical disciplines, coordinated by an independent professional organization, and are subjected to rigorous peer review to ensure that the scope and technical content are appropriate and reflective of good engineering practice. The process provides confidence that our regulatory system is built on sound technical judgment. I am pleased to note that many members of the NRC staff are also members of various standards committees. I strongly support such involvement, and consider it to be an important element of their professional activities.

I should also note that the development of new standards is playing a significant role as we move forward in risk-informing our regulations. We are currently engaged in a number of major standards-development efforts that will ultimately contribute directly to a risk-informed approach to regulation, including: a new fire protection standard, coordinated by the National Fire Protection Association; an ASME standard for probabilistic risk assessment under full power conditions, which is now nearing completion; and a complementary standard on PRAs for low-power and shutdown conditions and seismic risk evaluation, which is being managed by the American Nuclear Society.

Almost by definition, the development of consensus standards is a long and often difficult process. Reaching a consensus among the various viewpoints requires considerable effort and creativity, not to mention a healthy dose of patience. But as I hope I have made clear this morning, the process of constructive engagement is beneficial in and of itself. The final product is all the more useful because it has been subjected to this approach.

Let me close by conveying my thanks to all of you for participating in this symposium and my best wishes to you for a successful and productive meeting.

Thank you.