



NRC NEWS

U.S. NUCLEAR REGULATORY COMMISSION

Office of Public Affairs

Telephone: 301/415-8200

Washington, DC 20555-0001

E-mail: opa@nrc.gov

Web Site: www.nrc.gov

No. S-02-019

Maximizing Nuclear Safety Information: The Contribution of Performance Indicators

Remarks of Richard A. Meserve
Chairman, United States Nuclear Regulatory Commission

before the

NEA/WANO International Forum on Nuclear Regulator/Licensee Interface Issues

Paris, France

19 June 2002

It is my pleasure to join you today to address this session on measuring and communicating safety performance. I will use the occasion primarily to discuss the role of performance indicators in helping to assess the safety of operating reactors and my views on the sharing of such information with the public.

WANO, of course, has been one of the pioneers in the area of performance indicators. Since 1991, when it published its first performance indicator report, and 1993, when reporting began for all reactor designs, the concept has become ever more firmly established as a component of fostering improved nuclear power plant performance. Such indicators are now widely used as the benchmarks.

The U.S. Nuclear Regulatory Commission, as many of you know, introduced a new Reactor Oversight Program or ROP in April 2000, which took the place of the Systematic Assessment of Licensee Performance program, or SALP, with its "Watch List" for problem performers. The SALP was developed when there was relatively little operational experience with nuclear power plants. A governing presumption was that plants were safe if they were in compliance with NRC regulations. As a result, the focus of the SALP process was often on compliance, regardless of the safety implications of a failure to comply. SALP was also criticized for being overly subjective and unpredictable. The process was also largely retrospective, with the result that problems might be cited that had long been corrected, while emergent issues could be overlooked.

In response to these criticisms and in concert with the decision to move toward a more risk-informed regulatory philosophy, the NRC developed the ROP. Since it dramatically differed from the SALP, the ROP was tested at nine nuclear plants before being applied to all licensees. It provides for quarterly evaluation of the performance of every operating station, based on both performance indicators and inspection findings. It monitors plant performance in three broad areas: reactor safety, radiation dose to workers and the public, and security against threats. These broad areas reflect the perspective that reactor safety is maintained by avoiding accidents and reducing their consequences if they occur.

The ROP focuses on seven specific cornerstones: initiating events, mitigation systems, barrier integrity, emergency preparedness, public radiation safety, occupational radiation safety, and security. It is the premise of the ROP that if the licensee performs acceptably in these cornerstones, then reactor safety is maintained.

The ROP uses a number of performance indicators (PIs) to illuminate licensee performance in the areas defined by the cornerstones. For example, the PIs for the initiating event cornerstone include the number of unplanned scrams and losses of the normal reactor cooling system during unplanned scrams. The mitigating systems cornerstone is evaluated in part based on the incidences of safety system failures or unavailability. PIs such as the level of radioactivity in the reactor coolant system and reactor coolant system leakage measure, in part, the integrity of the barrier to the release of radioactivity. Licensees generate data on these performance indicators for submission to the NRC, and the NRC then verifies the data as part of its baseline inspection program. The PIs are compared against established thresholds which are related to their effect on safety.

I discovered at the second review meeting of the Nuclear Safety Convention that there was a belief among some of the participants that the U.S. relies predominantly on performance indicators. This is incorrect. The PIs provide insights into plant performance for selected areas. The NRC's inspection program provides a greater depth and breadth of information for consideration in assessing performance. The inspection program focuses on areas that are not evaluated by PIs or for which PIs cannot tell the whole story. Essentially, the more fully an indicator measures an area, the less extensive is the scope of inspection. It is worth stressing that the PIs are intended to supplement, not to replace the inspection program.

For example, under the initiating event cornerstone, the adequacy of flood protection measures must be evaluated. Due to the rare but possibly risk significant nature of flooding events, no performance indicator was judged to be suitable for monitoring licensee performance in this area. Therefore inspection activities alone verify that compensatory measures are documented, and that equipment is available, is routinely tested, and is fully capable of performing its intended functions.

The availability and reliability of plant equipment is evaluated based on PIs as well as inspection of the implementation of the maintenance rule. The inspection effort ensures that there is a proper balance between availability and reliability when considering the removal of equipment from service for preventive maintenance. The PI is objective, whereas the inspection effort relies on judgment. But both are a measure of the likelihood that accident mitigation systems will perform successfully when needed. The PIs and the inspection efforts are complementary.

The PIs have helped to ameliorate the limitations of the previous inspection program. Most PIs use data that licensees already compile for other performance assessment programs, so their generation is not burdensome. Indicators are thus an efficient means of gathering information about the safety of a plant. PIs are also objective measures of safety and are consistently evaluated across the industry. The PIs themselves and their thresholds for actions based in the PIs are risk-informed, which helps ensure we are spending time on issues of safety significance. However, we do recognize their limitations.

For example, PIs might result in unintended consequences. The NRC and the industry developed and tested replacement PIs for the “unplanned scrams” and related PIs. Some in the industry were concerned that operators would be reluctant to scram a plant manually when necessary in order to avoid an adverse PI, thus degrading plant safety rather than being a measure of it. Although we have seen nothing to indicate that this is occurring, NRC and the industry have sought replacements (thus far unsuccessfully).

Although the PIs and their thresholds were selected using risk insights, their impact on safety is evaluated in isolation. The ROP focuses on the change in core damage frequency that results from changes in a single, isolated parameter, assuming that all other factors that can affect CDF remain constant. Yet based on our understanding of risk, we realize that synergies exist and that a realistic assessment of the change in CDF cannot be related to the change in a single PI. In short, PIs cannot provide a complete picture of risk. By contrast, the risk significance of inspection findings are evaluated using risk assessment models that incorporate the known state of the plant at the time of the fault and therefore the models can provide more insight in cases of multiple faults.

Thus, although the use of PIs and risk assessment tools helps make the ROP more objective, we realize that the assurance of nuclear safety is not reducible to a set of numbers on a grid. Rather, we need a combination of the objective and the subjective. As a result, our evaluation of safety considers both quantitative and qualitative measures. While coolant system leakage can be expressed in figures, maintenance of a proper safety culture cannot.

The ROP views these abstract aspects of licensee performance, including safety conscious work environment, human performance and the effectiveness of problem identification and corrective action programs as “cross-cutting” because they impact more than one cornerstone. Since they are not easily quantifiable, they are evaluated through the inspection program rather than with PIs.

My perspective is the PIs have a role to play in evaluating plant safety. Used properly, they can contribute significantly to our understanding; but they cannot by themselves provide complete understanding. To paraphrase a proverb, “they make good servants but poor masters.” Thus, even as we continue to refine and improve our performance indicators, we must remain conscious of their limitations, and not let favorable findings produce complacency either in operators or regulators.

The Davis-Besse plant has recently illustrated the need for caution when assessing safety using both performance indicators and inspection programs. According to the PIs, the Davis-Besse plant was not a cause for concern. But, as you know, the plant turned out to have an undetected safety problem of long standing: corrosion of low alloy steel in the vessel head, resulting from boric acid leakage. I am sure you are familiar with this incident, which is still under review by the NRC.

At this point, it is too early to say whether a more refined set of performance indicators would have made us aware of the corrosion at Davis-Besse sooner, or whether greater attention to the results of the existing indicators would have identified the problem. We will be looking at that issue with great care. Whatever the answer may be, I certainly view it as a lesson to both licensees and regulators of the need to maintain a vigilant and questioning attitude toward plant safety that must not be constrained.

In the meantime, we are continuing our efforts to improve the performance indicators. We are about to begin a pilot program using modified reliability and unavailability indicators for mitigating systems in place of the current PIs, which rely on overly conservative estimates of fault exposure times. We are also developing new PIs for measuring containment integrity and for the elements that comprise the physical security cornerstone.

The NRC also relies on industry-level PIs to confirm that the nuclear industry as a whole is maintaining the safety of operating power plants. The key output of this program is an assessment of statistically significant adverse industry trends in safety performance— a measure of both industry performance and the effectiveness of the NRC's regulatory program. The data show that performance in the U.S. has significantly improved. For example, the average number of automatic scrams has declined by approximately a factor of 3 in the past decade. It is important that the improvement in safety performance is highly correlated with improvement in economic performance: we observe a corresponding increase in the average capacity factor from approximately 65% just 10 years ago to over 90% today. The objective measures of industry performance have helped to increase the public confidence in nuclear power, allowing generating companies to consider power uprates, license extension, and even new construction.

I was asked to comment on openness with regard to performance indicators. Let me first deal with one simple issue -- transparency between the regulator and its licensees. The benefits of performance indicators can only be realized if all parties have a common understanding of how these measures are used and what regulatory actions will result from them. Such an understanding can be reached only if there is an open and frank dialogue, based on trust, and clearly defined responsibilities. Licensees need to be fully forthcoming with regard to data, but regulators have their own duty to make their regulatory requirements clear, understandable, and predictable, as well as consistent in their application. If the situation is working as it should, neither licensees nor regulators should have cause to be surprised by the other.

Openness with the public is a more complex issue. One of the reasons that the ROP has been so widely accepted is the increased access of the public to timely information about plant performance on the NRC web site. The critics of the nuclear industry have joined our licensees in endorsing the ROP as an improvement on the former system largely because of the public availability of detailed and current information.

I must candidly acknowledge that there are some issues associated with public availability. In order to illuminate the data for the benefit of the public and to facilitate the sorting of plants for NRC decision-making, we have established color thresholds to characterize performance. Colors of green, white, yellow and red signify increasing values of risk significance and hence degradation of safety. Although in reality there may be an insignificant difference between a plant that is at the bottom of the green band and one that is at the top of the white band, the consequences of the binning can be

significant, particularly in terms of public perception. This is perhaps the inevitable consequence of the need to provide bands within which to characterize plants. But openness exacerbates the consequences.

Nonetheless, I am strongly committed to the continued public accessibility of such information. We operate on the principle that the public has a right to know how decisions affecting health and safety are made. There is a companion principle: that the more people know about the facts on which those decisions are based, the more confidence they are likely to have in the soundness and integrity of the outcome. Although there may be some who will use the openness to skew the information, benefits of openness outweigh the drawbacks.

Accordingly, I conclude that the answer to the concern about possible public misunderstanding of performance indicators is greater public education, not denial of the information. Indeed, one of the consequences of the September 11 attacks is the growth in public interest in the safety of nuclear plants. The provision of accurate information can help enable this discussion to be illuminated by the facts, rather than by fears. Performance indicators are part of the backdrop against which the discussion of nuclear safety can productively take place.

###