

No. S-2-91
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Remarks by
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U.S. Nuclear Regulatory Commission to the
International Brotherhood of Electrical Workers
Annual Regional Utility Conference
February 27, 1991
Philadelphia, PA

Good afternoon ladies and gentlemen. First, I want to thank the IBEW for inviting me to your Annual Regional Utility Conference. I am pleased to be with delegates from the IBEW Second District today in downtown Philadelphia. Among your members are those folks who keep the nation's nuclear power plants running safely. I firmly believe if there is going to be a future for nuclear power, the safe operation and maintenance of the current generation of power plants over the next 15 years is critical to a viable nuclear electricity option in this country. Your members play a very significant role in helping to achieve this goal and thus contribute to our Nation's energy strategy.

Today I am here to give you my perspective on how your efforts to prevent human error will enable you to keep running these plants safely and improve their performance. I will address my remarks to nuclear plant experience, since that is what I know best. The goal of enhancing the safe operation and performance by the prevention or reduction of human error should apply across the board in your activities relating to power generation.

Being a retired NavY man, that reminds me of a story about naval navigation.

An ensign, who had graduated near the bottom of his class at Annapolis, was on his first cruise and was having difficulty with navigation. Hoping to sharpen the young Man's skills, the captain gave the ensign the task of shooting the sun to determine the ship's position. The ensign went to work with the sextant and, after a lengthy period, delivered his calculations to the captain. Fifteen minutes later, the captain ordered the ensign to the bridge and asked for his ticket.

"Ticket?" the ensign asked. "I'm sorry I don't understand. What ticket?" To which the captain replied, "your ticket to the football game. According to your calculations, we're standing on the forty-yard line of the Rose Bowl."

The ensign's experience underscores the importance of good training and careful attention to the task at hand or you may end up with an error much larger than you ever envisioned.

Yet, things could be worse. Suppose your errors were published in the newspapers every day like those of baseball players.

Human error will be with us as long as we operate power plants. It is a fact of life. Yet I'm not so sure it needs to be the most prevalent cause of problems at nuclear power plants. The fact that it is troubles me, as I'm sure it does you.

I've suggested to the nuclear industry management in the past a few ideas to improve human performance. One of these is a time-proven concept of teamwork. At the vast majority of nuclear stations I visit, the reactor operators work and train as a team, and I support this wholeheartedly. I wonder, however, what added benefits would be gained if the maintenance staff also rotated on the same schedule with the operators, worked with the same people day after day, and even trained together as much as possible. A significant percentage of the human error events I read about involve a breakdown in the operations-maintenance interface. I have to believe this sort of teamwork approach would take a big bite out of those numbers.

By teamwork, I don't mean the kind of "team concept" I heard about recently, where "T" stands for talking, "E" stands for Evading, "A" stands for arguing, and "M" stands for manipulating. That kind of "teamwork" does not help prevent human errors.

Over the past five years, the key operational safety indicators monitored by the NRC have shown a clear and significant improvement in the performance of nuclear power plants. In particular, the number of operating events, unplanned automatic shutdowns, and safety system actuations per operating reactor has steadily declined. There has also been a reduction in the average radiation exposure of plant personnel and in the volume of radioactive wastes generated. I might add, that along with this improvement in safety and plant performance indicators, the average annual capacity factor for U.S. reactors has increased from 58 percent in 1984 to a projected 65 percent in 1990.

As operators, maintenance employees, and instrumentation and control technicians, you are subject to the rigors of rotating shift work. Yet you continue to perform in a competent and professional manner. The plant atmosphere you work in is often routine, but at times it can become extremely stressful. I want to applaud you all for your invaluable contribution to the improved safety performance.

Because the number of nuclear plants in the pipeline has been reduced over the last few years, much of the NRC's regulatory work has shifted from reviewing the designs of reactors as part of the

licensing process to inspecting and reviewing the safety performance of the 111 operating reactors in the U.S. In this regulatory environment, an increased emphasis on the operational aspects of nuclear safety is warranted. This means increased emphasis on human factors and plant management. There are clear indications that this change in regulatory focus has contributed to an improvement in the overall safety and reliability of nuclear power plants.

Experience has shown that about one-half of the potential events that could cause an incident at nuclear power plants involve some degree of human error. Even though the plant staff may be technically knowledgeable about the operation of the plant, the work environment can significantly affect plant operations.

A recent study of 184 licensee event reports for all accident precursor events during the period from 1984-89 showed that one-half involved one or more human errors. Of those events involved in human errors, it was judged that about one-half of those would be positively affected by improved training programs. The types of personnel considered in the study were control room operators and senior reactor operators; nonlicensed operators; electrical maintenance; instrumentation and control, and mechanical maintenance technicians; and technical staff and management. No significant trends showed up in the number of errors for any one of the types of personnel in this study.

Typical causes of human errors range from not following procedures, lack of adequate resources, inadequate training, to just plain inattention. Other factors that contribute to human error are the quality and experience level of control room operators and plant technicians, the quality of the man-machine interface in the plant, and the safety philosophy and practices used in managing plant operations. Therefore, support by utility management is essential to ensure that effective training, good procedures, properly designed equipment, and fitness for duty are all in place.

Although operating performance varies from plant to plant, several common threads stand out among the good performers. Each operating crew is a cohesive group that knows its strengths and limitations. They look out for each other and possess a high degree of self-confidence--traits which evolve from effective team training and competent leadership. Everyone on shift is a vital part of the team. Supervisors, licensed operators, nonlicensed operators, and maintenance personnel--all demonstrate a keen awareness of how their individual responsibilities and actions impact on overall plant operations.

The mix of experience on each shift is evaluated periodically in most plants. If weaknesses are found, they are corrected through such actions as expanded training, reassignment between shifts, and outside hiring. It is up to your management to provide you dynamic programs and sufficient resources to sustain cohesive,

top-performing teams. I believe the better informed you are as plant employees on contemporary technical issues and problems, the more valuable a resource you become. The wider your span of knowledge, the better you are able to contribute in abnormal or upset conditions. I firmly believe well-trained plant employees need the opportunity to expand their horizons. An active curiosity is essential and should be encouraged in all employees. When curiosity disappears, things begin to be taken for granted. When things are taken for granted, complacency sets in, with degraded performance not far behind.

As Andy Capp said, and I agree, "Problems that go away by themselves, usually come back by themselves."~

Therefore, to help understand better the root causes of recurring problems, the NRC took a closer look at its procedures and methods for evaluating operational safety performance after the troubling loss of feedwater event at the Davis-Besse Nuclear Power Station in June 1985. Among other conclusions, the NRC felt that it could obtain only limited returns in seeking further refinements in plant hardware and operator qualifications. NRC determined that its inspection program would have to focus more sharply on assessing how well the plants were being operated and maintained.

To improve the operational safety of nuclear power plants as they exist today, NRC and the utilities must look beyond the equipment and design issues and address the broad manner in which human performance affects plant safety. To do this requires examining the demands of daily plant operation with respect to the abilities and limitations of the human operators. However, this does not mean we can neglect our traditional examination of plant hardware and equipment maintenance.

I want to give you a few specific examples that occurred at nuclear power plants -- without naming names -- that illustrate the importance of preventing human errors.

There was no question human error was the cause of a loss of offsite power event at a nuclear power plant when an equipment operator mistakenly opened the wrong transformer disconnect.

In my next example, some motor-operated valves in one plant were ruined when maintenance personnel improperly installed plugs on several valve housings and introduced grease into the valve's motor housings. A combination of factors caused the event, including inadequate training for maintenance personnel, outdated procedures, and an equipment design that failed to consider human factors.

Sometimes these details seem small, but they can and do add up to unnecessary equipment failure, which leads to preventable accidents. Sometimes people make mistakes because they are tired, which reminds me of an interesting tale.

The personnel manager was interviewing a man for a job. "How long did you work in the other place?" the manager inquired. Sixty five years came the answer. "Sixty five years?" exclaimed the manager. "How old are you?" " I'm forty," the man replied. "Tell me," said the manager, "how could you work sixty five years when you're only forty years old?" "Overtime."

I have one more serious example of human error. During construction of a nuclear power plant, one utility performed a pull-back and inspection of electrical cables. They found cables of the reactor protection system to have substantial damage to the outer jacket and insulation, resulting in exposure of the conductor. The damage occurred as a result of pulling cables through previously filled conduits. To address the problem, the utility had to remove and replace numerous cables. Installation damage was then discovered on some of the new cable that was installed as the replacement cable because the pulling process was not always well controlled during the cable replacement. The lesson here is to learn from your mistakes and that procedures must be in place and must be followed. You need to think about what you are doing when you do a job and think of the consequences of your actions. Errors like these are expensive to fix and can be more costly if they initiate operational problems.

In its emphasis on operational safety, NRC has found that an effective safety work environment can be recognized by the following general characteristics: a prevailing state of mind that focuses on safety; a disciplined approach to all operating activities; insistence on sound technical bases for actions; rigorous self-assessment of performance, and insistence on strict accountability; uniformly high quality managers; and insistence on safety and quality by upper management of the utility.

No one can directly manage safety. Instead, workers and managers alike should manage the conditions that are needed for promoting safety. The NRC cannot mandate the existence of a good safety attitude at a plant. In establishing acceptable standards for safe operation of nuclear plants and evaluating licensee performance against those standards, the NRC complements the utility's efforts to promote the development and maintenance of a good safety attitude.

We all have a role to play in the business of safety and preventing or reducing the more negative contributions of human errors. I challenge you to go back to your plant and continue to reflect a good safety attitude for the benefit of all.

I am certain through teamwork -- here it is necessarily the right kind -and with personal accountability and a primary goal of safe plant operation, you will see your way through the dangers of complacency, you will pay attention to the details, and you will think about what you are doing on job. This will make for a safer

work environment and will contribute to safety and reliability of plant operation.

In closing, let me thank you for giving me the opportunity to speak with you this afternoon. I will leave you some wisdom I believe we each should follow: Every person who can be 2 first-rate something has no right Go be a fifth-rate something; because a fifth-rate something is no better than a first-rate nothing.

Thank you.