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No. S-97-13
May 30, 1997

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U.S. NUCLEAR REGULATORY COMMISSION

7th ANNUAL
NATIONAL RADIOLOGICAL
EMERGENCY PREPAREDNESS CONFERENCE
APRIL 22, 1997

Radiological Emergency Planning
Taking A Broader View

Good afternoon, ladies and gentlemen. As most of you are aware, I have been involved in radiological emergency planning (REP) issues for many years because of my previous responsibilities with the State of Arkansas. It is truly heartwarming to see so many of my friends and colleagues at this Annual REP Meeting and I am delighted to join you today so that we can meet again and share our thoughts on current issues in emergency preparedness. I will focus my remarks on the interrelated topics of exercise participation, incident response, outreach and assistance, potassium iodide, new source term implications, and economic deregulation and restructuring implications for emergency preparedness. I will also give you my personal perspective on most of the issues as I view them as a Commissioner of the Nuclear Regulatory Commission.

Because of the experience I had at the State level with Arkansas Nuclear One in interfacing and coordinating with Federal Agencies that are involved in the various aspects of nuclear power plant emergency response, it was very interesting and a unique experience to serve, last summer, as the Executive Team Director at the NRC Operations Center during a full participation exercise for Arkansas Nuclear One. This was also an educational experience to work from the other end of the ENS telephone!

NRC RESPONSE AND PARTICIPATION IN EXERCISES

Lead Federal Agency

I wish to begin my comments today with a review of "Lead Federal Agency" for radiological issues. As you are aware, the nature of the emergency, the licensee, the materials involved, and the facilities involved are determinants utilized in the Federal Radiological Emergency Response Plan to designate the Lead Federal Agency (LFA). While it may seem somewhat confusing, given that any one of five different Federal Agencies could be designated as the LFA in response to a nuclear material incident, the decision is generally based on the organization's normal responsibilities.

The NRC is the LFA for any emergency at a nuclear facility licensed by the NRC or an Agreement State or any emergency involving radioactive materials licensed by the NRC or an Agreement State. The DOE is the LFA for any emergency at one of its facilities or involving transportation of DOE materials. The DOD is the LFA for any emergency at one of its facilities or involving transportation of DOD materials. NASA is the LFA for emergencies involving domestic satellites that involve NASA space missions. DOD is the LFA for domestic satellites that involve DOD space missions.

The EPA is the LFA for those emergencies at a nuclear facility not licensed, owned, or operated by a Federal Agency or an Agreement State or for those emergencies involving materials not licensed or owned by a Federal Agency or an Agreement State. EPA is also the LFA for emergencies resulting from a foreign or unknown source. For emergencies other than these, the Federal Agencies would confer to determine the LFA for that particular event. In all of these situations, FEMA is the Coordinating Agency.

NRC Participation in Exercises

I would like to begin with a review of NRC participation in exercises. I have been and remain a proponent of significant involvement of Federal agencies in exercises. As a review, you are aware that the NRC published a final rule that eliminated the requirement for the "off year" or annual onsite exercise. While this reduced the required frequency for exercising the licensee's onsite emergency plan from annual to biennial performance, it preserved the requirement for the biennial full participation exercise. This rule requires licensees to ensure that emergency response capabilities are maintained between exercises by conducting drills, at least one of which must involve some of the principal functional areas of onsite capabilities. The rule also requires licensees to continue giving those State and local governments that are in the plume exposure pathway the opportunity to participate in these drills.

Even though exercises will only be evaluated every other year at a site, the NRC remains committed to the conduct and participation in emergency exercises. For example, during 1996, the NRC participated fully in four exercises, participated with Site Teams in six exercises, involved an Ingestion Team in one exercise, an augmented team in another exercise, and was involved in table top exercises with both of the gaseous diffusion plants.

In 1997, NRC headquarters will again participate fully in four reactor exercises. We will also participate in one lost source exercise, one gaseous diffusion plant exercise that is not a table top exercise, four limited headquarters involvement exercises, and to varying degrees, four ingestion exercises. Additionally, the NRC Regions will participate in other exercises that have been designated as Site Team Only, limited/Site Team exercises, and/or ingestion team exercises. The exercises were selected in consultation with the participating parties using a variety of criteria including schedule spacing, regional preference, and frequency of licensee and State participation in accordance with the goals of the State Outreach Program.

Proposed New Jersey Exercise

Members of the NRC staff recently attended a preliminary planning meeting for a plume, ingestion, and recovery exercise that is scheduled for the Salem nuclear power plant in New Jersey in the spring of 1998. As you know, the NRC feels strongly that any exercise at an NRC-licensed facility in which Federal participation is requested should be coordinated through the NRC as Lead Federal Agency (LFA). While still in the preliminary planning stages, this exercise presents interesting opportunities for Federal participation. There are two objectives, in particular, that merit our strong support. The first objective will address the New Jersey desire to fully integrate Federal capabilities into the New Jersey concept of operations and emergency response plan for radiological emergencies. New Jersey would also like to work with Federal representatives to review and modify their own plan to generate a generic State plan which could then be communicated to other States for their consideration and plan review.

Secondly, New Jersey has expressed a desire to have augmented FEMA participation, as well as DOE Federal Radiological Monitoring and Assessment Center (FRMAC), as players in this exercise. The NRC staff’s preliminary assessment is that this may require establishment of a FEMA facility (Disaster Field Office (DFO)) as well as a FRMAC. The focus would be to exercise the radiological and nonradiological support in a radiological event where the NRC is LFA. This element is also of interest to the NRC as it was a focus of the Susquehanna Federal Field

Exercise #3 (FFE-3) that was prematurely canceled in 1992. Furthermore, New Jersey has expressed an interest in examining the Stafford Act and Price-Anderson Act implications on a nuclear power plant accident.

The scope of this effort is negotiable at this point. However, we are encouraged by the efforts of New Jersey, Delaware, and the utility and, specifically, their early requests for Federal participation. They have demonstrated a willingness to work together with the Federal government to make this an enhanced training experience. Further planning meetings will be scheduled in the near future. Following preliminary consideration, this option will be presented to the Federal Radiological Preparedness Coordinating Committee (FRPCC) for their formal consideration as soon as possible. The tentative date for the ingestion and recovery portion of this exercise is in May 1998.

The NRC has also developed a guidance document for Large Scale Tabletop Exercises, NUREG-1514. This document has been used successfully by many State organizations to allow an opportunity for senior managers to consider issues not normally addressed in the plume phase exercises. Most recently, the NRC staff participated in an exercise in Delaware in which the Governor and Lieutenant Governor also participated. We encourage all State organizations to consider this option as a way to accomplish some of the exercise goals associated with exercise play without the resources commitment required for full participation exercise.

Incident Response for Portsmouth and Paducah Gaseous Diffusion Plants

On March 3, 1997, the Department of Energy (DOE) transferred the regulatory oversight of the Portsmouth, Ohio and the Paducah, Kentucky Gaseous Diffusion Facilities to the NRC. The NRC and the DOE have signed a Memorandum of Understanding that commits each organization to coordinate with each other to respond to emergencies at the gaseous diffusion plants. DOE has adopted a two-tier emergency classification system for these sites in order to maintain consistency with the NRC classification scheme for fuel facilities. The NRC response to emergencies will take into account the special characteristics of the hazards intrinsic to these facilities. The primary concern at these facilities involves the chemical effects of releases rather than radiological effects of the product. A supplement to the Response Technical Manual is being developed for use in response to emergencies at the gaseous diffusion plants. The NRC intends to build relationships with the States and local agencies to ensure an effective response to emergencies at these facilities.

Implications for NRC Oversight of DOE Facilities

The assumption of oversight for the DOE gaseous diffusion plants has been a challenge to the NRC and an opportunity to gain further understanding of emergency response planning in general because of the issues concerning emergency response with the oversight of DOE facilities and issues related to DOE contractors. This experience has raised more questions than answers. The following questions have arisen in agency discussions for which answers have yet to be determined.

1. What are the parameters and the implications for emergency response at other DOE facilities for which the NRC will assume oversight in the future?

2. Will DOE support of emergency response to NRC licensed facilities be affected when the NRC assumes oversight of DOE and its support infrastructure?

3. Will agreements associated with DOE support for emergency response to States and local governments require alteration, transfer or some other modification?

As you can see, this may be the tip of the iceberg with respect to issues that may need to be addressed as the transition from DOE self- oversight to NRC external oversight progresses. Any insights or perspectives that you may have on this subject will be appreciated.

Non Nuclear Power Plant Emergencies

As you would expect, I support our activities in radiological emergency planning (REP) for nuclear power plants. But more importantly - I strongly support emergency planning activities for non-nuclear power plant incident responses. This is the area where injuries and deaths to members of the public have occurred. This should also be a visible and active part of our focus on incident response. Let me explain why.

NRC staff has no record of any nuclear power plant operation or incident in this country, including TMI, that resulted in exposure of members of the public in excess of applicable 10 CFR Part 20 dose limits for the public. In contrast, there is a history of radioactive materials incidents that have resulted in overexposure of the members of the public. Some of these overexposures were of sufficient magnitude to cause acute radiation injuries. The following examples illustrate this point.

The California Hip Pocket Incident

In 1979, an industrial radiographer was employed at a temporary job site in California. When he left the site, he failed to properly secure the radiography camera and, what is most important, failed to conduct a radiation survey of the camera to confirm that the multi-curie ^{192}Ir source was properly secured. The source fell out of the camera and it was later picked up and handled by other workers at the site who were unaware that it was radioactive. Several persons suffered localized radiation injuries as a result. One worker placed the source in a hip pants pocket resulting in a very serious localized radiation dose, 1.5 million rem surface dose and 60,000 rem at 1 cm depth.

The Indiana, Pennsylvania Incident

In 1992, a waste disposal company reported finding a radiation source in waste. The NRC investigation revealed that in November 1992 a clinic in Indiana, PA treated an elderly patient with high dose brachytherapy using a 4 Ci ^{192}Ir source. The treatment was terminated early because of equipment problems. Unbeknownst to the operators, the source wire had broken and the source remained in the patient. A radiation survey of the patient at the end of the treatment to confirm that the source was safely secured was required but was not performed. The patient went from the clinic to a nursing home where she died 5 days later. The catheter (containing the source) was removed by nursing home personnel and disposed of as biohazard waste. The source was discovered during routine radiation surveillance of waste by the waste disposal company. The additional dose received by the patient was a contributing factor in the patient's death. As many as 94 persons were exposed to the source including clinic staff, nursing home staff, residents and visitors and waste disposal company employees. Doses to the public ranged from 0.034 to 2.57 rem.

The Texas Lost Source Incident

In 1996, industrial radiography devices in storage in Texas were stolen for sale as scrap metal. The devices subsequently changed hands between scrap metal firms. As a result of the multiple handling of the devices, the lock box of one of the devices was broken off and the 35 Ci ^{60}Co source fell to the ground near a scrap yard office in Houston, Texas. Scrap yard employees and investigating police officers and the family of the scrap yard owner, including two young children were exposed. Results of cytogenetic studies of blood samples taken following this incident suggested that no one received a dose in excess of

10 rem but one worker received a much larger dose to his extremities as a result of handling the source.

The Scrap Metal Issue

On over 200 occasions, radioactive sources have been found in metal scrap intended for recycling. On 26 occasions, radioactive sources were inadvertently smelted by metal mills in the United States and Canada resulting in contamination of the mills, products, and mill byproducts. On other occasions, unshielded sources have been found in scrap yards and landfills. The finding of radioactive sources and devices in the public domain and the inadvertent smelting of radioactive materials into commercial products may result in public health and safety hazards requiring the mobilization of State and Federal emergency response resources. Also, accidental smeltings of radioactive materials in other countries have resulted in contaminated products that cross international borders. These smeltings were not detected when they occurred and, as a result, radioactively contaminated products were introduced into commerce.

Government responses to these incidents can sometimes be significant. For example, following the 1983 Mexican incident, 2,500 pieces of contaminated cast iron pieces and between 500 and 900 tons of contaminated rebar that had been exported to the U.S. were identified, recovered and returned to Mexico. This was accomplished with the assistance of the 50 State radiation control and emergency response programs at a cost to them of more than 7.9 professional staff-years and $233,000 in out-of-pocket expenses. Needless to say, to do this required diversions of critical, limited resources from other, scheduled program activities.

Given these “example incidents,” one can readily perceive the significant potential health and safety issues associated with radioactive materials entering the public domain in an uncontrolled manner. Therefore, radiological emergency planning should focus on radioactive material events, as well as nuclear power plant events. It is for these reasons that I was pleased to learn that an exercise is planned for Region I that involves the NRC, EPA and local states in a lost source scenario.

REALISM IN SCENARIOS

The next subject that I would like to discuss is realism in scenarios. Over the years that I worked with the emergency response efforts of Arkansas, I came to understand the sequences

of events that were necessary to drive an emergency response exercise to the General Emergency classification. These sequences were all too often as extraordinary as they were predictable. Since I became a Commissioner, my perceptions regarding emergency response scenarios have remained unchanged.

The exercise scenarios often contain technical inconsistencies which may result in passivity among the participants, frustrate the diagnostic process, and frequently produce negative training. Exercise scenarios rarely, if ever, utilize current and historically significant incidents to build upon. Most seem to rely on failure mechanisms that may be "miraculous" at worst and disconnected at best. In contrast, historically significant events often include human error, instrumentation failure, and machine/human interface problems. Drill scenarios, however, seldom take advantage of these concepts to exacerbate the consequences.

While the players may be kept guessing and analyzing the event in the early going of an exercise, how often do we hear "the essence" of the residual scenario discussed by the players because the exercise scenario must achieve an "expected condition" in order to cover the objectives and mobilize the offsite players? I recognize that this "speculation" speaks well of the abilities of the exercise participants, but I continue to wonder about the utility of the preprogrammed nature of the scenario and the benefit to the participants.

Another significant weakness of exercise scenarios is their continuing failure to address the plant's accident management capabilities. When was the last time any of us noted an opportunity for a success path in which some action by the participants was permitted to return a vital component to service, find an inventive way to address a particular limiting condition, or mitigate the consequences of the event? What was the effect upon the participants when they were informed that their actions and inventiveness were of no consequence because the preprogrammed scenario had run its defined course? What positive training objective was accomplished?

Unfortunately, the quality of exercise scenarios has declined over the years. Certainly, some of this may be attributed to scenario predictability and conditioning of the participants. However, from a larger perspective, I believe that exercise objectives and limited resources are also partly responsible for this decline.

Exercising the radiological emergency response plan is a time and resource consuming activity for all organizations involved. It will not be a small task to improve the utility of

these exercises, factor in potential opportunities for success paths, still meet exercise objectives, and observe increasing budget limitations. But I believe this is preferable to the current situation in which emergency responders become increasingly complacent, question the utility of their efforts, and potentially experience "negative training" as a result of their participation. I strongly encourage the scenario developers to pay more attention to the quality of their efforts and to the overall safety objective of preparing emergency responders for a potential future event. One that I sincerely hope never occurs.

Potassium Iodide Issue

The use of KI by the general public as part of radiological emergency response planning has been the subject of much controversy, within the NRC, among the States, and internationally, as well. The existing Federal policy on the stockpiling and distribution of potassium iodide was published in the July 24, 1985 *Federal Register*. This policy "recommends the stockpiling or distribution of KI during emergencies for emergency workers and institutional(ized) persons, but does not recommend requiring predistribution or stockpiling for the general public."

In September 1989, the American Thyroid Association requested that this policy be revisited as it relates to the stockpiling and distribution of KI for use by the general public. Upon evaluation, the staff of the Federal Radiation Protection Coordinating Committee (FRPCC) reaffirmed the existing policy. Partly in response to a petition for rulemaking submitted to the NRC in September 1995, the FRPCC again revisited this issue. While in the view of the FRPCC staff, this latest evaluation did not identify new information that seriously challenged the existing policy, several recommendations were made that were adopted (with modification) by the FRPCC, together with a plan to publish a revised policy statement.

The proposed revision to the Federal policy would continue to recommend stockpiling and distribution of KI for use by emergency workers and institutionalized persons. The decision for stockpiling and use of KI for the general public would be left to the discretion of the State and, in some cases, local governments. Any State, or in some cases, local governments, which select the use of KI as a protective measure for the general public may so notify FEMA, and may request funding for the purchase of an adequate supply of KI. The Commission has not yet considered these recommendations at a policy level. However, we expect to do so before the revised policy statement is issued in its final form.

Implications of the New Source Term

Currently, operating plants have used source term information that dates back to research and studies conducted prior to 1962. The “old source term” which is still used and referenced today was published in TID-14844, “Calculation of Distance Factors for Power and Test Reactors” in 1962. More recently, the staff has published NUREG-1465, “Accident Source Terms for Light-Water Nuclear Power Plants” which takes into account research into severe accidents and radionuclide behavior. The NUREG-1465 source term contains a more realistic description of release timing and radionuclide composition. The revised source term describes different release fractions of core inventory, chemical and physical forms of important species, and natural removal processes that reduce the quantity of radioactive material that may be released to the environment. The accident source term is utilized to calculate design basis accident dose consequences.

Under the new framework, doses at the low population zone will still be calculated from the plume passage over the course of the accident. Radiological doses are calculated using the total effective dose equivalent (TEDE) methodology as defined in 10 CFR Part 20, which considers the effects of a dose to all organs. The calculated doses would be compared to a dose acceptance criterion of 25 rem TEDE for the exclusion area boundary for any two hours (the two-hour period that produces the highest dose) following the onset of an accident, and a 25 rem TEDE dose for low population zone for the duration of the accident (taken to be 30 days). This approach provides a coherent regulatory framework for evaluating the radiological consequences of design basis accidents using the revised source term and, in essence, a conversion of existing reactor siting criteria to new dose terminology.

While the application of the revised source term has been focused on advanced and evolutionary reactors, the Commission recently provided instruction to the staff to further evaluate the use of the “new source term” in NUREG-1465 for operating reactors. The staff will begin by rebaselining two power plants, one a boiling water reactor (BWR) and the other a pressurized water reactor (PWR). This effort is intended to obtain a better understanding of the postulated release of fission products into the containment atmosphere during an accident and, using the new methodology, the associated consequences. Upon completion of the rebaselining, the staff will commence work on a number of pilot projects with several licensees to gain an understanding of the potential benefits and impacts associated with using the new source term. Upon completion of the rebaselining projects and

coincident with the conduct of the pilot projects, the staff will commence rulemaking, if appropriate, to address issues that may affect the use of the new source term methodology.

Some of the areas for which the industry and NRC staff see potential implications include: containment isolation valve timing, mitigation system actuation timing, allowable leak rate changes, and filtration unit simplification. Other areas potentially affected include radiological consequences, equipment qualification, and post accident sampling. As you will note, the focus at this point appears to be predominately equipment related. No decisions have been made, at this time, by the Commission regarding the approval of changes. We would like to understand the results of the rebaselining efforts before proceeding further.

Finally, could the use of the new source term impact the size of the plume exposure emergency planning zone? Will the use of the new source term provide a basis for reexamination of the present policy governing emergency planning zones? As a regulatory agency, the NRC is obligated to evaluate any submittal for change and to fairly evaluate the merits and the potential impact on public health and safety. The NRC has received two submittals in the past that requested a reduction in the size of the plume exposure emergency planning zone based upon site-specific accident analyses. While these were not approved at that time, I would not be surprised to see future requests for similar actions upon completion of the evaluation of the use of the new source term at the operating reactor facilities. This is an issue that we may have to address in the future. Certainly, consideration of these issues will require public input.

Economic Deregulation: Implications for Emergency Preparedness

The issue of a competitive market for electric utility services is upon us. A day does not pass without new information in trade magazines, newspaper articles, and information on Congressional activities that include some mention of industry restructuring, mergers, agreements with States, and other inventive ideas on new approaches for the provision of electrical energy to our homes and businesses. The competitive market is here; however, the timing for full implementation and the implications on State and Federal regulatory structures have yet to be determined. There is, as in any time of change, a great deal of uncertainty and concern.

From the NRC perspective, we have two significant concerns. First, provisions must be made to assure adequate financing and maintenance of sufficient resources to assure safe and complete decommissioning of the facility. Second, the owners and

operators of the facility must maintain adequate financing and sufficient resources to safely operate the reactor facilities and meet regulatory requirements to assure the public health and safety. One of the fundamental requirements includes the maintenance of an emergency plan that will be capable of protecting the public health and safety.

There are two areas that currently cause concern for safety of the operational reactors that have implications for emergency response. The first one of these is the potential reduction of resources. As licensees move into the competitive market, increasing emphasis will be placed on cost effective operations and minimization of nonoperational support expenditures. Certainly, emergency response and preparedness efforts do not reduce operating costs; rather, it could be perceived as a burden that does not enhance the facility's cost competitive posture in relation to other energy competitors in the market. With this concern, the NRC will have to reevaluate its programs to ensure that fundamental responsibilities such as emergency planning are not neglected. With respect to this concern, I believe that there is some hope. The Commission has noted that many of the reactor facilities which have outstanding operating and safety records are also some of the most cost effective operating facilities. Safety in operation and maintenance of reactor facilities can be compatible with cost-effective operation.

The second significant concern is electrical grid reliability. As the competitive market unfolds, new independent power providers will come to the grid with electrical energy to sell. Old, familiar providers will also come to the grid selling their product. Under the current regime, utilities are rewarded with recovery of costs for investments in plants and equipment such that an adequate margin is maintained in the grid to ensure that peak load conditions in the summer and winter are handled without the necessity of rolling brownouts and blackouts. Over the years, because of the costs of capital and the structures in each State to obtain recovery of costs, the country has seen a continued downward trend in the margins available to support peak load conditions.

What incentive will there be in the competitive market to maintain margins on the national and regional electrical grids? Who will be responsible for ensuring an adequate margin exists? Why is this important?

The NRC believes that grid reliability is a significant safety issue. In fact, there will be a Commission Briefing on this very subject tomorrow. In terms of evaluating the risk to safe operations and the risk of an accident, grid reliability is very important. The risk of the loss of offsite power is

factored into numerous design basis accident analyses. The presumption of a given reliability level provides the comfort that should the unforeseen occur, the reactor facility would be positioned to cope with an expected level of transients. These transients include perturbations on the grid and loss of offsite power. When the margins on the electrical grid shrink, then the risk for the loss of offsite power increases. Without the excess margin, grid voltage and frequency stability may decrease when minor disturbances occur. Last summer, this country experienced two significant disturbances on the Western Grid. These disturbances resulted in the tripping of plants across many States with subsequent initiation of the emergency onsite power sources. While some may believe that grid disturbances are unavoidable, the reduction in margin increases the likelihood that reactor facilities will lose offsite power and emergency equipment will be challenged unnecessarily. An answer for this concern has yet to be determined.

Conclusion

Although NRC has done a great deal to address the emergency preparedness issues that confront the agency and the nuclear industry, we need to do more to ensure that we have positioned ourselves to prepare for changing missions and budget, deal with economic pressures being faced by the nuclear industry, and improve the regulatory framework. We must also recognize that, historically in the United States, the greatest health impact on members of the public or radiation workers is from lost and/or misuse of radioactive materials not subject to 10 CFR Part 50 requirements. Emergency response and planning personnel must consider this fact in future activities. Finally, greater effort must be devoted to ensuring that emergency response exercises are realistic in relation to actual events and allow responders to respond in a realistic fashion.

It is my opinion that the NRC can help with the efforts to maintain a workable framework for emergency preparedness through our regulatory efforts, and achieve a high degree of credibility demanded by the public by arriving at its decisions in a fair and open process.

We are also aware that FEMA is undergoing a significant review of its radiological emergency preparedness program with the goal of improving the efficiency and effectiveness of the program. The NRC fully supports this effort.

Thank you for your attention. I would be pleased to answer any questions that you might have at this time.