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EMERGENCY PLANNING AND PREPAREDNESS BEFORE AND AFTER THREE MILE ISLAND

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FOR THE

INSTITUTE OF ELECTRICAL & ELECTRONIC ENGINEERS

1979 SYMPOSIUM

ON

NUCLEAR POWER SYSTEMS

OCTOBER 17, 18, 19, 1979

SAN FRANCISCO, CALIFORNIA

INTRODUCTION

I am honored and pleased to once again have the opportunity to present some of my views on Emergency Planning and Preparedness as it relates to nuclear power facilities at an Institute of Electrical and Electronic Engineers Symposium. I have been a member of the IEEE and one of its precursors, the IRE (Institute of Radio Engineers) for some twenty-three years, and during that time, I have found that this forum is receptive to honest, frank and uncompromising dialogue and appraisal, on many controversial and difficult issues. With this in mind, I present the following views, which are my own, shared by some, not shared by others.

BEFORE THREE MILE ISLAND - AN OVERALL PERSPECTIVE

Prior to the accident at the Three Mile Island nuclear generating station, radiologic emergency response planning and attendant preparedness as it relates to nuclear facilities, was never in a position of high visibility within the nuclear industry or within the Federal, State and local governments in this nation. Further, very few resources, in terms of personnel and funds, were devoted to it. There were a variety of reasons for this state of affairs.

First and foremost, were the two long cherished notions: (1), that nuclear facilities were designed, constructed and operated with such integrity, the chances of a serious accident occurring were extremely remote; and (2), that even if an accident were to happen, because of the integrity of design, construction and operation, any accident would have little effect in terms of offsite radiological consequences. Although the record of nuclear power safety is excellent in general terms, it is not flawless and we have been given some serious warnings.

The first of these two notions, that is "chances" or "probabilities" of accidents happening, has, in my view and the views of others, been essentially "knocked into a cocked-hat." Two relatively serious events, in terms of "chance", have occurred in large power reactor facilities in this country within the last 4 years: the serious fire at the Browns Ferry nuclear power facility and the accident at the Three Mile Island nuclear power facility.

The corrolary or second of these two notions, that is that little would happen in terms of offsite consequences, is to some measure still supported by the integrity of the facilities themselves. One cannot say too much with respect to the the role and actions of operators and nuclear facility management during both of these events, except to say that tardy notification of offsite organizations occurred, some correct moves were made, but at the same time, many incorrect moves were also made. The point to be made here is that we were all very fortunate in both of these accidents in that offsite radiological consequences were either non-existent or relatively minimal.

There may be those in industry and within the Federal government who do not share these observations, but nevertheless, it's my view, shared by many, that we came uncomfortably close in both of these accidents to potential consequences that could have caused grievous harm to individuals, our society, our environment, and our national energy program.

The warning has clearly manifested itself. Dr. Stephen Hanauer, of the NRC, who was the Chairman of the NRC Special Review Group (of which I was a member), which prepared the report (NUREG-0050)[1] concerning the fire at the Browns Ferry nuclear power facility, remarked at one point during that investigation, with words to the effect -- "Maybe it was like a mild heart attack -- it woke us up". We have had a second "mild heart attack" at Three Mile Island. So, it behooves all of us, industry, government and every one else involved, to learn from this experience because we may not get another chance to improve matters in the interim, should another accident occur --especially a fast-breaking accident, as opposed to the drawn-out Three Mile Island event.

Other reasons for a relatively weak radiological emergency response planning and preparedness program with respect to the operation of nuclear facilities, are rooted in long seated deficiencies in general emergency planning and preparedness programs at the Federal, State and local government levels. Notwithstanding the massive Federal emergency operational response and industry response at Three Mile Island, advance emergency planning and coordination leaves much to be desired. Initially at Three Mile Island, coordination between Federal, State and local authorities, was a problem.

General emergency planning and preparedness at the governmental levels has suffered a period which can be best characterized as relative "benign neglect", ever since the end of World War II. Civil Defense or Emergency Services programs at the Federal, State and local government level have fallen into disarray and mediocrity due to fragmentation of efforts, lack of motivation, lack of effective leadership, inadequate attention, and inadequate funding. This is partially the reason why the new Federal Emergency Management Agency (FEMA) was established on April 1, 1979. FEMA brings together the major Federal agencies who have had responsibilities in civil preparedness, continuity of government during a national emergency, and disaster control and mitigation.

Any radiological emergency response planning and preparedness program that is mounted, must depend ultimately on an adequate general emergency planning base, at Federal, State, and local government levels. Efforts to build a proper radiological emergency response posture in support of these nuclear facilities, has suffered because one cannot build a "golden idol" on "feet of clay". If the base is defective, which it is, the idol will not stand for very long, if at all.

Adequate, well conceived general emergency planning and preparedness at all levels of government, to cover the wide range of hazards in our technological society, is the key to an improved radiological emergency response planning and preparedness program. The NRC and other technical agencies must and will work with the new FEMA to improve this program.

Problems and Progress After Three Mile Island

I have presented the overriding problem in my foregoing remarks. But, there are a number of specific problems related to radiological emergency response planning and preparedness. All of these problems existed before the accident at Three Mile Island, but the accident has speeded-up progress in these areas. There are many problems, but let me discuss five of the more salient ones:

1. An Adequate Planning Basis:

   What is an adequate planning basis for radiological emergencies at fixed nuclear facilities? This question, (re-phrased as - "What kind of an accident at a nuclear facility should we plan and prepare for handling?") was essentially asked by many of the States and local governments, and their national organizations some years ago. This resulted in two Federal agencies, NRC and EPA, launching an effort to examine this question.

In August of 1976, a joint U.S. Nuclear Regulatory Commission/U.S. Environmental Protection Agency Task Force on Emergency Planning was formally appointed to look into this matter. In December of 1978, after over 2 years of work, the joint NRC/EPA eleven member Task Force unanimously concurred in and published its report, "Planning Basis for the Development of State and Local Government Radiological Emergency Response Plans In Support of Light Water Nuclear Power Plants" NUREG-0396/EPA-520/1-78-016.[2]

The "bottom line" on this Task Force report is, that there is no specific nuclear power plant accident that one can identify as being the accident for which plans and preparedness programs should be in place. Rather, the Task Force came down on the side of planning for consequences, with only minimal concern for the uncertainties of probabilities. And, to define an adequate, improved planning basis, the Task Force recommended that essentially generic Emergency Planning Zones (EPZs) be established around all nuclear power facilities in this country. The Task Force further determined and recognized that the Low Population Zone (LPZ) concept used for siting purposes had little real meaning in terms of offsite emergency planning and preparedness. The Task Force, in essence, rejected the concept of the "LPZ" for definitive and comprehensive emergency planning offsite. Further, the Task Force recognized the need to develop an emergency planning basis to address the so-called "Class 9" accidents, or accidents resulting in extensive damage to, or meeting of, the nuclear fuel core.

This need for a capability to accommodate emergency situations beyond the so-called "design basis accidents" used in plant and site evaluation, makes generic rather than site specific areas appropriate. The Task Force decided that the establishment of Emergency Planning Zones (EPZs) of about 10 miles for the airborne "plume" radiological exposure pathway, and about 50 miles for the ingestion or food radiological exposure pathway would be sufficient to define the areas in which planning for the initiation of predetermined protective measures is warranted for any given nuclear power plant. The Emergency Planning Zone concept is illustrated in Figure 1.

As a side note and independent of the work of the NRC/EPA Task Force, the Swiss Federal Office of Energy, Nuclear Safety Division, was developing an Emergency Planning Zone concept very similar to the zones recommended by the NRC/EPA Task Force. The Swiss have 3 zones; an inner "Fast Alarm Zone" of 2 to 6 kilometers, a second zone of 20 kilometers (12.5 miles), and a third zone (for the ingestion pathway) with no radius prescribed.

Although not without some initial controversy and resistance from many quarters, the Task Force report is a major milestone along the way toward defining an adequate radiological emergency response planning basis. The report, and the recommendations contained in the report have been formally endorsed by the Commissioners of the NRC as of October 5, 1979 and are also endorsed by the EPA Administrator as well. Any perceived problems in implementing the establishment of the Emergency Planning Zones can and will be overcome if there is a will and commitment to do so, at Federal, State and local government levels.

2. Accident Assessment:

Accident assessment has been, and continues to be, a problem area. Although defined as an essential emergency planning element in 1970 in the AEC (now NRC) emergency planning regulations 10 CFR 50 Appendix 'E'[3] for nuclear facility NRC licensees, and later in the former AEC's emergency planning guidance document for States and local governments, "WASH-1293" (now NRC publication "NUREG-75/111")[4], much needs to be done to improve accident assessment, both onsite and offsite.

Steps are underway to improve this accident assessment capability. On the licensee side, improved in-plant instrumentation specifically designed for assessing accident situations has been indicated and will now be required. On the Federal, State and local side, standardized offsite accident assessment techniques and systems need to be developed and improved, especially in the areas of coordination between agencies at all levels of government and in the evaluative/decisionmaking process. The coordination of accident assessment information must also be improved between the nuclear facility operator and the offsite agencies. Guidance concerning the types of emergency instrumentation

which might be useful, and the acquisition of instruments and systems themselves, are needed in many localities.

Several programs are now moving to address these problems. Licensees will be required to upgrade their emergency plans. Further, licensees will be required to implement the related recommendations of the NRC "Lessons Learned Task Force"[5] involving instrumentation to follow the course of an accident, and relate the information provided by this instrumentation to emergency action level guidelines[6] promulgated by the NRC. This will include instrumentation for post-accident sampling, high range radioactivity monitors, and improved in-plant radioiodine instrumentation since radioiodine can be a dominant radioisotope of concern in airborne radiological releases. The implementation of the "Lessons Learned" recommendation on instrumentation for detection of inadequate nuclear core cooling will also be factored into the emergency plan action level criteria.

Guidance in the area of radiological instrumentation and offsite accident assessment techniques for States and local governments, are being prepared by the Idaho National Emergency Laboratory under contract to the Office of State Programs, NRC. Plans are also afoot to test an inexpensive airborne radioiodine sampling and collection device, which together with an existing modified Civil Defense radiological instrument, has the potential to help provide quick, rough "go" - "no go" information to authorities responding to an accident in offsite areas where a radioiodine release may be the dominant radioisotope of concern in certain accidents. This portable device, invented and recently patented by researchers at the Brookhaven National Laboratory[7] under contract to NRC, Office of State Programs, is being independently evaluated by the Idaho National Engineering Laboratory. If the device passes muster, NRC has plans to put it into the existing inventory of civil defense radiological monitoring instruments currently available to State and local government personnel.

Recently, the Commission has approved relatively modest budget resources to allow us to proceed with a few "pilot-demonstrations" of the Lawrence Livermore Laboratories (LLL) Atmospheric Release Advisory Capability (ARAC) system. This system, pioneered by Dr. Joseph Knox of LLL some years ago for U.S. Department of Energy (DOE) facilities (formerly AEC General Manager facilities), has received renewed interest in NRC for licensed nuclear facilities. The system, in its ultimate form, is capable of providing rapid atmospheric consequence assessment offsite, thus freeing nuclear facility operators and State and local organizations from laborious "1890" type operations, with maps, plastic sheets, overlays, and grease pencils, which is the "State-of-the-art" in many nuclear power plants today.

ARAC was employed by the U.S. DOE response team, on an ad hoc basis at Three Mile Island. The system appears to have great potential in making real time meteorological predictions and in its ultimate configuration, coupled with proper radiological sensors, real time radiological predictions as well. The Office of State Programs, NRC, intends to establish the first pilot-demonstration of ARAC in the State of New York by installing ARAC computer terminals and other hardware in the New York State Emergency Operating Center, and a local government Emergency Operating Center located near Consolidated Edison's Indian Point Nuclear Power Facility. Consolidated Edison will be requested to foot their end of the bill, by paying for the ARAC terminals at the Indian Point station. We intend to install the same system at one or two other sites to acquire the necessary data and operating experience with the system, with a view toward establishing ARAC, or a system like it, nationwide.

3. Training

Since March 1, 1975, the NRC with the assistance of other Federal agencies, has conducted formal training programs for Federal, State and local government personnel in both radiological emergency response planning and operations. Over 1200 persons (80% State and local government personnel, 20% Federal personnel) have attended these training programs from all of the States. The training programs have been well received and are of excellent quality, thanks to competent

and dedicated faculty members. Much remains to be done in terms of retraining because of the high turn-over (roughly 10% per year) among State and local government personnel and also to keep pace with new developments in the emergency planning and preparedness area. NRC's plans are to continue to improve these training programs and to develop new ones where necessary. Nuclear facility personnel training must also be accelerated and improved as well.

Related to training, is the matter of standardized exercise-scenarios to test emergency plans. Too often, in the past, exercises did not adequately test emergency plans. Hangups existed about creating an exercise-scenario that resulted in significant offsite consequences. These hangups are now vanishing, post-TMI. The NRC is developing exercise-scenarios to realistically test onsite and offsite emergency plans which should result in improving the emergency response capability at all levels of government.

4. Funding

Adequate funding for general and radiological emergency response planning and preparedness has been a problem at all levels of government. Federal, State and local. The funding problem is particularly acute at the local government level, where often many of the involved personnel are low-paid employees, part-time employees, or volunteers with meager resources available to them. Federal programs for general emergency planning and preparedness, that have been provided in the past, have not been entirely successful for a variety of reasons. Emergency planning and preparedness budgets are low, both at the Federal level, and at the State and local government levels, not only in terms of actual funding available but also in terms of priority assigned when related to other programs. Adequate salaries must be paid to Emergency Services people in order to attract good, competent candidates for these jobs.

The funding situation needs to be improved. The amount of money required for a substantial improvement in the radiological emergency planning and preparedness effort, (as a sub-set of general emergency planning and preparedness), does not appear to be staggering. As a matter of fact, it is very small when compared to the investment made in a single nuclear

power unit, of say, 1000 Megawatts-Electric, the gross cost of which today is well over the one billion dollar mark, in today's dollars, and we have some 70 nuclear power facilities licensed to operate in this nation today, and many more under construction.

Where can these funds come from?--and more importantly--where should they come from?

Dr. Stephen Salomon, an Environmental Economist of the NRC's Office of State Programs, has recently completed a year long study of this matter. His report which was released in draft form as "NUREG-0553"[8] in the spring of this year, two days before the Three Mile Island accident, examines this question of emergency planning funding in significant detail. Dr. Salomon, over a 9 month period, visited some 12 States and 24 local governments charged with the responsibilities to develop emergency response plans supportive of nuclear power facilities within their jurisdictions. His findings depict a wide range of funding situations, from relative "affluence" - to "abject poverty", - concerning personnel and resources to do a proper job in this area, particularly at local government levels. Even where funding was adequate, in some cases there was no motivation or encouragement to spend funds on radiological emergency response planning and preparedness. Often available funds were diverted to other "projects" deemed important to the communities involved. Often, emergency planning was at the bottom of the totem pole. These problems have at their roots, the individual, political, social, governmental and industrial perceptions of the relative safety of a high technology facility. Three Mile Island has changed a lot of heretofore complacent views.

But, in those communities with little available to them to improve matters, the recognition of a need to do more does not always translate to, or result in, improvement. Help is needed. And, although the Federal government can and should provide some assistance, the nuclear industry has an obligation to provide financi l assistance as well. Some nuclear utilities have voluntarily done yeoman's work in this area, but many have not done all they can and should do. It is in their best interests to do so. The need for these specialized emergency plans and

the attendant preparedness that they imply, would be unnecessary if the nuclear facility were not there.

Dr. Salomon's report, "Beyond Defense-in-Depth", NUREG-0553, will be published as a final NRC staff report at the end of October, 1979. His report is not touted as the "be all and end all" of the emergency planning funding problem, but it is an excellent first glimpse of it and should serve as a basis for taking some action now and looking at the problem seriously, and developing a comprehensive solution in the very near future. The report should be useful to not only those of us involved in the regulation and management of the nuclear industry, but to the new Federal Emergency Management Agency (FEMA), and the Congress of the United States.

5. Emergency Planning Guidance

A great deal of good, if not excellent, technical emergency planning guidance has been developed and published over the past 5 years, but much remains to be done. The accident at Three Mile Island has, in great measure, validated the existing guidance and the activities of the people in this business that take their work seriously. The existing guidance on Protective Action Guides (PAGs)[9] for radiological exposure needs to be completed by the U.S. Environmental Protection Agency and the U.S. Department of Health, Education, and Welfare, agencies charged with this responsibility. A Federal policy on the administration of radioprotective drugs, such as the use of Potassium Iodide as a thyroid blocking agent in some circumstances, needs to be developed by DHEW who is also charged with this responsibility.

Our emergency planning regulations and general guidance documents for nuclear facility licensees, Federal, State and local governments, need updating and some improvement. The NRC/EPA Task Force recommendations on the establishment of Emergency Planning Zones, must and should be quickly put into place. As mentioned before, specific technical guidance, such as emergency instrumentation and accident assessment guidance, needs to be developed. Guidance on interdicting or controlling the accidental radiological exposure to humans via domestic animals and agricultural

products in the food chain, needs to be developed as well. This can and should be done with the help of all concerned.

Summary

The last bastion of the often touted and quoted "Defense-in-Depth" concept against consequences of accidents at nuclear facilities, which has governed the development of commercial nuclear power for two and one-half decades in this country, is a proper and effective emergency planning and preparedness program with respect to these facilities. This bastion, has not received the support which it deserves. Proper and adequate emergency planning, rather than paying "lip-service" to it, can help alleviate many of the fears surrounding the safe operation of nuclear power facilities. In the past, the old view that emergency planning and preparedness should be "kept in the closet", away from public scrutiny, lest it "stir-up the folks in Toonerville", just won't wash anymore. Three Mile Island has changed all of that, and I look at it as a healthy, up-beat change. This accident, has given us a golden opportunity to improve things and we must not fail, collectively, to take advantage of it and to learn from it and to act on it. We are unlikely to have another chance to do so.

This means an augmented commitment of dedicated, competent people, modest money and resources, but it is a relatively small commitment in order to do the job properly. And, if this nation is to have its faith restored in this technology, an adequate, competent, high visibility emergency planning and preparedness program can, among other needed improvements, help achieve this goal. The choice is ours, -- collectively.

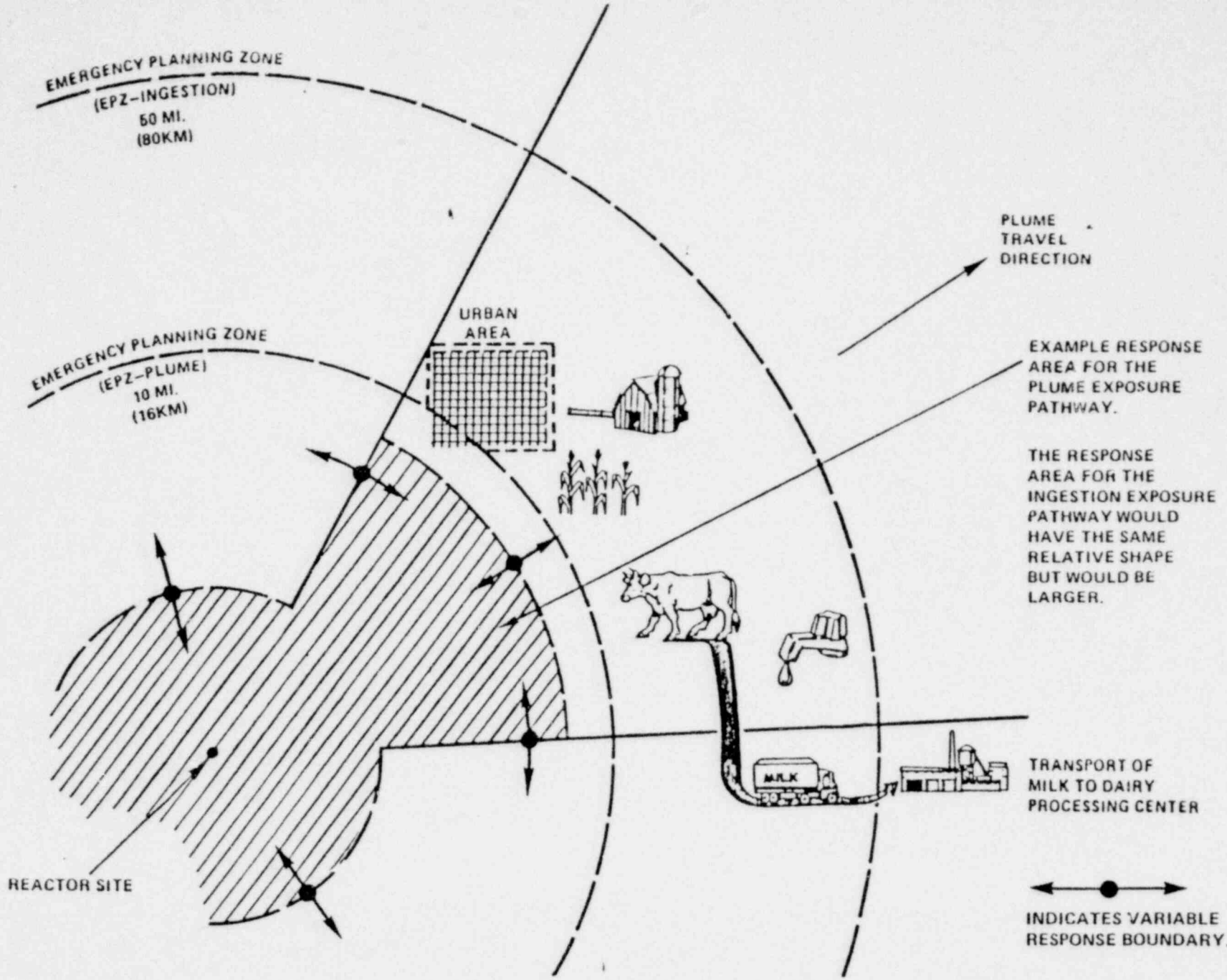

Figure 1 Concept of Emergency Planning Zones

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