

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION



BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
COMMONWEALTH EDISON COMPANY	)	Docket Nos. 50-454 OL
	)	50-455 OL
(Byron Nuclear Power Station,	)	
Units 1 & 2)	)	

DAARE/SAFE and ROCKFORD LWV  
FINDINGS OF FACT AND CONCLUSIONS OF LAW  
REGARDING EMERGENCY PLANNING

June 20, 1983

8306270022 830620  
PDR ADOCK 05000454  
G PDR

DS03

## TABLE OF CONTENTS

### OPINION    Intervenor's Revised Emergency Planning Contention

Paragraph 2 - The Evacuation Time Study . . . . .	1
Applicable Law . . . . .	2
Sub-paragraph 2(c) - Relative Significance of Alternative Assumptions in the Evacuation Time Study . . . . .	4
Sub-paragraph 2(e) - Consideration of Peak Populations and Behavioral Aspects in the Evacuation Time Study . . . . .	7
Sub-paragraph 2(k) - Weather Characteristics in the Evacuation Time Study . . . . .	16
Conclusions . . . . .	17
Paragraph 3 - Emergency Medical Services . . . . .	18
Applicable Law . . . . .	18
Discussion . . . . .	20
Conclusion . . . . .	23
Paragraph 8 - Local Protection Afforded by Protective Measures . . . . .	23
Applicable Law . . . . .	24
Discussion . . . . .	25
Administration of Potassium Iodide . . . . .	28
Conclusion . . . . .	29
Paragraph 10 - Reliance on Volunteer Emergency Personnel . . . . .	30
Applicable Law . . . . .	30
Discussion . . . . .	31
Conclusion . . . . .	33
Paragraph 13 - Communications with Emergency Response Organizations . . . . .	34
Applicable Law . . . . .	34
Discussion . . . . .	35
Conclusion . . . . .	36

FINDINGS OF FACT . . . . . 38

Paragraph 2	
Sub-paragraph 2(c) Relative Significance of Alternative Assumptions in the Evacuation Time Study . . . . .	42
Sub-paragraph 2(e) Consideration of Peak Populations and Behavioral Aspects in the Evacuation Time Study .	44
Sub-paragraph 2(k) Weather Characteristics in the Evacuation Time Study . . . . .	50
Paragraph 3 - Emergency Medical Services . . . . .	51
Paragraph 8 - Local Protection Afforded by Protective Measures . . . . .	54
Paragraph 10 - Reliance on Volunteer Emergency Personnel	60
Paragraph 13 - Communications with Emergency Response Organizations . . . . .	63

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
COMMONWEALTH EDISON COMPANY	)	Docket Nos. 50-454 OL
(Byron Nuclear Power Station,	)	50-455 OL
Units 1 & 2)	)	

DAARE/SAFE and ROCKFORD LWV  
PROPOSED FINDINGS OF FACT  
AND CONCLUSIONS OF LAW REGARDING  
EMERGENCY PLANNING

OPINION

Intervenors' Revised Emergency Planning Contention

Intervenors' Revised Emergency Planning Contention raises issues regarding emergency planning for the Byron Station.

The issues were set forth in 13 separate paragraphs.

Pursuant to a stipulation of the parties, four of the paragraphs and three sub-paragraphs of a fifth paragraph were litigated. (The remaining paragraphs of the Revised Emergency Planning Contention are to be resolved through an informal procedure established by the stipulation between the parties.)

Paragraph 2 - The Evacuation Time Study

This paragraph of the Revised Emergency Planning Contention is comprised of several sub-paragraphs, three of which were litigated - sub-paragraphs 2(c), 2(e), and 2(k). The litigated sub-paragraphs contend that the "Evacuation Time Estimates Within the Plume Exposure Pathway Emergency Planning Zone for the Byron Nuclear Generating Station" dated December, 1982, (hereafter the "Byron Evacuation Time Study," Applicant's



Exhibit No. 18), which was prepared by Applicant's consultants, does not conform to the guidelines established by Appendix 4 to NUREG-0654/FEMA-REP-1, Rev. 1 (hereafter "NUREG-0654," Board Exhibit No. 3). Specifically, Intervenor's contend that:

In violation of 10 CFR Section 50.47 (b) (10), Commonwealth Edison's "Evacuation Time Estimates for the Plume Exposure Pathway Emergency Planning Zone of the Byron Nuclear Generating Station" does not conform to NUREG-0654, Appendix 4 and will not provide accurate or useful guidelines for the choice of protective actions during an emergency because the study:

\* \* \* \* \*

- (c) does not address the relative significance of alternative assumptions;

\* \* \* \* \*

- (e) does not consider the impact of peak populations, including behavioral aspects;

\* \* \* \* \*

- (k) does not use site weather characteristics as presented in the FSAR.

#### APPLICABLE LAW

10 CFR 50.57 (b) requires that:

The onsite and offsite emergency response plans for nuclear power reactors must meet the following standards:

\* \* \* \* \*

(10) A range of protective actions have been developed for the plume exposure EPZ (Emergency Planning Zone) for emergency workers and the public.

Guidelines for the choice of protective actions during an emergency, consistent with Federal guidance are developed and in place, and protective actions for the ingestion exposure pathway EPZ appropriate to the locale have been developed...

This standard is addressed by specific criteria in NUREG-0654 which state, inter alia;

8. Each licensee's plan shall contain time estimates for evacuation within the plume exposure EPZ. These shall be in accordance with Appendix 4.

\* \* \* \* \*

10. The organizations plans to implement protective measures for the plume exposure pathway shall include:

\* \* \* \* \*

1. Time estimates for evacuation of various sectors based on a dynamic analysis (time-motion study under various conditions) for the plume exposure pathway emergency planning zone (see Appendix 4);...

(NUREG-0654, at 61-63.) The referenced Appendix 4 provides "an example of what shall be included in an evacuation times assessment study and how it might be presented. The example includes a complete outline of material to be covered, but only a few typical tables and explanations are provided. The requirements are intended to be illustrative of necessary considerations and provide for consistency in reporting."  
(NUREG-0654, at 4-1.)

The volume of guidance included in NUREG-0654, Appendix 4, leads the Board to believe that accuracy in evacuation time studies is of great importance. The Board also notes that the range of times between the onset of accident conditions and the start of a major release of of the order of one-half hour to several hours (NUREG-0654 at 13).

There was an extreme reluctance on the part of the

authors of the Evacuation Time Study to concede that errors in the study could have consequences for the health and safety of the public if the study was put to use. Even after twice stating that some greater exposure to the public could occur due to inaccurate evacuation time estimates (Tr. 4850-51), Ms. McCluskey recoiled with an absolute denial of such possibility (McCluskey, Tr. 4854).

At the same time there was a reluctance on the part of intervenors to recognize that some insensitivities in the study may have no negative consequences. Intervenors have, however, posed scenarios and pursued assumptions to more clearly define the sensitivity of the evacuation time study to human and environmental elements. They have refrained from any radical assertions regarding human behavior or ice age weather and have attempted to find some middle ground. The study's authors meanwhile tended to stand firm on most every assumption.

Despite the demanding guidance in Appendix 4, there exists a degree of ambiguity in the relevant guidance, as a primary contributor, Dr. Thomas Urbanik (Tr. 5418) concedes. The Board has been guided in its interpretations of Appendix 4 largely by Dr. Urbanik's insights.

Sub-paragraph 2(c) Relative Significance of Alternative Assumptions in the Evacuation Time Study

Appendix 4 to NUREG-0654 provides that evacuation time estimates should address "the relative significance of alternative assumptions, especially with regard to time dependent

traffic loading of the segments of the evacuation roadway network." (NUREG-0654, at 4-7.) This guidance was intended to assure that a range of times which indicate the sensitivity of evacuation time estimates to various conditions would be available to decision makers charged with selecting the appropriate protective action. (Findings 5, 6) Roadway capacity is not a constraining factor on evacuation time for the largely rural Byron area. The critical sensitivity of the study is to other assumptions namely preparation and mobilization time. (Findings 7, 8)

The assurance offered us by Mr. Urbanik that the indigenous rural situation has been considered as it relates to preparation time is an "inordinately long preparation time compared to most sites in the U.S." (Finding 9 ) Since Mr. Urbanik does not purport to be an expert on demographics and has not seen the FSAR for the Byron Station (Finding 10 ), it is unclear from the record whether the long preparation time has sufficiently compensated for or over-compensated for the rural nature of the area.

Applicant's witnesses McCluskey and Horst believe the Evacuation Time Study to be in compliance with NUREG-0654, Appendix 4, because their evacuation time study has applied a range of seasonal, diurnal and weather conditions to "a detailed consideration of roadway network and population distribution." We are directed to section 4.1.2 of the study for a discussion of the significance of alternative assumptions relative to time dependent traffic loading. (Finding 11 ) There is little evidence in the record or in section 4.1.2

and Table 4-1 that the local demography or the economic structure of the local population have been considered in the development of preparation and mobilization times. Ms. McCluskey notes that the study identifies major employers in the area (Finding 12 ) but not any surveying of who is employed at these sites or how long these sites require for shutdown.

Dr. Horst and Ms. McCluskey have gathered no data on where people work relative to their homes in estimating the time required to travel from work to home. Experience in other situations is cited but travel times from a work area does not appear to be a generic consideration. (Finding 13 )

Finally, no explicit demonstration has been made that the time required to evacuate farms in the area has been considered in the estimation of preparation times. (Finding 14)

There appears to be relatively little basis for the three categories in section 4.1.2 which assess the time required to leave work, travel from work to home or evacuate the home (or farm). (Finding 15 )

In light of Mr. Urbanik's belief that the influence of a rural setting on preparation times could have been quantified (Finding 16 ), we suggest that this be carried out in addition to the assimilation of some information on local industry as it is relevant to distances travelled and shut down time.

The applicant's contractors have recognized the lack of capacity constraints but have not pursued other constraints indigenous to the Byron area to which a more congested area



may not be susceptible.

We conclude that the Byron evac time study considers most assumptions to demonstrate the sensitivity of the roadways to a range of conditions. Yet, the roadway network is not the determining factor here. The lightly researched and briefly discussed preparation time is the crux of an evacuation of the Byron area.

Determining the relative significance of alternative assumptions in a rural area means giving attention to the impact of normal versus adverse weather conditions; day versus night and weekday versus weekend on the preparation times in a rural context. Therefore, the Board finds that the Evacuation Time Study does not adequately address the relative significance of alternative assumptions with regard to time dependent traffic loading of the roadway network and is deficient in this respect as a tool to guide emergency decision makers in their choice of a protective action.

Sub-paragraph 2(e) Consideration of Peak Populations and Behavioral Aspects in the Evacuation Time Study

Appendix 4 to NUREG-0654 provides that "(c)onsideration shall be given to the impact of peak populations including behavioral aspects" (NUREG-0654 at 4-10).

The consideration of peak populations and behavioral aspects is situated in NUREG-0654 near references to special facilities but peak populations are addressed in Applicants prepared testimony and generally by Applicant and staff witnesses as peak seasonal and recreational populations. (Finding 17)

Behavioral aspects are addressed by Applicant in regard to the public in general. Intervenors pursued the impact of peak populations generally, the behavioral aspects of evacuation during peak populations; and behavioral aspects generally. Intervenors refrained from addressing issues relating to special facilities behavioral aspects with the exception of parents of school children. Other special facility issues are the subject of the stipulation between the parties.

#### Peak Recreational Populations

Applicant's witnesses testified that special events have been analyzed in separate simulations. The Evacuation Time Study indicates that the presence of additional transient populations associated with special events does not increase the time required to evacuate. (Finding 18 )

While there is no rigorous presentation of data on the special event evac scenarios it is observed in the Study that while no queuing occurs in other scenarios there is queuing during special events. In fact, all intersections in the evacuation road network in Oregon are subject to backup. This is not surprising considering that 30,000 persons descend on a town of 3,000. Intersections near the Byron Dragway and the MotoSport Speedway are similarly strained. (Finding 19 )

The attendance of 25,000 to 30,000 persons at special events in the Byron EPZ doubles or triples the total local permanent population in affected sectors. (Finding 19 )

NRC witness Urbanik asserts that what would have produced different results in the time study would have been an increase in the evacuating population by a factor of 2 to 4. "Then



the analysis would have shown something vastly different."

( Finding 21 ) NRC staff witnesses are silent in their prepared testimony regarding the special event evacuation time estimates. ( Finding 22)

#### Peak Populations - Behavioral Aspects

The NETVAC II Dynamic Route Selection model purports to account for human decision making in route selection. Driver preference is said to be based on two criteria: The direction of the outbound roadway and the traffic conditions observed at any intersection. (Finding 23 ) Familiarity with the roadways in the Byron area is assumed. (Finding 24 )

That transient populations, including workers who enter the area for employment and thousands of summer recreational people, are assumed to be familiar with the routes taken to work or to recreational areas. (Finding 25 ) The Board has no disagreement with this assertion. However, this offers little assurance that safe and efficient evacuation routes are known.

Even if we accept Dr. Horst's additional assumption that transient populations are familiar with the major highways and the major roadways in the area, such familiarity would not allow evacuees to determine with reasonable degree of certainty whether they were driving to safety unless the location of the plant is known. Dr. Horst did not know whether transients would know where the Byron Station is located. (Finding 26 )

The impact of speeding, disobeying traffic rules and

passing other vehicles with increased frequency is not considered in the study because people (assumed to be familiar with the area) are also familiar with the design limitations of their roadways, and because people would drive the speed of other cars on the roadway. (Finding 27 )

The argument that numerous persons unfamiliar with an area can reach safety by driving the speed and direction of other cars is rather circular since one must assume familiarity in the first instance and in the lead car.

The scope and impact of transients unfamiliarity with the roadways is consistently downplayed by Applicant's witnesses. Dr. Horst repeatedly spoke of a "few individuals" not being familiar with the area. (Finding 28 ) There is no factual or common sense basis for assuming that only a few of the thousands of transients in the EPZ on any summer weekend or the tens of thousands during special events would be somewhat disoriented during flight from a radiological incident. An evacuation time study which does not account for such unfamiliarity may seriously underestimate the time required to evacuate during peak populations. The Board further notes that less adaptive behavior or panic is more likely to occur where a danger is evident but the direction to safety is unclear.

Applicant's witness McCluskey observed that transient persons unfamiliar with the area would know they are in error, "If they are not going in the same direction as everybody else." (Finding 29 ) Such behavior may alleviate some of the problems discussed above. However, this tendency to

seek out the more congested area (by transients numbering in the tens of thousands during peak periods) in choosing direction runs in conflict with the second criterion for route choice assumed in Dynamic Route Selection. Persons are expected to choose the less congested path. (Finding 30 )

Dr. Horst conceded that if there was a very high preference to go one way versus another, a large percentage of persons would go that way even though there is congestion on the roadway. (Finding 31 )

It is observed that these two human tendencies during an evacuation (seeking and avoiding more dense traffic) do not give rise to an either/or situation. (Finding 32 ) The concept of Dynamic Route Selection, however, only accounts for one tendency (avoiding congestion) and thus tends to optimize traffic flow. (Finding 30 ) We have an aspect of human behavior, occurring particularly during peak populations, that has been recognized by the authors but neither the causes of alternative preferences nor the impact of the congestion appear to have been pursued.

Consideration of behavioral aspects as used in Appendix 4 to NUREG-0654 means that if there is some basis for believing that people might act in a particular way, that such behavior should be factored into the analysis. (Finding 32 )

#### Parents of School Children

The Evacuation Time Study assumes that instructions will be followed. It is further assumed that persons within the plume exposure EPZ will leave when instructed to leave. (Finding 33 ) The Board notes that this runs in the face of

required confirmation procedures and calculated evacuation confirmation times which allow emergency workers to enter a contaminated area because this cost is thought to be outweighed by the benefit of notifying and assistance given to persons who did not leave. (Finding 34 )

Parents are assumed to leave without their schoolage children if those children are in school during an emergency. The thrust of intervenors cross examination was that this would not be the case under any conditions. The authors of the study suggest that this is the expected behavior if parents are informed and reassured before hand that specific arrangements have been made for their children. (Findings 35, 36) The Evacuation Time Studies authors are convinced of the adequacy of planning documents in assuring parents that school children will be taken care of even though they are both unfamiliar with the public information brochures distributed to area residents which contain instructions for parents of school children and which may or may not have offered the necessary assurances. (Findings 37, 38)

Ms. McCluskey also recognized that reassurances might be required at the time of the emergency that persons families were being safely evacuated. There is no evidence in the record that arrangements for such timely reassurances to parents have been made. (Finding 39 )

The basis for belief that instructions will be followed is "professional experience" and some studies put out by Ohio University. However, no professional experiences or data from any studies which related to how parents would

perceive and react to danger to children during a radiological or other emergency was offered into evidence. (Findings 40, 41)

The only behavioral studies cited by Applicant's witnesses pertained to "following instructions" and an absense of panic. (Finding 42 ) Instructions to evacuate without ones children are considered by the Board to be extraordinary instructions requiring extraordinary reassurances. It is also evident that attempts to reunite families can be carried out in the absense of panic. Therefore the studies cited may not be germane to the behavior considered by intervenors. (Finding 42)

Without substantiating behavioral research or surveys which show that parents will, in reality, leave their school age children and evacuate separately, and without an adequate evidentiary basis for assertions as to the adequacy of reassurances given to parents, the Board cannot accept Applicant's position that this is the expected behavior.

#### Behavioral Aspects

The dispute regarding human behavior is somewhat revealed in these lines.

Q. Don't almost all of these assumptions (4.1.3) tend to eliminate impediments to a smooth and speedy evacuation?

A. (Witness McCluskey) The assumptions to some degree, identify areas that should be addressed or looked at to affect the evacuation in a timely manner. So, what the assumptions do is to identify what would be necessary to accomplish this evacuation.

Q. Are you prescribing that certain aspects of human behavior be altered in some way so that your time study is sound?



A. No, I'm not saying that human behavior is to be altered.

I am saying that is human behavior. (Tr. 4859 at 1-12.)

Intervenors attempted to establish that the unlikelihood of panic during a radiological disaster has not been proven and secondly, that given the breadth and diversity of human behavior, the authors descriptions of human behavior in assumptions and supporting testimony are not only unreasonable but irresponsible. McCluskey was unable to demonstrate how her personal experience with evacuation offers insights into human behavior during a radiological disaster. (Finding 43 )

Applicant's witnesses cite an EPA document entitled "Evacuation Risks--An Evaluation" 1974, and quote from its conclusions as follows "the idea that people will panic in the face of great threat or danger is very widespread. However, it is not borne out in reality. Insofar as wild flight is concerned the opposite behavioral pattern in most disasters is far more likely." (Emphasis theirs.) (McCluskey & Horst Applicant Prepared Testimony at 7; ff. Tr. 4834.)

First, the Board wonders if the opposite behavioral pattern to wild flight is not, in fact, complete passivity and non responsiveness. This creates many problems for the assumption used in the study that people will leave when instructed to leave. (Finding 44)

Even if the Board accepts Ms. McCluskey's definition of the opposite behavioral pattern as being that which was used in the study, there are still two problems. (Finding 45)

First, the conclusion to the EPA document is hardly definitive. The statement that "the opposite behavioral

pattern (to wild flight) in most disasters is far more likely," does not inform the Board that wild flight or panic will not occur, or that the opposite behavioral pattern is far more likely in all disasters. (Finding 46 )

These uncertainties cannot be resolved based on the evidence at hand as the Applicant has chosen to quote from the conclusion of a study rather than offer it into evidence. (Finding 47 )

Second, the Applicant's witnesses have largely denied the existence and the impact of some middle ground between "wild flight" and the "opposite behavioral pattern." The word opposite itself implies that there is some middle ground as does common experience. (Finding 48 )

The insensitivity of the study's authors and the study itself to this middle ground, to unconstructive human behavior short of hysteria resulting from a marginally understood and stressful situation is unwarranted. Some attempt must be made to quantify behavioral factors or provide a margin for error in recognition of the uncertainties involved. In fact, Dr. Horst has testified that this can be done. (Finding 49 ) As indicated by the NRC staff witness, NUREG-0654 intends that if there is some basis for believing that people might act in any particular way, then that behavior should be factored in the analysis. (Finding 32 ) Evidence was presented and testimony given which has led the Board to conclude that people will act in a way contrary to the behavior assumed by the Evacuation Time Study for peak populations.

The Board concludes that the Byron Evacuation Time Study



does not adequately consider peak populations and behavioral aspects. The Study is, therefore, impaired as a useful and accurate guide to assist the responsible decision makers in the choice of an appropriate protective action. (Finding 50 )

Sub paragraph 2(k) Weather Characteristics in the Evacuation  
Time Study

---

Appendix 4 to NUREG-0654 indicates that two weather conditions--normal and adverse--are to be considered in the Evacuation Time Study. (NUREG-0654 at 4-6.) Adverse weather has been defined in the Byron Evacuation Time Study as those conditions that reduce road capacity to 70% of normal weather capacity and includes conditions that may impair visibility and/or traction, such as light snow, icing, rain, or fog. (Finding 51 ) Yet author Horst 'can only speculate' as to whether decision makers know what 70% roadway capacity looks like. (Finding 52 ) In fact, IESDA planner David Smith has no idea what 70% of roadway capacity looks like. (Finding 53)

Authors state in written testimony that the adverse weather which was used in the Evacuation Time Study was the most common adverse weather, i.e., rain which was assumed to reduce road capacity to 70% of normal road capacity and increase the time required to travel home from 30 to 45 minutes. (Finding 54 ) Dr. Horst insists that conditions other than rain (e.g., a light snowstorm) can be compared to rain in the summertime to determine if "adverse" conditions, as used in the study, exist. (Finding 55 )

The prescribed use of rain as a reference is not found in the study and the effects of snow on roadway capacity was not considered in the analysis. (Findings 56, 57) NUREG-0654, Appendix 4 suggests that an area such as Byron, a northern site with a high summer tourist population, should consider rain, flooding or fog as the adverse condition as well as snow with winter population estimates. (Finding 58 )

The study does not identify the adverse weather frequency used pursuant to NUREG-0654 at 4-6. (Finding 59 ) Additionally, Dr. Horst has no idea how often in a typical year a decision maker would be faced with a weather condition that is more adverse than the adverse condition selected in the study. (Finding 60 )

Based on the study's presentation, decision makers will not know with any degree of certainty whether adverse conditions considered in the study apply, whether enough rain has fallen or run off or whether enough snow has been plowed.

Judgement is, of course, called for but significant information such as the nature and frequency of the adverse weather condition assumed in the study are absent in the document. The Board, therefore, finds that the Evacuation Time Study does not adequately consider site weather characteristics so as to be a useful tool for decision makers.

#### CONCLUSION

The Board concludes that the Byron Evacuation Time Study does not adequately consider the relative significance of alternative assumptions; the impact of peak populations

including behavioral aspects, and site weather characteristics. The Evacuation Time Study does not conform to NUREG-0654, Appendix 4 and will not provide accurate or useful guidelines for the choice of protective actions during a radiological emergency.

Paragraph 3 - Emergency Medical Services

Intervenors contend that:

In violation of 10 C.F.R. Section 50.47(b)(12), emergency planning for the Byron Station EPZ does not sufficiently address the fact that there are inadequate medical facilities to provide the equipment and trained personnel to care for contaminated injured persons; that there are insufficient procedures for the screening, treatment, and isolation of persons sustaining radiological injuries; and that there is an insufficient number of materials, supplies, equipment, and vehicles to provide for the transportation of injured persons during a radiological disaster.

Applicable Law

10 C.F.R., Part 50, Appendix E states at IV(E):

- (6) Arrangements for transportation of contaminated injured individuals from the site to specifically identified treatment facilities outside the site boundary;
- (7) Arrangements for treatment of individuals injured in support of licensed activities on the site at treatment facilities outside the site boundary;

The standard cited for this Contention, 10 C.F.R. 50.47(b)(12) states:

- (b) The onsite and offsite emergency response plans for nuclear power reactors must meet the following standards:

- (12) Arrangements are made for medical services for contaminated injured individuals.

During the course of the Byron Licensing Proceedings, an interpretation of 10 C.F.R. 50.47(b)(12) was made by the Commission. The meaning of the phrase, "contaminated injured", and the scope of "arrangements...for medical services" to be provided for the public in the event of a nuclear power accident were elaborated upon. Accordingly, the Commission concluded that emergency response efforts should include consideration of: (1) those who become injured and are also contaminated, and (2) those who may be exposed to dangerous levels of radiation. Further, the Commission stated:

With respect to individuals who become injured and are also contaminated, the arrangements that are currently required for onsite personnel and the emergency workers provide emergency capabilities which should be adequate for treatment of members of the general public. Therefore, no additional medical facilities or capabilities are required for the general public. However, facilities with which prior arrangements are made and those local or regional facilities which have the capability to treat contaminated injured individuals should be identified. Additionally, emergency service organizations within the plume exposure pathway emergency planning zone (EPZ) should be provided with information concerning the capability of medical facilities to handle individuals who are contaminated and injured. With respect to individuals who may be exposed to dangerous levels of radiation, treatment requires a lesser degree of advanced planning and can be arranged for on an as-needed basis during an emergency. Emergency plans should, however, identify those local or regional medical facilities which have the capabilities to provide appropriate medical treatment for radiation exposure. No contractual agreements are necessary and no additional hospitals or other facilities need be constructed. Southern California Edison Company (San Onofre Nuclear Generating Station, Units 2 & 3) CLI - 83-10, at 2-3, 17 NRC \_\_\_\_, April 4, 1983.

### Discussion

The Commission's highly restrictive interpretation of the planning standard for intervenors contention on Emergency Medical Services, and the stipulation which the parties entered into, reduced considerably the scope of this contention. The digestion of these two influences and the distilling of the meaning of the contention in the new context is reflected in the record.

Because the Commission is silent as to the treatment of individuals who are contaminated and who are not injured traumatically, but moderately, and have not been exposed to dangerous levels of radiation and also silent with respect to those who are contaminated but not injured in any way: that is, by radiation or by traumatic injuries, (Tr.5061.) virtually any consideration of medical needs generated by the contamination of persons in the general public become off limits to intervenors. As the Commission states above, "no additional medical facilities or capabilities are required for the general public." The arrangements that are required for onsite personnel are to be considered adequate for the general public. The Board, in light of its responsibility to protect the public health and safety from undue harm, has taken a very close look at arrangements for onsite personnel.

Commonwealth Edison has contracted with Rockford Memorial Hospital to provide emergency services for its onsite Byron personnel who may be injured and contaminated. (Finding 61)

The record contains little evidence attesting to the capabilities of this facility. Neither Applicant, nor NRC Staff offered witnesses in the medical profession capable of offering



testimony on the adequacy of Rockford Memorial. The contract with Rockford Memorial Hospital was made by medical department and station personnel who did not appear. (Findings 62, 63, 64)

The record was further inhibited by the fact that the Rockford Memorial's Emergency Room facility to be used in the event of an accident at Byron has not been built yet. (Finding 65) Despite this, enough information was made available to raise some areas of concern.

The emergency room facility will have 18 beds without the possibility of isolation from each other. (Finding 66) In addition to this shortcoming in the facilities for the care of external contamination, we find that Rockford Memorial will not have the capability of providing care for internally contaminated persons. (Finding 67)

The record does not show with any degree of certainty that Commonwealth Edison has contracted with a facility capable of providing treatment for internally contaminated persons. Dr. Golden could only speculate that Northwestern Memorial has facilities to treat persons with internal contamination. (Finding 68)

Applicant's witness David Ed states in prepared testimony that victims of radiation exposure can be adequately treated at Northwestern Memorial Hospital. Mr. Ed's familiarity with the facility is limited. (Findings 69, 70)

Edison has an agreement with the Byron Fire Protection District to provide emergency ambulance service to the Byron Station. (Finding 71) But again, Applicant and NRC Staff have failed to

present witnesses with any familiarity with the facility. The present revision of the Byron plan shows some shortage of equipment BFPD. (Finding 72)

The draft Byron plan identifies six ambulance services in or near the emergency planning zone that are to provide support in a radiological emergency including the transportation of contaminated injured persons. (Finding 75) Of the five ambulance services identified in the Byron plan, 4 responded to intervenors survey. Three of these four services do not have a written protocol for the transportation of patients contaminated in a radiological emergency. (Finding 73) A contaminated person in transit should have some individual familiar with radiation and decontamination procedures with them. (Finding 74)

The one responding ambulance service with such protocols possesses no protective equipment or radiation survey instruments for emergency workers use in their own protection and in the isolation of contaminated or contaminated injured persons. (Finding 73) Three of the five ambulance services in the EPZ lack such protective equipment while a fourth only has blankets for isolation. These ill-equipped services are charged with protecting the public health and safety in the event of an incident at Byron.

The number of individuals both onsite and offsite who may become contaminated and injured is estimated to be "from one to perhaps 25 or so" individuals. (CLI 83-10 page 11.) So even if all EPZ ambulance services attend to contaminated injured, there is still a possibility that more would be needed.



Mr. Smith from IESDA testified that additional mutual aid agreements with other ambulance services outside the EPZ are being pursued including but not limited to those in Rochelle and Rockford. Ambulance services in two adjoining counties may be included in the plan after the need for such support is assessed. NRC Staff witness Gordon Wenger contemplated the possibility of the use of National Guard ambulances based in Illinois. No details describing the workings of any such proposed arrangements are in the record or the IPRA itself. (Findings 77, 78)

#### Conclusion

The record does not demonstrate that there are adequate arrangements for contaminated injured onsite personnel and emergency workers, (Finding 79) hence the capabilities for treatment of members of the general public cannot be considered adequate. Applicant has revealed very little about its arrangements for the treatment of its personnel who are contaminated and injured. We conclude that this planning does not satisfy the requirements for emergency medical services under the San Onofre decision.

#### Paragraph 8 - Local Protection Afforded by Protective Measures

Intervenors contend that:

In violation of 10 CFR 50.47 (b) (10), emergency plans are incapable of offering sufficient guidance for the choice of protective actions during an emergency since applicant and state planners have yet to adequately determine the local protection afforded (in dose reduction) by various protective measures including evacuation,

sheltering, and radioprotective prophylaxis.

Applicable Law

The standard for this contention is stated under the "Applicable Law" discussion in regard to the Evacuation Time Study. The Evaluation Criteria for this standard relevant to intervenors contention is found in NUREG-0654 at II.J.10 and provides:

- (10) The organization's plans to implement protective measures for the plume exposure pathway shall include:

\*\*\*\*\*

- (F) State and local organizations' plans should include the method by which decisions by the state health department for administering radioprotective drugs to the general population are made during an emergency and the predetermined conditions under which such drugs may be used by offsite emergency workers;

\*\*\*\*\*

- (M) The bases for the choice of recommended protective actions from the plume exposure pathway during emergency conditions. This shall include expected local protection afforded in residential units or other shelter for direct and inhalation exposure, as well as evacuation time estimates;
- 10 CFR Part 50 Appendix E, Section IV requires that:

The nuclear power reactor operating license applicant

shall also provide an analysis of the time required to evacuate and for taking other protective actions for various sectors and distances within the plume exposure pathway EPZ for transient and permanent populations.

#### Discussion

The goal of emergency planning for a radiological incident is to totally eliminate or maximally reduce the dose commitment accumulated by the general population. Timely evacuation is always the preferred protective measure since it can reduce dose commitment to zero. (Finding 80)

The utility of the evacuation time study as a tool to be used in recommending protective actions was appraised in many ways with widely differing degrees of enthusiasm. (Findings 31, 82, 83) There was agreement however that if responsible governmental officials are to choose an appropriate protective action in a given radiological emergency, they must have available to them realistic estimates of the time in which, in light of existing local conditions, evacuation could reasonably be accomplished. Our opinion on paragraph 2 of the emergency planning contention rules this portion of paragraph 8. (Finding 84)

When a timely evacuation is impractical or impossible and sheltering must be considered as an alternative to evacuation, state planners use a generic shelter protection factor. The reduction in dose commitment through sheltering is then compared to the dose reduction afforded by an untimely evacuation. The dose reduction factor likely to be used for sheltering assumes a single-story wood frame

building, the least protective type of sheltering provided by a permanent structure. Applicants witness explains that this conservatism is consistent with state policy which favors evacuation. (Findings 85, 86)

The actual protection afforded by shelters in the Byron area is higher than that for a one-story wood home. Therefore a delayed evacuation (selected on the assumption of one story wood homes) may not maximally reduce the dose commitment accumulated by the general population. Once a timely evacuation is determined to be unfeasible, a policy which favors (untimely) evacuation over sheltering is no longer necessarily in the interest of the public health and safety. (Findings 87, 88)

The gathering of information needed to select the optimum protective action will include an analysis of local conditions and constraints and any other factors necessary to determining the viability of each protective action. (Finding 89)

In assessing the value of sheltering as a protective action it is not necessary for decision makers to determine the sheltering capability of every structure in the EPZ. Such an undertaking would be an inefficient use of emergency personnel (Finding 90) The suggestion that perhaps buildings which would serve as congregate shelters should be surveyed for their sheltering capability was too quickly dismissed by applicants emergency planner. Dr. Golden considered it impractical to identify structures for sheltering large numbers of people since it would be self defeating to

order people who are capable of being evacuated to move to a building still within the EPZ. (Finding 91) Since no estimates of "the time required..for taking other protective actions" (other than evacuation) have been made in compliance 10 CFR Part 50, Appendix E. Section IV, it cannot be assumed that evacuation can be achieved in as timely a manner as sheltering. (Finding 92)

Sheltering is a protective action consisting of doing the best you can with what you have. (Finding 93)

Utilizing the communities' most effective shelters is consistent with the priority of maximally reducing the dose received through any given protective action. If a dose reduction can be achieved by moving children into the next school building then school administrators should know that and that shall be done. Determining the dose reduction afforded by large buildings already in existence accessible to small communities and transient populations makes sense. (Finding 94)

Information on sheltering and assistance in the development of a sheltering strategy (optimum locations in buildings and methods of restricting ventilation for respiratory protection) would be most useful to nursing home and school officials who do not possess the expertise required to minimize dose commitment through effective sheltering. (Findings 95, 96)

It is advised that responsible authorities initiate an experimental determination of shielding factors for major structures in the Byron EPZ with emphasis on school buildings



and nursing homes. No house to house inspection is called for since no party seems to advocate this and the board agrees with applicants witnesses that such an undertaking not be an effective deployment of emergency personnel. However, theoretical determination of shielding factors which incorporates a mix of structures is in order and could be based on some surveying. Homeowners may be interested to know whether their home offers as substantial a dose reduction as, say, their neighbor's house and hence the distribution of a brief table summarizing shielding factors would be useful in maximizing dose reduction through sheltering.

#### Administration of Potassium Iodide (KI)

The board has 2 problems with applicants policy on KI. The board accepts that KI is not a substitute for sheltering or evacuation because of its singular contribution to dose reduction. (Finding 97) However, the board has some difficulty understanding the policy statement on KI insofar as it appears to set the merits of KI up against some other protective action. KI is effective in reducing dose commitment to the thyroid gland due to the ingestion or inhalation of radioactive iodine and can be used in consort with evacuation or sheltering. Secondly, the policy is discriminatory in that KI is provided to special groups that cannot evacuate in a timely manner but will not be provided generally if the population at large cannot evacuate in a timely manner. (Finding 98)

Conclusion

The board concludes that there has not been compliance with 10 CFR, Part 50, Appendix E, Section IV; 10 CFR, Part 50. 47(b)(10); or the guidance of NUREG-0654. The Applicant and state emergency planners have not adequately determined the local protection afforded (in dose commitment reduction) by evacuation, sheltering, or the administration of Potassium Iodide.



Paragraph 10 - Reliance on Volunteer Emergency Personnel

Intervenors contend that:

The emergency planning relies too heavily upon volunteer personnel to effect an evacuation. The emergency plans fail to indicate the number of volunteer personnel who are necessary or available to perform the responsibilities assigned to them.

Furthermore, the plans do not:

- (a) assess the availability of volunteers during hours in which many are employed outside the EPZ;
- (b) take into consideration inevitable personal conflicts in the responses of volunteers who have families in the EPZ; and,
- (c) give consideration to the possibility that some volunteers who might perform well in non-radiological disasters might refuse to participate in a radiological disaster at the Byron Station.

Applicable Law

10 C.F.R. 50.47(b)(1) states:

The onsite and, except as provided in paragraph (d) of this Section, offsite emergency response plans for nuclear power reactors must meet the following standards:

- (1) Primary responsibilities for emergency response by the nuclear facility licensee and by state and local organizations within the Emergency Planning Zones have been assigned, the emergency responsibilities of the various supporting organizations have been specifically established, and each principal response organization has staff to respond and to augment its initial response on a continuous basis.

10 C.F.R. Part 50, Appendix E further stipulates that the plans submitted must include a description of their contents:

"...sufficient to demonstrate that the plans provide reasonable assurance that adequate protective measures can and will be taken in the event of an emergency."

The Board recognizes that an emergency response plan that lacks sufficient personnel to implement such an undertaking is inadequate and unworkable.

#### Discussion

Volunteer and part-time emergency workers are to provide numerous essential emergency services, including notification of the public, access and traffic control, transport of the mobility impaired, emergency medical services, fire protection and law enforcement in the event of an accident at Byron.

(Finding 99)

Individuals with close personal knowledge of nursing home and bus service personnel in the Byron area doubt the willingness of volunteer and part-time personnel to serve as emergency workers during a nuclear disaster at the Byron Station. Family concerns are cited. (Finding 100) The Director of IESDA, Mr. Erie Jones, acknowledged the fact that volunteers would be reluctant to turn to emergency duties until such time as they have been reassured about the safety of their families. Mr. Jones conceded that some volunteers may not render assistance at an emergency because of family and other commitments, but he believes that their numbers would not be so great as to impair the implementation of the emergency plan. (Findings 101, 102)

The plan and the record fail to indicate that consideration has been given to the number of volunteers who are necessary or

available for emergency response to an incident at Byron. (Finding 103) Rural areas tend to rely more heavily on volunteers for emergency services. (Finding 104) No determination has been made as to how many volunteers in the Byron plan have dependent families or other commitments which would make them unavailable. (Finding 105) The Byron Superintendent of schools was concerned that part-time bus drivers employed outside the EPZ would be unable (due to distance or weather conditions) or unwilling to return to the schools during an emergency. (Finding 106)

Mr. Jones suggests that the very fact of their volunteering would demonstrate a volunteer's motivation to perform an emergency service. (Finding 107) The decision to be a particular type of volunteer, however, is based in part on the person's assessment of the type and level of danger involved. David Smith notes that it is a different type of person that volunteers to be a fireman than the person that volunteers to be an ambulance service member. (Finding 108) People do not present themselves to IESDA and volunteer to be a radiological emergency response worker for the Byron IPRA. They are persons who have made themselves available to the local units of emergency services ~~that~~ have come to have a role in the IPRA. (Finding 109)

Mr. Jones testified that volunteers have responded well in emergency situations that involve risks similar to a radiological emergency. (Finding 110) A volunteer's conception of what he will experience once he gets to the scene may affect his response. (Finding 111) Radiation cannot be detected by the senses and there is some debate over the long-term health effects of radiation. (Finding 112) Fear of contamination led many more persons

to evacuate a wide area surrounding the Three Mile Island reactors than were instructed to leave. (Finding113) Nothing in the record indicates that non-nuclear emergency situations have ever aroused this kind of flight or that another nuclear accident would not. Volunteers have not been called to assist in a radiological emergency in Illinois. (Findings114,115)

Mr. Jones and the NRC Staff sponsored witness from the Federal Emergency Management Agency (FEMA) stated that training and awareness of the dangers involved is the key to effective performance by volunteers in an emergency. (Finding116) Mr. Jones testified that he has "never" had a volunteer panic. (Finding 117) Thomas Bowes, President of the Reserve Association for the Ogle County Sheriffs Department, testified that although training certainly has the effect of reducing fear, training does not eliminate panic. (Findings118,119) Mr. Bowes testified that his understanding of radiation had been enhanced by training, readings, and a conversation with Mr. Wenger. Although his fears of radiation had been significantly reduced, he would still abandon an emergency post if he believed that exposure to the plume would occur. (Finding 120)

### Conclusion

Generally, the IPRA- Byron, Volume 6, Revision 0, fails to indicate the number of volunteer personnel who are necessary or available to perform the responsibilities assigned. The plans do not (1) assess the availability of volunteers during hours in which many are employed outside the EPZ; (2) take into consideration inevitable personal conflicts in the responses of volunteers

who have families in the EPZ; or (3) give consideration to the possibility that some volunteers who may perform well in non--nuclear disasters might refuse to participate in a nuclear disaster at the Byron Station.

IESDA has failed to assemble data on: (1) the work location of volunteers and time needed for their response to emergency notification; (2) the number of volunteers with families in the EPZ; and (3) the number of volunteers who would refuse to respond at all to nuclear emergencies.

This data would indicate the need to recruit additional personnel to provide adequate response on a 24-hour basis and give some assurances that assigned volunteers could and would - in fact - respond when needed.

#### Paragraph 13- Communications with Emergency Response Organizations

Intervenors contend that:

In violation of 10 C.F.R. 50.47 (b) (1), the emergency plans, specific tasks, and responsibilities have been formulated without sufficient communication between planning officials and primary and support response organizations so as to enable said organizations to fulfill their assigned roles.

#### Applicable Law

Intervenors cite 10 C.F.R. 50.47(b)(1) which states in relevant part:

The onsite and, except as provided in paragraph (d) of this Section, offsite emergency response plans for nuclear power reactors must meet the following standards:



- (1) Primary responsibilities for emergency response by the nuclear facility licensee, and by state and local organizations within the Emergency Planning Zones have been assigned, the emergency responsibilities of the various supporting organizations have been specifically established...

NUREG-0654 offers additional guidance under II.A.3.:

Each plan shall include written agreements referring to the concept of operations developed between federal, state, and local agencies and other support organizations having an emergency response role within the Emergency Planning Zones. The agreements shall identify the emergency measures to be provided and the mutually acceptable criteria for their implementation, and specify the arrangements for exchange of information...

#### Discussion

Adequate planning is clearly reliant upon communications between emergency planners and response organizations. The final determination as to whether communications have been adequate can only come when the plan has been completed and tested.

Intervenors, state planners, applicants, and federal reviewers are clearly at the mercy of awkward time tables in discussing the adequacy of communications at such an early stage in the planning. The Board has been thrown into an even more awkward position of having to decide the issue.

Intervenors have offered into evidence the testimony of three school superintendents, two nursing home administrators, and the director of the county program for handicapped students. All assert that communications have been unsatisfactory. (Finding 121)

Several of the school superintendents raised questions concerning the liability of emergency response organizations during and emergency. These questions have been brought to the attention

of IESDA and that organization shall address them. (Finding 122) The unresponsiveness of state officials to repeated inquiries over many months from school superintendents is of concern to the Board and is relevant to this portion of the emergency planning contention. Whereas some questions regarding the logistics of the emergency plan might have been premature, these questions on liability were raised at an appropriate time in the planning process.

Applicants testimony is that the local response organizations are given an opportunity to review the plan during its development to ensure that it reflects their organizational structure and their resources. (Finding 123) Intervenors have demonstrated that this has not thus far been the case. A weeks time was given for review of Revision 0. (Finding 124)

IESDA has developed an Emergency Response Training Plan Matrix (Applicant's Exhibit No. 20) which identifies the organizations that have emergency responsibilities under the Byron Plan and what aspects and procedures of the plan each group must be trained in and familiar with. (Finding 125) The Board is hence aware of what we must look for but has received insufficient evidence to conclude that compliance will occur. Applicant presented no testimony from IESDA field workers who have had or will have contact with Intervenors' witnesses and other emergency response personnel. (Finding 126)

#### Conclusion

The Board cannot find that the specific tasks and responsibilities have been, or are being formulated with sufficient

communication between planning officials and the emergency response organizations so as to allow those organizations to fulfill their assigned roles. Despite the forward looking nature of the decision this Board must render, this Board does not at this time find reasonable assurance that the final plans will reflect adequate input from the local response organizations to ensure that they can fulfill their assigned roles.

FINDINGS OF FACT

1. In December, 1982, by order of the Licensing Board and by agreement of the parties, three contentions concerning emergency planning were admitted for purposes of litigation. The admitted emergency planning contentions were DAARE/SAFE Contention 3 and Rockford League of Women Voter's Contentions 19 and 108. On February 21, 1983, Intervenors filed their "Amendment and Consolidation of DAARE/SAFE Contention 3 and Rockford League of Women Voter's Contentions 19 and 108" (hereafter, the "Revised Emergency Planning Contention") which stated various emergency planning issues in 13 separate paragraphs. By stipulation of the parties, dated March 30, 1983, it was agreed that Intervenors would withdraw DAARE/SAFE Contention 3 and League Contentions 19 and 108, that certain paragraphs of the Revised Emergency Planning Contention would be litigated, and that the remaining paragraphs of the Revised Emergency Planning Contention would be resolved informally outside of the hearing process. (The Stipulation of the parties however, does provide a mechanism for formal resolution of the emergency planning issues in the event the informal process fails.) These findings are limited to those issues which the parties agreed to litigate and for which evidence was presented and the record closed, specifically Revised Emergency Planning Contention paragraphs 2(c), 2(e), 2(k), 3, 8, 10 and 13.

2. Applicant presented the testimony of five witnesses. Ms. Jean L. McCluskey and Dr. Thomas J. Horst, employees of

Stone & Webster Engineering Corporation presented joint testimony and appeared as a panel. Ms. McCluskey is the Project Manager for the Byron Station Evacuation Time Study. Dr. Horst is responsible for the technical aspects of the Study. Ms. McCluskey and Dr. Horst testified as to the purpose, assumptions, and limitations of the Evacuation Time Study, which was the subject of Paragraphs 2(c), 2(e), and 2(k) of the Revised Emergency Planning Contention. Dr. John Golden is Applicant's Supervisor of Emergency Planning and his testimony addressed medical arrangements and protective actions, the subjects of paragraphs 3 and 8. Dr. Golden also answered questions on examination pertaining to the Evacuation Time Study. Mr. David Ed of the Illinois Department of Nuclear Safety (EDNS) addressed medical arrangements, protective actions and planning coordination, the subjects of paragraphs 3, 8, and 13. Mr. David Smith, Chief of Field Services for the Illinois Emergency Services and Disaster Agency (IESDA), addressed medical arrangements, volunteers and planning coordination, the subjects of paragraphs 3, 10, and 13. Mr. Smith also answered questions on questions to the Evacuation Time Study. Mr. Ed and Mr. Smith appeared as a panel. Mr. E. Erie Jones, Director of IESDA, addressed the use of volunteers in emergency planning, the subject of paragraph 10. Mr. Jones also addressed emergency planning in Illinois and for Byron Station in general.

3. The NRC Staff presented three witnesses. Dr. Thomas Urbanik is associated with the Texas Transportation Institute of Texas A & M University and is responsible to the NRC for



reviewing evacuation time estimates for nuclear facilities. Dr. Urbanik testified as to his review of the Evacuation Time Study, the subject of paragraphs 2(c), 2(e), and 2(k) of the Revised Emergency Planning Contention. Mr. Monte B. Phillips, an Emergency Preparedness Analyst with the NRC, addressed the Evacuation Time Study, medical arrangements, and protective actions, the subjects of paragraphs 2(c), 2(e), 2(k), 3, and 8. Mr. Gordon Wenger, a Community Planner with the Federal Emergency Management Agency (FEMA), addressed medical arrangements, protective actions, volunteers, and planning coordination, the subjects of paragraphs 3, 8, 10 and 13.

4. Intervenors presented the written testimony of 9 witnesses in affidavit form. The testimony was prepared prior to the Stipulation which removed many of the issues from litigation. Consequently, their prepared testimony has been edited by agreement of the parties to exclude those portions made irrelevant by the Stipulation. Intervenors lead witness was Mr. Paul Holmbeck. Mr. Holmbeck appeared on a panel with two of the other witnesses, Mr. James Murphy and Mr. Joel Cowen. The panel addressed a survey of ambulance services conducted by Intervenors pertaining to medical arrangements, the subject of paragraph 3 of the Revised Emergency Planning Contention. The prepared testimonies, as edited, of Mr. Holmbeck and Mr. Murphy subsequently became part of the evidentiary record as Joint Intervenors Exhibits 13 and 20 respectively, pursuant to a stipulation of the parties, approved by the Board. (Tr. 6854-60.) Mr. Cowen's testimony was excluded from admission into evidence. (Tr.

6105-06.) Mr. Thomas Bowes, Administrator of the White Pines Manor Nursing Home, appeared as a witness and addressed protective actions, volunteers, and planning coordination, the subjects of paragraphs 8, 10, and 13. The written testimony of the remaining 5 witnesses was admitted into evidence as edited as Joint Interveners' Exhibits Nos. 14-19 pursuant to a stipulation of the parties and as approved by the Board. (Tr. 6854-60.) Their testimony addresses paragraphs 8, 10 and 13. The five witnesses include: Mr. Gary Montel, Administrator of Pine Crest Manor Home; Mr. J. Michael Maloney, Superintendent of Schools for the Leaf River Community Unity; Mr. Charles Lamb, Director of the Ogle County Educational Cooperative; Mr. David Turner, Superintendent of Schools for the Mt. Morris Community Unit; and Mr. David Miller, Superintendent for the Meridian Community Unit.

Sub-paragraph 2(c) Relative Significance of Alternative  
Assumptions in the Evacuation Time Study

5. Appendix 4 to NUREG-0654 provides that evacuation time estimates should address "the relative significance of alternative assumptions, especially with regard to time dependent traffic loading of the segments of the evacuation roadway network." NRC Staff witness Thomas Urbanik, a primary contributor to NUREG-0654 Appendix 4, explained that this guidance reflects a concern at the time that alternative assumptions for the loading of the roadway network might significantly affect evacuation times. (Urbanik, NRC Staff prepared Testimony, at 5.ff.Tr.5391.)

6. Knowledge of the sensitivity of evacuation time estimates to various conditions can assist decision makers in selecting the appropriate protective action. The development of a range of times which indicates this sensitivity is the purpose of considering alternative assumptions. (Urbanik Tr.5398-6399.)

7. The analysis in the Byron evacuation study is not sensitive to many assumptions to which an analysis for a more densely populated site might be sensitive. (Urbanik Tr.5399.)

8. The largely rural Byron area has a low population density. Roadway capacity is not a constraining factor on evacuation time. The sensitivity of the study is to other assumptions namely preparation and mobilization time. Preparation time controls the evacuation time. (Urbanik Tr.5400,5403, 5410,5414.)

9. According to Mr. Urbanik the Byron evacuation study uses an "inordinatley long preparation time compared to most sites in the U.S." Or larger than average. (Urbanik Tr.5413-5414.)

10. Mr. Urbanik does not purport to be an expert on demographics and has not seen the FSAR for the Byron Station. (Urbanik Tr.5414,5415.)

11. Applicant's witness McCluskey and Horst believe the time study to be in compliance with NUREG-0654, Appendix 4, because their evacuation time study has applied a range of seasonal, and weather conditions to "a detailed consideration of roadway network and population distribution." Section 4.1.2 offers a discussion of the significance of alternative assumptions relative to time dependent traffic loading. (McCluskey and Horst, Applicants prepared testimony at 5-6.)

12. Ms. McCluskey notes that the study identifies major employers in the area (McCluskey Tr.5014.), but not any surveying of who is employed at these sites or how long these sites require for shutdown.

13. Dr. Horst and Ms. McCluskey have gathered no data on where people work relative to their homes (Horst Tr.5013.) in estimating the time required to travel from work to home. Dr. Horst cites experience as a basis for the estimate. (Horst Tr.5014.)

14. No explicit demonstration has been made that the time required to evacuate farms in the area has been considered in the estimation of preparation times. (Applicants Exhibit 18 at 4.3.1, Urbanik Tr.5413.)

15. There appears to be relatively little basis for the

three categories in section 4.1.2 which assess the time required to leave work, travel from work to home or evacuate the home (or farm). (Applicants Exhibit 18 at 4-3.)

16. The influence of a rural setting on preparation times could have been quantified. (Urbanik Tr. 5413.)

Sub-paragraph 2(e) Consideration of Peak Populations and Behavioral Aspects in the Evacuation Time Study.

17. Appendix 4 to NUREG-0654 provides that "(c)onsideration shall be given to the impact of peak populations including behavioral aspects" (NUREG-0654 at 4-10.) Peak populations are addressed in Applicants prepared testimony as peak seasonal and recreational populations. (McCluskey and Horst at 6ff. Tr. 4834.)

Peak Recreational Populations

18. Applicants witnesses have analyzed special events in separate simulations. The study indicates that the presence of additional transient populations associated with special events do not increase the time required to evacuate. (McCluskey and Horst Applicant prepared Testimony at 6ff. 4834; Applicant Exhibit 18 at 6-2.)

19. While no queuing occurs in other scenarios there is queuing during special events. All intersections in the evacuation road network in Oregon are subject to backup. Intersections near the Byron Dragway and the MotoSport Speedway are similarly strained. (Applicant Exhibit 18 at 7-1.) 25,000 to 30,000 persons attend special events in the Byron EPZ. That number doubles or triples the local permanent



population in affected sectors. One such event occurs in Oregon a town of 3,500. (Applicant Exhibit 18, 6-2 and Table 1-1 IPRA-Byron Revision 0.)

21. NRC witness Urbanik asserts that what would have produced different results in the time study would have been an increase in the evacuating population by a factor of 2 to 4. "Then the analysis would have shown something vastly different." (Urbanik Tr.5401.)

22. Mr. Urbanik and Monte B. Phillips are silent in their prepared testimony regarding the special event evacuation time estimates. (T. Urbanik and Monte B. Phillips NRC prepared Testimony.)

#### Peak Populations - Behavioral Aspects

23. The NETVAC II Dynamic Route Selection model purports to account for human decision making in route selection. Driver preference is said to be based on two criteria: The direction of the outbound roadway and the traffic conditions observed at any intersection. (Applicants Exhibit 18 at Appendix A, 4-5; Horst Tr.4868.)

24. Familiarity with the roadways in the Byron area is assumed. (Horst Tr. 4875,4878.)

25. Transient populations, including workers who enter the area for employment and thousands of summer recreational people, are assumed to be familiar with the routes taken to work or to recreational areas. (Horst Tr.4878.) This offers little assurance that actual evacuation routes are known.

26. Horst assumes that transient populations are familiar with the major highways and the major roadways in the area.

Dr. Horst did not know whether transients would know where the Byron Station is located. (Horst Tr.4878.)

27. The impact of speeding, disobeying traffic rules and passing other vehicles with increased frequency is not considered in the study because people familiar with the area are also familiar with the design limitations of their roadways, and because people would drive the speed of other cars on the roadway. (McCluskey Tr.4887-4889.)

28. Dr. Horst repeatedly spoke of a "few individuals" not being familiar with the area. Transient recreational populations number in the thousands on any summer weekend and tens of thousands during school events. (Horst Tr.4881; 4884-5; Applicants Exhibit 18 at tables 3-3 and 3-4.)

29. Applicants witness McCluskey observed that persons unfamiliar with the area would know they are in error, "If they are not going in the same direction as everybody else." (McCluskey Tr.4879.)

30. In Dynamic Route Selection, persons are expected to choose the less congested path, thus tending to optimize traffic flow. (Horst Tr. 4968, 4875.)

31. Dr. Horst conceded that if there was a very high preference to go one way versus another way, a large percentage of the folks would go that way, even though there is congestion on the roadway. (Horst Tr.4875.)

32. Two tendencies during an evacuation (seeking and avoiding more dense traffic) do not give rise to an either/or situation. (Horst Tr.4881.) Consideration of behavioral aspects as used in Appendix 4 to NUREG-0654 means that if there is some basis for believing that people might act in a

particular way, that such behavior should be featured into the analysis. (Urbanik Tr.5406.)

Parents of Schoolchildren

33. The Evacuation Time study assumes that instructions will be followed. (Tr.4863-4864.) It is further assumed in the Byron evacuation time study that persons within the plume exposure EPZ will leave when instructed to leave. (McCluskey Tr.4863-4864; Applicants Exhibit 18 at 4-4.)

34. This assumption runs in the face of required evacuation confirmation procedures and calculated evacuation confirmation times which allow emergency workers to enter a contaminated area because this cost is thought to be outweighed by the benefit of notification and assistance given to persons who did not leave. (Applicants Exhibit 18 at 6-3.)

35. It is assumed that parents will leave without their schoolage children (if those children are in school) during an emergency. (McCluskey and Horst Tr.4998-5000.)

36. Parents response depends on the way the plan is set up. Parents must be informed and reassured before hand that specific arrangements have been made for their children. (McCluskey Tr.4998(marked as 4997) ).

37. McCluskey is convinced of the adequacy of planning documents in assuring parents that school children will be taken care of. (McCluskey Tr.5011.)

38. Both authors state that they are unfamiliar with the public information brochures distributed to area residents which contain instructions for parents of school children. (McCluskey and Horst Tr.4870.)

39. McCluskey recognized that reassurances might be required at the time of the emergency that persons families were being safely evacuated. (McCluskey Tr.5011.) There is no evidence that arrangements for such timely reassurances to parents have been made.

40. Basis for belief that instructions will be followed is "professional experience" and some studies put out by Ohio University. (McCluskey Tr. 4999(marked as 4998) ).

41. No professional experiences or data from any studies which specifically relates to how parents would perceive and react to danger to children during a radiological or other emergency was offered into evidence.

42. The only studies cited were those pertaining to "following instructions" and the absence of panic. Instructions to evacuate without ones children are considered by the board to be extraordinary instructions requiring extraordinary reassurances. Attempts to reunite families can be carried out in the absence of panic.

#### Behavioral Aspects

43. Ms. McCluskey's personal experience with an evacuation does not appear to offer significant insights into human behavior. No mention is made in Ms. McCluskey's discussion of 'North easter' emergencies of the amount of advanced warning for such storms. The only support offered by Ms. McCluskey on the similiarity of her experience in the northeast with a radiological disaster reads thus, "I think both are seen as emergency situations which require a response..." and she goes on to state that this fact is supported by two studies. (McCluskey Tr. 4890-4893.)

44. The opposite behavioral pattern to "wild flight" may well be complete passivity and non responsiveness.

45. Ms. McCluskey defines the opposite behavioral pattern as being that behavioral pattern which was used in the study. (McCluskey Tr.4863-4864.)

46. First, the conclusion to the EPA document cited by witnesses for the Applicant is not definitive. The phrase the opposite behavioral pattern (to wild flight) in most disasters is far more likely does not inform the board that wild flight or panic will not occur, nor that the opposite behavioral pattern is far more likely in all disasters.

47. These uncertainties cannot be resolved based on the evidence at hand as the Applicant has chosen to quote from a conclusion of a study rather than offer it into evidence. Mr. Bielawski directs us, (at Tr.4865.) to the quote for a definition of "wild flight" and the "opposite behavioral pattern". But no definitions present themselves.

48. Some middle ground between "wild flight" and the "opposite behavioral pattern" exists. The word opposite implies that there is some middle ground as does common experience.

49. Dr. Horst believes that all assumptions in the study, if wrong, can be changed, quantified and the impact considered in the analysis. (Horst Tr.4860.)

50. The Board concludes that the Byron Evacuation Time Study does not adequately consider peak populations and behavioral aspects. The study is therefore impaired as a useful and accurate guide to assist the responsible decision makers in the choice of an appropriate protective action.



Sub-paragraph 2(k) Weather Characteristics in the Evacuation  
Time Study

---

51. Appendix 4 to NUREG-0654 indicates that two weather conditions--normal and adverse--are to be considered in the Evacuation Time Study. Adverse weather has been defined (NUREG-0654 at 4-6.) in the Byron Evacuation Time Study as those conditions that reduce road capacity to 70% of normal weather capacity and includes conditions that may impair visibility and/or traction, such as light snow, icing, rain, or fog. (Applicants Exhibit 18 at 2-3.)

52. Author Horst can only speculate as to whether decision makers know what 70% roadway capacity looks like. (Horst Tr.4954.)

53. IESDA's David Smith has no idea what 70% of roadway capacity looks like. (Smith Tr.5298.)

54. Authors state in written testimony that the adverse weather which was used in the Evacuation Time Study was the most common adverse weather, i.e., rain which was assumed to reduce road capacity to 70% of normal road capacity and increase the time required to travel home from 30 to 45 minutes. (McCluskey and Horst, Applicant prepared Testimony at 8-9, ff.Tr.4834.)

55. Dr. Horst insists that conditions other than rain (e.g., a light snowstorm) can be compared to rain in the summertime to determine if "adverse" conditions, as used in the study, exist. (Horst Tr.4958-59; 4968; 4970.)

56. The use of rain as a reference point is not found

in the study.

57. The effects of snow on roadway capacity was not considered in the analysis. (Horst Tr.4958)

58. NUREG-0654, Appendix 4 suggests that an area such as Byron, a northern site with a high summer tourist population should consider rain, flooding, or fog as the adverse condition as well as snow with winter population estimates. (NUREG-0654 at 4-6,4-7.)

59. The study does not identify the adverse weather frequency used pursuant to NUREG-0654 at 4-6.

60. Dr. Horst has no idea how often in a typical year a decision maker would be faced with a weather condition that is more adverse than the adverse condition selected in the study. (Horst Tr.4988.)

Paragraph 10 - Reliance on Volunteers

61. Commonwealth Edison has contracted with Rockford Memorial Hospital to provide emergency services for its onsite Byron personnel who may be injured and contaminated. (John Golden, Applicant prepared Testimony at 4.)

62. Applicant offered no witnesses in the medical profession capable of offering testimony on the adequacy of the Rockford Memorial Hospital facility.

63. Of Applicant's witnesses only John Golden has has visited Rockford Memorial. This visit occurred the day before he gave testimony. Dr. Golden does not possess a medical background. (Golden Tr.5044-5046.)

64. The contract with Rockford Memorial Hospital was made by medical department and station personnel who did

not appear. (Golden Tr.5045-5046.)

65. Rockford Memorial Hospital's Emergency Room facility to be used the event of an accident at Byron has not been built yet. (Golden Tr.5046.)

66. Rockford Memorial Hospital's emergency room facility will have 18 beds which do not have isolated rooms. (Golden Tr.5054.)

67. Rockford Memorial Hospital will not have the capability of providing care for internally contaminated persons. (Golden Tr.5052.)

68. Dr. Golden speculated that Northwestern Memorial has the facilities to treat persons with internal contamination. (Golden Tr.5052.)

69. Applicant's witness Ed states in prepared testimony that victims of radiation exposure can be treated at Northwestern Memorial Hospital. He further testified that Northwestern Memorial is capable of sophisticated analysis diagnosis and treatment of radiation induced injuries. (David Ed, Applicant's prepared Testimony at 10.)

70. Applicant's witness Ed has visited neither Rockford Memorial Hospital nor Northwestern Memorial Hospital. Mr. Ed was unable to recall reading any analysis or diagnosis prepared at Northwestern Memorial Hospital or any account of treatment provided at that facility. (Ed. Tr. 5280, 5283-84.)

71. Edison has an agreement with the Byron Fire Protection District to provide emergency ambulance service

to the Byron Station. (Golden Applicant prepared Testimony at 3-4, ff. Tr.5035.)

72. The Byron Fire Protection District Resource Summary found in the IPRA Byron Preliminary Revision 0, December, 2982, lists no radiation survey instruments and no protective equipment. (IPRA, Vol 6, at Chaptet 2, p. 301.) Applicant's Exhibit No. 19, December 1982.

73. The board suggested that Ambulance Medical Services Survey, question number 16, "Do you have a written protocol for the transportation of patients contaminated in a radiological emergency?" would be acceptable into evidence insofar as the responses came from within the Byron EPZ. Four of the five ambulance services in the EPZ responded to the survey. Three of these four respondents did not have such protocols and a foot note indicates that the other service possesses no protective equipment or radiation survey instruments for emergency workers use in protecting themselves and in isolating contaminated or contaminated injured persons.

74. David Ed of the Department of Nuclear Safety states that some individual familiar with radiation and decontamination procedures should be with a contaminated individual in transit. (Ed Tr.5242.)

75. The draft Byron plan identifies six ambulance services in or near the emergency planning zone that are to provide support in a radiological emergency including the transportation of contaminated injured persons. (Smith Applicant's prepared Testimony at 3, ff. 5170.)

76. Three of the four EPZ ambulance services that responded to intervenors survey indicated a total absense of protective equipment while a fourth possessed only blankets. (Intervenor prepared Testimony, Attachment two, Appendix 2.)

77. Additional mutual aid agreements with other ambulance services outside the EPZ are being pursued including but not limited to those in Rochelle and Rockford ambulance services in two adjoining counties may be included in the plan after the need for such support is assessed. (Smith, Applicant's prepared Testimony at 3-5, ff.5170; Tr.5238; Ed Tr.5239-4.)

78. NRC Staff witness Gordon Wenger contemplates the possibility of the use of National Guard ambulances during an incident at the Byron station. (Wenger, NRC Staff prepared Testimony at 3-4, ff. Tr.5511,) There is no evidence on record that these alternative measures will actually be included in the plans.

79. The Board finds that under the recent interpretation of 50.47(b)(12) in San Onofre applicant has failed to provide reasonable assurance that adequate arrangements for medical services for contaminated injured individuals will be provided.

Paragraph 8 Local Protection Afforded by Protective Measures

80. The goal of emergency planning for a radiological incident is to totally eliminate or maximally reduce the dose commitment accumulated by the general population in a radiological emergency. Timely evacuation is always the preferred protective measure since it can reduce dose



commitment to zero. (Ed, Applicant prepared Testimony, at 11, ff. Tr.5174.)

81. No consensus appears to exist among authors, planners or implementors as to how the evacuation time study is to be used in determining the impact of adverse weather on the advisability of evacuation. (Horst Tr.4958-59, 4968; 4970; Smith Tr.5298; Ed. Tr.5307.)

82. There is little similarity in estimates of the dependability of the time study's figures. Leeway is assumed to be anywhere from 30 minutes to an hour each way to working with blocks of hours. (Horst Tr.4852; Smith Tr. 5300; Golden Tr.5094.)

83. The utility of the evacuation time study as a tool to be used in recommending protective actions was appraised in many ways with widely differing degrees of enthusiasm.

84. If responsible governmental officials are to choose an appropriate protective action in a given radiological emergency, they must have available to them realistic estimates of the time in which light of existing local conditions evacuation could reasonably be accomplished. Our opinion on paragraph 2 of the emergency planning contention rules this portion of paragraph 8.

85. When a timely evacuation is impractical or impossible and sheltering must be considered as an alternative to evacuation, state planners use a generic shelter protection factor. The reduction in dose commitment through sheltering is then compared to the dose reduction likely to be afforded by an untimely evacuation. (i.e. an evacuation that cannot

be timely achieved so as to reduce dose commitment to zero) The dose reduction factor used assumes a single-story wood frame building, the least protective type of sheltering provided by a permanent structure. (Ed, Applicants prepared Testimony at 11-13, ff. Tr.5174; Ed Tr.5349-5352.)

86. The reason given by Mr. Ed for the use of a conservative value for the dose commitment reduction afforded by sheltering is that such a practice is consistent with Illinois Department of Nuclear Safety and IPRA policy which favors evacuation. (Ed, Applicants prepared Testimony at 12, ff. Tr.5174.)

87. If the actual protection afforded by shelters in the Byron area is higher than that for a one story wood home, then a delayed evacuation (selected on the assumption of one story wood homes) may not maximally reduce the dose commitment accumulated by the general population. Many structures in the area are neither one story nor wood. (Intervenor Exhibits 14-19, see esp. Lamb 3.9. Holmbeck 8-12.) It would be similarly disconcerting if the Evacuation Time Study loaded traffic into inferior roadways as a conservatism.

88. Once a timely evacuation is determined to be unfeasible a policy which favors (untimely) evacuation oversheltering is no longer necessarily in the interest of the public health and safety.

89. The "Manual of Protective Action Guides and Protective Actions for Nuclear Incidents." (EPA PAGs) will serve as a basis for Applicants recommendation for protective actions

and will guide state and local authorities in establishing a capability to implement protective actions. (Golden, Applicants prepared Testimony Exhibit at 6.3.1; NUREG-0654 Section II.J.9.) According to the EPA PAGs the gathering of information needed to select the optimum protective action will include an analysis of local conditions and constraints and any other factors necessary to determining the viability of each protective action. (Golden, Applicants prepared Testimony at 6.3.1.; NUREG-0654 Board Exhibit 3 at Section II.J.9; EPA-PAGs at 1.2-1.3, Intervenor Exhibit, Holmbeck at 11.)

90. In choosing between evacuation and sheltering as protective actions it is not necessary for decision makers to know the sheltering capability of every structure in the EPZ. Such an undertaking would be an inefficient use of emergency personnel. (Golden Applicant prepared Testimony at 10-11, ff. Tr.5035; Phillips, NRC prepared Testimony at 10, ff. 5509, Golden Tr.5141-5143.)

91. Applicants witness John Golden asserts that it is impractical to identify structures for sheltering large numbers of people since it would be self defeating to order people who are capable of being evacuated to move to a building still within the EPZ. (Golden Tr.5145.)

92. Applicant has not demonstrated that estimates of "the time required...for taking other protective actions" (other than evacuation) have been made in compliance with 10 CFR, Part 50, Appendix E, Section IV. Therefore it cannot be assumed that evacuation can be achieved in as

timely a manner as sheltering.

93. Sheltering is a protective action consisting of doing the best you can with what you have (Phillips, NRC Staff prepared Testimony at 10-11.)

94. Determining the dose reduction afforded of large buildings already in existence and accessible to small communities and transient populations makes sense.

95. Sheltering reduces exposure to radiation and radioactive materials in varying degrees through providing structural shielding of direct radiation, as well as some mechanical reduction of inhalable radioisotopes. Information on sheltering assistance in the development of a sheltering strategy (optimum locations in buildings and methods of restricting ventilation for respiratory protection) for schools and nursing homes has not been available in the Byron EPZ. Despite this, some facility officials have begun considering how dose savings due to sheltering might be enhanced. (Ed, Applicants prepared Testimony: Attachment 1 page 1; Montel 2,9; Lamb 3,6; Turner 10; Maloney 9; Holmbeck 11-12; Bowes 2,7.)

96. Nursing home and school officials do not possess the expertise required to minimize dose commitments due to sheltering, (Pursuant to the stipulation of the parties, none of the Intervenor's witness was deemed to have expertise in determining sheltering capability of specific structures. Tr.6854-60).

97. KI is only effective in reducing dose commitment to the thyroid gland due to the ingestion or inhalation of

radioactive iodine. KI is not a substitute for sheltering or evacuation because of its singular, limited contribution to dose reduction.

98. In the event of an accident where some dose commitment may be attributable to radioiodine, IPRA may recommend the administration of KI to certain groups within the general population that are difficult, if not impossible, to evacuate in a timely manner- e.g., nursing home occupants, hospital patients and workers, prison inmates and guards, etc.

In the event that the general public cannot evacuate in a timely manner (due to severe weather or an imminent release), sheltering or evacuation will be the prescribed protective action depending upon which measure will be more effective in dose reduction. But whether sheltering or evacuation is prescribed, KI will not be administered to the general public. The rate of uptake of radioiodine in the thyroid gland is much more swift in children. (Ed, Applicant prepared Testimony at 13; Attachment 1, at 1-2; Ed. Tr.5293.)



Paragraph 10 - Reliance on Volunteer Emergency Personnel

99. Volunteer and part-time emergency workers are to provide numerous essential emergency services, including notification of the public, access and traffic control, transport of the mobility impaired, emergency medical services, fire protection and law enforcement in the event of an accident at Byron. Fire protection district and ambulance squad personnel in Mt. Morris, Leaf River, Oregon, Stillman Valley, Davis Junction, Holcomb and Linwood are entirely made up of volunteers. Almost all bus drivers and many police officers are part-time employees. (Holmbeck, Intervenor Exhibit at 20-21.)

100. Individuals with close personal knowledge of nursing home and bus service personnel in the Byron area doubt the willingness of volunteer and part-time personnel to serve as emergency workers during a nuclear disaster at the Byron Station. Family concerns are cited. (Bowes, Intervenor's Prepared Testimony at 6; Intervenor's exhibits 14-18.)

101. The Director of IESDA, Mr. Erie Jones, acknowledged the fact that some emergency workers would be reluctant to turn to emergency duties until such time as they have been reassured about the safety of their families. (Jones, Tr. 5457.)

102. Mr. Jones conceded that some volunteers may not show up at an emergency because of family and other commitments, but he believes that their numbers would not be so great as to impair the implementation of the emergency plan. (Jones Tr. 5458-5459.)

103. The plan and the record fail to indicate that consideration has been given to the number of volunteer firemen, ambulance attendants, nursing home workers, and part-time bus drivers in the

Byron Station EPZ that could be available at the time of an emergency and whether that number could adequately perform the responsibilities given them by the IPRA- Byron.

104. Because the rural counterparts to~~x~~ urban full-time firemen and ambulance service members tend to be volunteers, the percentage of emergency workers who tend to be volunteers tends to be higher in rural areas. (Smith, Tr. 5338.)

105. It has not been determined how many volunteers in the Byron plan have dependent families. (Jones, Tr. 5457.)

106. The Byron superintendent of schools reported to Mr. Gordon Wenger of FEMA that a number of part-time bus drivers for that district have other employment at varying locations outside the EPZ and would have some difficulty returning to the schools during an emergency. Weather would be an additional impediment. The school superintendent also expressed his concern that some bus drivers would simply refuse to appear for duty during a radiological emergency. (Wenger, Tr. 5562-5565.)

107. IESDA Director Jones suggests that the very fact of volunteering demonstrates volunteer emergency workers' motivation to perform a public service. (Jones, Applicant's Prepared Testimony at 6, FF. Tr. 54444; Tr. 5468.)

108. The decision to be a volunteer is based, in part, on the person's assessment of the type of danger. It is a different type of person that volunteers to be a fireman than the person that volunteers to be an ambulance service member. (Smith, Tr. 5319.)

109. People do not present themselves to IESDA and volunteer to be a radiological emergency response worker. They are persons

who have made themselves available to the local units of emergency services and have come to have a role in the IPRA. (Jones, Tr. 5463.)

110. Mr. Jones testified that volunteers have responded well in emergency situations that involve risks similar to a radiological emergency. (Jones, Tr. 5472-5475.)

111. A volunteer ambulance driver's conception of what he will see at the scene of his first car accident may affect his response. (Smith, Tr. 5314-5315.)

112.. Jones acknowledged that it is generally true that a volunteer acting in an emergency capacity during a tornado or a flood can see where the wind or water are dangerous. Radiation cannot be seen, heard or smelled. There is some debate over the long-term health effects of radiation. (Jones, Tr. 5450-5452.)

113. Many more persons evacuated the area around Three Mile Island than were instructed to leave. (Jones, Tr. 5455.)

114. A nuclear disaster will be a new experience for both volunteers and supervisors in Illinois. (Jones, Tr. 5472.)

115. Mr. Jones cannot recall a single transportation accident in Illinois involving radioactive materials to which volunteers were called to assist. (Jones, Tr. 5487.)

116. Mr. Jones and the NRC Staff witness from FEMA stated that training and awareness of the dangers involved is the key to effective response by volunteers in an emergency. (Jones, Applicant's Prepared Testimony, at 6, FF. Tr. 5444; Wenger, NRC Staff's Prepared Testimony, at 6, FF. 5511.)

117. E. Erie Jones testified that he has "never" had a volunteer panic. (Jones, Tr. 5493.)

118. Thomas Bowes, President of the Reserve Association for the Ogle County Sheriffs Department has had over 250 hours training and one year of probationary time in preparation to be a volunteer in the Sheriffs Reserve. He has 20 years experience in volunteer services during which time he has offered assistance during emergencies involving traffic accidents and flooding.

119. Mr. Bowes has experienced irrational and irresponsible behavior on the part of trained volunteers during emergencies involving hesitation in performing responsibilities. Mr. Bowes concludes from his experience as a volunteer that training does not eliminate the possibility of panic. (Bowes, Tr. 5626-5627.)

120. Mr. Bowes testified that his understanding of radiation had been enhanced by training, readings, and a conversation with Mr. Wenger of FEMA. Although his fears of radiation had been reduced significantly, he would still abandon an emergency post if he believed that exposure to the plume would occur. (Bowes, Tr. 5634-5636.)

Paragraph 13- Communications with Emergency Response Organizations

121. Intervenors have offered into evidence the testimony of three school superintendents, two nursing home administrators, and the director of the county program for handicapped students. All assert that communications have been unsatisfactory. (Bowes, Intervenor Prepared Testimony at 2, 8 FF. Tr. 5622; Joint Intervenors' Exhibits 15-19: Montel at 2, 9-10; Lamb at 2-3, 6, 8; Turner at 3-4, 8, 9-10; Miller 3-4, 8, 9-10; Maloney 3-4, 7-11.)

122. Several of the school superintendents have raised questions concerning the liability of emergency response organizations

during an emergency. These questions have been brought to the attention of IESDA and that organization shall address them. (Joint Intervenor Exhibits 16,18-19; Smith, Tr. 5214, 5220, 5354-5355.)

123. Applicants testimony is that the local response organizations are given an opportunity to review the plan during its development to ensure that it reflects their organizational structure and their resources. (Smith, Tr. 5204)

124. School superintendents were given about a weeks time for their review of Revision 0. (Joint Intervenor Exhibits 16, 18 and 19 at 2-4; Tr.5204-5208.)

125. IESDA has developed an Emergency Response Training Plan Matrix (Applicant's Exhibit No. 20) which identifies the organizations that have emergency responsibilities under the Byron Plan and what aspects and procedures of the plan each group must be trained in and familiar with. (Smith, Applicant Prepared Testimony at 6; FF. 5170.)

126. Applicant presented no testimony from IESDA field workers who have had or will have contact with intervenors' witnesses and other emergency response personnel.