October 21, 1983

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
UNION ELECTRIC COMPANY	)	Docket No. STN 50-483 OL
	)	
(Callaway Plant, Unit 1)	)	

NRC STAFF'S PROPOSED FINDINGS OF FACT AND CONCLUSIONS OF LAW

I. INTRODUCTION

This is the second and final Partial Initial Decision ("PID") involving the application by Union Electric Company ("Applicant") for a license to operate the Callway Plant, Unit 1, a pressurized water nuclear reactor located in Callaway County Missouri. The first PID, issued on December 13, 1982 (LBP-82-109, 16 NRC 1826), addressed contentions raised by Joint Intervenors concerning quality assurance/construction defects matters.[1/] The only issue left before the Licensing Board after December 13th was that of emergency planning raised by John Reed. This PID addresses that issue.

In unpublished Memoranda and Orders dated December 7, 1982 and February 25, 1983, the Board admitted nineteen emergency planning contentions raised by Mr. Reed. The parties (Applicant, Mr. Reed, and the NRC staff) subsequently negotiated two settlement agreements ratified

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1/ LBP-82-109 was affirmed by the Appeal Board on September 14, 1983 (ALAB-740, 18 NRC ___). Joint Intervenors subsequently filed a Motion for Reconsideration before the Appeal Board; a ruling on that Motion is pending.

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by the Board on June 23 and July 27, 1983 disposing of all but two of Mr. Reed's contentions. The two remaining contentions, Reed Contentions 6 and 16,[2/] were the subjects of an evidentiary hearing held in Fulton, Missouri on September 13, 1983. Both the Applicant and Staff presented witnesses at the hearing;[3/] Mr. Reed relied on cross-examination for his case. An appearance was also made by the Missouri Public Service Commission under 10 C.F.R. § 2.715.

II. OPINION

Reed Contention 6 focuses on the issue of protective actions against radioiodine. Contention 16 addresses messages with instructions for long-term sheltering. At the hearing, it was clear that the focus of the contentions is nearly identical. It is Mr. Reed's position that potassium iodide ("KI") tablets must be distributed to all members of the general public living within the ten mile plume exposure pathway emergency planning zone ("EPZ").[4/] His position as outlined in his Contention 6 is that the federal government finds KI a safe and effective means of preventing the uptake of radioiodine by the thyroid gland and that shelter

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2/ The full text of Reed Contentions 6 and 16 is attached as an Appendix to this PID.

3/ Also testifying at the hearing were witnesses from the Missouri Bureau of Radiological Health and the Federal Emergency Management Agency. See Finding 1.

4/ Mr. Reed's Contention 6 also addresses the need to provide KI to emergency workers. This issue is moot; the testimony clearly indicated that the State of Missouri will provide KI for all emergency workers (as well as institutionalized personnel living within the 10-mile EPZ) in the event of an accident at the Callway facility. Finding 9.

as a protective measure is not an adequate substitute for KI. Therefore, according to Mr. Reed, 10 C.F.R. § 50.47(b)(10)[5/] requires that KI be distributed to the general public. The instructions for long-term sheltering are deemed inadequate because the instructions do not call for the use of KI.

Iodine is taken from the blood stream by the thyroid gland and used in that gland in the manufacture of certain hormones. If an individual is exposed to radioactive iodine, the body will concentrate the radioactive iodine in the thyroid. This hazard can be minimized by the administration of KI prior to exposure to radioactive iodine. The KI will serve as a blocking agent by saturating the thyroid with nonradioactive iodine. The blocked radioactive iodine is then eliminated in the urine. If taken in a timely fashion (shortly before exposure to radioactive iodine) KI is highly effective in reducing radioiodine exposures to the thyroid gland. If taken at the wrong time, however, KI will have little or no effect as a blocking agent. Finding 2.

5/ That Section reads in its entirety:

> (b) 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:
>
> * * * *
>
> (10) A range of protective actions have been developed for the plume exposure pathway EPZ 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.

Although the testimony indicated that KI can serve as an effective blocking agent, the testimony also indicated that adverse side effects may be associated with the drug as well. The data in this regard is limited, but a number of adverse reactions have been reported. Most of these adverse reactions have been mild; some severe reactions have however been noted. It should be noted that these reactions were reported from controlled distribution of the drug and not from unsupervised use after general distribution to members of the public. Finding 3.

Despite the potential for adverse effects, it is the position of the Federal Radiological Preparedness Coordinating Committee ("FRPCC"), a body that includes representatives from, inter alia, EPA, FDA, FEMA, and NRC, that the short term use of KI is recommended if an individual is likely to receive a projected dose to the thyroid of 25 rem. The FRPCC therefore recommends that KI be stockpiled for distribution to emergency workers and to institutionalized individuals in the event of a nuclear accident. The rationale for singling out emergency workers and institutionalized personnel is based on the following reasons:

(1) the number of individuals for any site is small and requires a limited supply of KI that can be readily distributed;

(2) these individuals would be more likely to be exposed to a radioactive plume in the event of an accident;

(3) the medical histories of the limited number of such individuals can be reviewed and the distribution and administration of KI readily controlled; and

(4) these individuals can be readily monitored for adverse effects by medical personnel.

Finding 6.

Although the FRPCC recommends that KI be distributed to emergency workers and institutionalized personnel, the final determination as to whether KI should or should not be distributed is left to state and/or local officials. Similarly the decision on distribution of KI to the general public is left to state and local government. However, no federal recommendation is made that KI be distributed to the general public. Testimony by the witness from FEMA indicated that while emergency workers and institutionalized persons may not be evacuated in a timely manner, a choice of evacuation as the primary protective measure for the general population in the event of an accident is acceptable to FEMA. Thus FEMA requires compensating measures if a state decides not to distribute KI to emergency workers or institutionalized personnel; no such compensating measures are called for if the decision is not to distribute KI to the general public. Findings 5-7.

It bears noting that KI only protects against one form of radiation (inhalation of radioiodine), while evacuation and sheltering provide protection against other forms as well. In recognizing this fact, the FRPCC cautioned against overreliance upon KI for the protection of the general public:

> One of the considerations in deciding whether to implement the use and distribution of KI for the general population is that KI blocking only effectively reduces the radiation exposure of the thyroid gland. While this is an important contribution to the health and safety of the individual, it is not nearly as effective as measures which protect the total body of the individual from radioactivity. Both

> in-place sheltering and precautionary evacuations can reduce the exposure to the total body . . . . The use of KI for thyroidal blocking is not an effective means by itself for protecting individuals from an airborne release of radioactivity from a nuclear power plant accident and, therefore, should be used in conjunction with sheltering, evacuation, or other protective methods.

Finding 7.

The NRC staff concurs with the Federal decision not to recommend the distribution of KI to the general public. The basis for the Staff position includes the following:

(1) Fatal carcinogenic risk in the event of an accident is greater from the whole body dose than from the thyroid dose. Evacuation and shelter provide protection from both doses; KI only offers protection from the thyroid dose;

(2) Distribution of KI might give the public a false sense of security of protection from the total effects of an airborne release when in fact only the thyroid would be protected;

(3) The Staff is continuing studies on respiratory protective measures that would be effective against airborne particulates as well as against radioiodine;

(4) Problems exist with the distribution of the drug. If the drug is predistributed to the general public, control of when and how it will be used cannot be assured.

Finding 8.

Both FEMA and the NRC staff take the position that the decision whether to distribute KI to the general public should be left to state and local officials. The Director of the State of Missouri's Bureau of Radiological Health, Mr. Ken Miller, described the State's position on

this matter at the hearing. The State has determined that KI will be made available to emergency workers, and institutionalized personnel. The State will be responsible for acquiring the drug; instructions will be provided to those who use KI and dose records will be maintained. Finding 9.

For the general public, the State of Missouri plans to rely on shelter and evacuation as protective measures instead of distributing KI. Mr. Reed appeared to misconceive the State's position at the hearing. Mr. Reed's Contention 6 cites the offsite plans as identifying evacuation as "a last resort" and concludes that shelter is "therefore, the primary protective action." In point of fact, the decision to evacuate or to shelter will be based on expected exposures. If the expected exposure is greater than 25 rem thyroid (the exposure at which Federal guidance recommends KI be distributed to emergency workers) or 5 rem whole body, evacuation will be recommended. Only if the expected exposure is less than 25 rem thyroid (or 5 rem whole body) will sheltering be the recommended protective action for the general public. Finding 10.

During cross-examination, Mr. Reed raised the issue of a very quick release from an accident potentially necessitating the choice of shelter as a protective action even if thyroid exposures are likely to exceed 25 rem. The testimony indicated that the potential for such releases is quite limited. Moreover, the testimony indicated that if the accident scenario and meteorological conditions result in an unlikely "quick release" preventing evacuation, shelter along with ad-hoc respiratory protective measures would provide an adequate level of protection until evacuation could be carried out. Findings 12-13.

This is not the first time the issue of KI for the general public has been litigated in an NRC licensing proceeding. In three previous cases,[6/] licensing boards have determined that state policies not to distribute KI to the general public were consonant with sound emergency planning and that no changes were required in the emergency plans. Mr. Reed provided the Board in this proceeding with no reason to think the case might be otherwise in Missouri. It is important to keep in mind that KI provides protection only to the thyroid, the greater potential for cancer fatalities comes from the whole body dose, and adverse reactions to KI are known to occur. Testimony also indicated that there is a potential for misuse when a drug is distributed to the general public and a fear that individuals may rely too heavily on the drug instead of taking other protective actions such as evacuation or sheltering. (Finding 4). There are also problems associated with the distribution of the drug. Id. In light of all these factors, Missouri has chosen to utilize shelter and evacuation as the primary protective measures for the general public. If thyroid exposures are expected to exceed 25 rem, evacuation will be recommended. In the unlikely event that evacuation is impossible, shelter and ad hoc respiratory protection can be used. Evacuation and shelter, unlike KI, provide protection against whole body doses as well as thyroid doses. In

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6/ Metropolitan Edison Company (Three Mile Island Station, Unit 1), LBP-81-59, 14 NRC 1211, 1664-70 (1981), aff'd, ALAB-697, 16 NRC 1265 (1982); Southern California Edison Company (San Onofre Station, Units 2 and 3), LBP-82-39, 15 NRC 1163, 1186 (1982), aff'd, ALAB-717, 17 NRC 346 (1983); Louisiana Power and Light Company (Waterford Station, Unit 3), LBP-82-100, 16 NRC 1550, 1567 (1982), aff'd, ALAB-732, 17 NRC ___ (slip op. at 27 n.25) (June 30, 1983).

the circumstances, the Board finds that the State of Missouri has adequately developed a range of protective actions for the general public as required by 10 C.F.R. § 50.47(b)(10) and that the Commission's regulations do not require that KI be administered to the general public.

III. FINDINGS OF FACT

1. Reed Contentions 6 and 16 assert that emergency planning cannot be considered adequate unless provisions are made to distribute KI to the general public. See Appendix. In response to these contentions, Applicant presented the direct testimony of four witnesses: Dr. Roger E. Linneman, Neil G. Slaten, Kenneth V. Miller, and Donald F. Paddleford. Fol. Tr. 2268. Dr. Linneman is a medical doctor with expertise in the area of radiological health; his testimony addressed the benefits of KI, the potential for adverse reactions, and various problems associated with its distribution. Mr. Slaten is an engineer with Union Electric who in the event of an emergency will serve as the Radiological Assessment Coordinator; his testimony addressed the effectiveness of sheltering and ad hoc respiratory protection. Mr. Miller is the Administrator of the Missouri Bureau of Radiological Health; his testimony addressed the State of Missouri's position on the distribution of KI to emergency workers and to the general public. Mr. Paddleford is an engineer with Westinghouse;[7/] his testimony dealt with the probability of an accident yielding a significant radioactive release in a very short time, thus rendering evacuation undesirable. The Staff presented the direct testimony of two witnesses: David M. Rohrer and Marlee Carroll. Fol. Tr. 2366. Mr. Rohrer is an emergency preparedness specialist with the NRC; Ms. Carroll is a FEMA

7/ Westinghouse supplied the nuclear steam supply system for Callaway.

representative on the Regional Assistance Committee responsible for reviewing, inter alia, the offsite plans associated with the Callaway Plant. Mr. Rohrer and Ms. Carroll described their respective agencies' position on the distribution of KI to the general public. Mr. Reed presented no witnesses; he relied solely on cross-examination for his case.

2. Iodine is taken from the blood stream by the thyroid gland and used in the manufacture of the thyroid hormones, thyroxine and Triiodothyronine, which regulate metabolism. If an individual is exposed to radioactive iodine, the body cannot distinguish it from stable (i.e., nonradioactive) iodine and, consequently, will concentrate the radioactive iodine in the thyroid. If a hazardous amount of radioactive iodine is or may be present in the atmosphere, the hazard can be minimized through the administration of stable iodine in the form of KI. The KI will increase the blood pool of available iodine for the thyroid. If an individual has not yet been exposed to radioactive iodine, the KI will effectively block the radioactive iodine from concentrating in the already saturated thyroid. The "blocked" radioactive iodine is then eliminated in the urine. Even if an individual has already been exposed to radioactive iodine, within the first hour after exposure a 130 mg. tablet of KI will block 90% of the uptake. If KI is administered within four to six hours after exposure, it will block the uptake by 40 to 50%. KI will have little effect if given more than twelve hours after exposure. The effectiveness of KI as a radioactive iodine blocker, then, is directly related to the time at which it is administered. If taken in a timely fashion it is highly effective in reducing radioactive

iodine exposures to the thyroid gland; if taken at the wrong time, it can have little or no effect. Linneman Direct at 3-4.

3. Potassium Iodide use is not without potential adverse side effects. There has been no experience to date on the general distribution of KI to the public; those who have received the drug up to now have been under direct medical supervision. Dr. Linneman testified that 150 cases of side effects associated with KI have been reported and that some adverse reactions may have gone unreported. The side effects reported range from the mild to severe; four fatalities have been linked to KI. At present, little is known about the incidence of side effects in large populations; estimates range from one in one million to six in ten thousand. Linneman Direct at 4; Tr. 2283-84, 2286, 2289-91, 2306 (Linneman).

4. In addition to the potential of adverse reactions, there are likely to be difficulties in administering KI to the general public. The drug has a shelf life of only two to three years and then must be replaced. Tr. 2307 (Linneman). If the drug is not predistributed to the public, it may not be used in a timely fashion. If, on the other hand, it is predistributed, there is the potential for misuse of the drug. Misuse is more likely with KI because the public is not used to the drug and would be using it in a crisis situation. Tr. 2283, 2292-94, 2305 (Linneman); Rohrer Direct at 4-5; Tr. 2370-71 (Rohrer).

5. The Federal Emergency Management Agency ("FEMA"), the Agency responsible for reviewing offsite emergency plans (see 10 C.F.R. § 50.47(a)(2)), draws a distinction between the provision of KI to emergency workers and the provision of the drug to members of the general public. In either case, the ultimate decision is left to state

officials. The FEMA position is set out in the Agency's "Interim Policy Guidance on Potassium Iodide" dated December 1, 1982:

> Each State has a responsibility for formulating guidance to define if and when potassium iodide is used as a thyroid blocking agent for emergency workers, institutionalized persons, and the general public. Where States elect not to include KI in their preparedness posture either for emergency workers or institutionalized persons, the plans should state under whose authority the decision was made and the rationale for the decision. This rationale should include a description of the alternatives to the use of KI to which the State is committed in the preparedness supporting the State and local plans. This may include special ventilation, sealing of structures, or the use of expedient respiratory protection such as dustmasks.

Carroll Direct at 2-3 (emphasis added). An explanation of a decision not to provide KI to emergency workers is called for, as are compensatory measures. No such compensatory measures are indicated if it is decided not to provide KI to the general public. Carroll Direct at 5.

6. FEMA's position on KI is supported by the Federal Radiological Preparedness Coordinating Committee ("FRPCC"), a committee consisting of representatives from FEMA, NRC, EPA, FDA, and a number of other Federal agencies. The FRPCC recommends the use of KI for individuals likely to receive a projected thyroid dose in excess of 25 rem. Carroll Direct at 4. In amplifying the reasoning behind the recommendation, intended for emergency workers and institutionalized personnel, FRPCC noted the following distinctions between such individuals and members of the general public:

(1) the number of individuals for any site is small and requires a limited supply of KI that can be readily distributed;

(2) these individuals would be more likely to be exposed to a radioactive plume in the event of an accident;

(3) the medical histories of the limited number of such individuals can be reviewed and the distribution and administration of KI readily controlled; and

(4) these individuals can be readily monitored for adverse effects by medical personnel.

Carroll Direct at 4, citing FRPCC's "Federal Policy of Distribution of Potassium Iodide around Nuclear Power Sites for use as a Thyroid Blocking Agent," dated October 2, 1982.

7. The FRPCC concurs with FEMA that the ultimate decision of whether to distribute KI rests with state and local officials. Although the FRPCC endorses the distribution of KI to emergency workers and institutionalized personnel, it warns against overreliance on KI as a protective measure for the general public:

> It is recognized that the decision to use KI for thyroid blocking to protect the health and safety resides with the State and local helth authorities. Therefore, with the exception of the NRC licensee's personnel located on-site during the accident, the decision for use of KI during an actual emergency by all other individuals for whom the use of KI is recommended are the responsibility of these authorities. In addition, because the factors bearing on the desirability of stockpiling and distributing KI for thyroidal blocking of the general population within the Emergency Planning Zone for the Plume Exposure Pathway depend heavily on local conditions, this matter is a decision for State and local authorities to make. In deciding whether to distribute and use KI for the general population, these authorities should carefully evaluate advantages and possible problems in implementing this program for the specific nuclear power plant(s) within their jurisdiction.
>
> One of the considerations in deciding whether to implement the use and distribution of KI for the general population is that KI blocking only effectively reduces the radiation exposure of the thyroid gland. While this is an important contribution to the health and safety of the individual, it is not nearly as effective as measures which protect the total body of the individual from radioactivity. Both in-place sheltering and precautionary evacuations can reduce the exposure to the total body . . . . The use of KI for thyroidal blocking is not an effective means by itself for

> protecting individuals from an airborne release of radioactivity from a nuclear power plant accident and, therefore should be used in conjunction with sheltering, evacuation, or other protective methods.

Carroll at E, citing FRPCC's "Federal Policy . . ."

8. The NRC also has found no compelling reason to recommend the distribution of KI to the general public. The Staff position is based on the following factors:

(1) Studies conducted by both the FDA and NRC indicate that the fatal carcinogenic risk is greater from the whole body dose than from the thyroid dose. This makes the value of administering KI to the general public questionable as other protective measures (e.g., evacuation or shelter) would be instituted based on the more critical effects, which would also reduce the thyroid dose. In addition, an NRC analysis indicates that distribution of KI to the general public would not be cost effective from a cost/benefit standpoint.

(2) KI administration may give the general public a false belief that they would be protected from the total radiation effects of an airborne release when only their thyroid would be protected and the critical dose might be from external radiation or inhalation of particulate matter rather than from uptake of inhaled radioiodine.

(3) The NRC staff is continuing studies on the use of other measures to protect the general public. The work shows some promise for alternative means of reducing the inhalation dose

from an airborne release for all particulates, not just radioiodine particulates.

(4) There are problems in finding an effective means of distributing KI. If the drug is stockpiled, even at the local level, it may not be taken at the optimum time. If KI is predistributed, control of when and how it is used cannot be assured.

Rohrer Direct at 3-5.

9. The State of Missouri has determined that, consistent with Federal guidance, it will make KI available for use by emergency workers and institutionalized personnel. The State will provide the drug to the State Mental Hospital in Fulton and to the local county courts or to emergency units designated by those courts. In the event of an emergency, the State's Bureau of Radiological Health will provide information regarding projected exposures and will offer guidance on the use of KI. The actual decision on whether to administer KI to emergency workers and institutionalized personnel will be made by local officials and hospital officials, respectively. The State will provide information on the use of the drug to those who may use it and will maintain dose records of those people who do in fact take the drug. Miller Direct at 5 and Attachment 1; Tr. 2317-18, 2324-26 (Miller).

10. The State has determined not to provide KI to the general public. Miller Direct at 2, 5, The State considers emergency workers and institutionalized personnel to be at higher risk than members of the general public. Miller Direct at 2; Tr. 2317-18 (Miller). If the expected exposure to members of the public is greater than 25 rem thyroid

or 5 rem whole body, evacuation will be the recommended protective response. If the expected exposure is less than 25 rem thyroid or 5 rem whole body, sheltering will be recommended. Tr. 2319 (Miller), 2346 (Slaten); Slaten Direct at 4; Missouri State Plan, Annex B.

11. Both the NRC staff and FEMA have found Missouri's decision to provide KI for emergency workers and institutionalized personnel but not to the general public to be acceptable. Rohrer Direct at 5; Carroll Direct at 6.

12. Mr. Reed raised in his Contention 6 and at the hearing the spectre that an accident might result in a very quick release, thus precluding evacuation as a protective action and resulting in long-term sheltering being recommended even though thyroid exposures might exceed 25 rem. Mr. Paddleford, in uncontradicted testimony presented on behalf of the Applicant, discussed accident sequences that might result in radiation doses greater than 25 rem to the thyroid. His testimony revealed the following:

(1) An accident beyond a design basis accident must occur. The probability of such an accident occurring at Callaway is estimated to be less than 5×10^{-5} per year. Further, most such accidents would not result in thyroid doses greater than 25 rem.

(2) Westinghouse studies indicate that the great majority (over 90%) of potential core melt and containment failure sequences would occur over a period of several hours and would allow for timely evacuation.

(3) The two scenarios listed in NUREG/CR-0388 that would result in large scale releases of radioiodine in a short period of time

are estimated (in that document) to have an occurrence probability of only 10^{-11} and 10^{-9} per year.

(4) The Callaway Plant is equipped with numerous methods of assessing an accident as it occurs to minimize a time lag between accident development and notification of authorities. Paddleford Direct at 5-12. Thus, even if a (very unlikely) beyond design basis event should occur at Callaway, the bulk of such events would allow for timely evacuation of the affected public. (Tr. 2330-32 (Paddleford).

13. In the extremely unlikely event that evacuation is indicated (i.e., exposures might exceed 25 rem thyroid or 5 rem whole body) but cannot be effectuated, residents will be instructed to take shelter and, if necessary, use ad hoc respiratory protective measures. In such cases, sheltering would be viewed as a temporary measure; after passage of the plume (typically, between 0.5 and 3 hours), evacuation would be recommended. Slaten Direct at 7-8, 15. In the event of an atmospheric release, the public may recieve radiation doses from three exposure modes: exposure to external radiation as the plume passes, exposure to external radiation deposited by the plume, and internal exposure due to inhalation of radionuclides from the plume. Slaten Direct at 3. Sheltering provides protection from all three modes; KI for the most part only provides protection from the inhalation mode. Slaten Direct at 5-8; Tr. 2340-42 (Slaten). Sheltering will reduce the inhalation dose by approximately 35%. Slaten Direct at 6. Ad hoc respiratory measures, such as use of a folded handkerchief, towel, or toilet paper could result in a much greater reduction (on the order of 85%). Slaten Direct at 9-13. A study by James A. Martin, Jr. of the NRC indicated that shelter

and ad hoc respiratory measures are competitive with KI in terms of providing thyroid protection. Slaten Direct at 10, 13.

14. The evidence showed that KI can be an effective means of protecting the thyroid gland from radioiodine. The evidence also showed that there are potential adverse side effects associated with the drug, there is potential for misuse in distributing a drug to the general public, and there is fear that the drug may be relied upon too heavily in the event of an accident. The greater potential for cancer fatalities comes from the whole body dose; KI provides protection only to the thyroid. In light of these factors, Missouri has determined to rely on shelter and evacuation as the primary protective measures for the public. Evacuation and shelter, unlike KI, provide protection to the whole body as well as the thyroid. If thyroid exposures are expected to exceed 25 rem, evacuation will be recommended. The evidence showed that it is extremely unlikely that evacuation will be precluded because of a "quick release," and that if such a release occurs, shelter and ad hoc respiratory measures will provide protection to the thyroid comparable to KI. The NRC staff and FEMA agree that distribution of KI to the general public is not required by NRC regulations and that the State's policy against such distribution is reasonable. This Board concurs.

IV. CONCLUSIONS OF LAW

The Board has considered all documentary and oral evidence presented by the parties on all of the matters in controversy raised by Reed

Contentions 6 and 16. Based upon a review of the entire record in this proceeding and the foregoing findings of fact, the Board enters the following conclusions of law.

This is a contested proceeding on an application for an operating license for a utilization facility. The Board has previously made findings of fact and conclusions of law on the matters put into controversy by Joint Intervenors with respect to construction defects at Callaway and Applicant's quality assurance program. The Board has herein made findings of fact and conclusions of law on the issues raised by Reed Contentions 6 and 16. No other matters in controversy remain before the Board. The Board has not determined that a serious safety, environmental, or common defense and security matter exists. See 10 C.F.R. § 2.760a. Other findings required to be made prior to the issuance of an operating license are to be made by the Director of Nuclear Reactor Regulation. See id. and 10 C.F.R. § 50.57.

Having decided all matters in controversy raised by Joint Intervenors earlier and by Reed Contentions 6 and 16 in favor of authorizing operation of the facility, the Board concludes that as to the matters decided herein, the Director of Nuclear Reactor Regulation would be authorized, upon making the requisite findings with respect to matters not resolved in either of the Board's Partial Initial Decisions, to issue to Applicant a license to operate Callaway Plant, Unit 1.

V. ORDER

WHEREFORE, IT IS ORDERED, in accordance with 10 C.F.R. §§ 2.760(a) and 2.762, that this Partial Initial Decision shall constitute the final action of the Commission thirty (30) days after the date of issuance hereof, unless exceptions are taken in accordance with section 2.762 or the Commission directs that the record be certified to it for final decision. Any exceptions to this Partial Initial Decision or designated portions thereof must be filed within ten (10) days after service of the decision. A brief in support of the exceptions must be filed within thirty (30) days thereafter (forty (40) days in the case of the NRC Staff). Within thirty (30) days of the filing and service of the brief of the appellant (forty (40) days in the case of the NRC staff), any other party may file a brief in support of, or in opposition to, the exceptions.

IT IS SO ORDERED.

ATOMIC SAFETY AND LICENSING BOARD

James P. Gleason, Esq., Chairman

Mr. Glenn O. Bright

Dr. Jerry A. Kline

Respectfully submitted,

Robert Perlis
Counsel for NRC Staff

Dated at Bethesda, Maryland
this 21st day of October, 1983

APPENDIX

Reed Contention 6 reads as follows:

#6. PROTECTIVE ACTIONS AGAINST RADIOIODINE (DRUGS AND EQUIPMENT)

A range of protection actions have not been developed for the plume exposure pathway EPZ for local emergency workers or the public which protect against direct or ingested radiation as is required by 10 C.F.R., Part 50, Section 50.47(b)(10) and NUREG-0654, II, J, which includes provisions for the use of radioprotective drugs, particularly for emergency workers and institutionalized persons whose immediate evacuation may be infeasible or very difficult. Such provisions must include quantities, storage, and means of distribution (see NUREG-0654, II, J, e).

A. Evacuation is considered the most protective action for members of the public in a radiological accident (SOP, pg. 8-4) but constraints and disadvantages may make it inappropriate, such as arrival of the plume in mid-evacuation, etc. Evacuation is a last resort (SOP, pg. 8-3).

B. Shelter is, therefore, the primary protective action but good protection in a dwelling is limited (EPA-520/1-75-001, 1.6.3.2):

> - -, shelter provided by dwellings with windows and doors closed and ventilation turned off would provide good protection from inhalation of gases and vapors for a short period (i.e. one hour or less) but would be -- ineffective after about two hours --.

No effective course of action is proposed for sheltering after that period. Use of ad-hoc respiratory devices in lieu of other effective methods of

preventing inhalation or ingestion of nuclides such as radioactive iodines for extended periods of time places public health and safety in jeopardy.

(1) Use of potassium-iodide as a protective option by residents in the plume exposure pathway EPZ is rejected in the proposed Off-site Plan, page 9-5, item I.

(2) Potassium-iodide is not provided for optional use by local emergency workers, nor is respiratory protection that meets NRC standards for use in a radiological environment.

(3) Local governments' proposed SOPs state that because of safety, economic and legal considerations, the decision to evacuate should be the protective action of last resort (see SOPs, Proc. #8, 4.3). Of the two options discussed in the SPOs, shelter and evacuation, the State has decided to evacuate rather than issue KI; however, shelter without the benefit of KI is the primary protective action to be considered in an accident involving a release of nuclides from the plant. Pre-school children, pregnant women and all females of childbearing age who are advised to stay indoors (shelter mode) without KI or respiratory protection are subject to thyroid damage or its destruction in themselves and/or the children in utero.

C. The State of Missouri has refused to provide radioprotective drugs, i.e. prophylactic iodine, for either emergency workers or the general public. The Bureau of Radiological Health has decided that evacuation is a more feasible logistical response for protection against radioiodine than is issue of potassium iodide (KI) (see State of Missouri RERP, page B11, H.).

(1) Radioiodines contribute significant exposure modes to whole body exposures, thyroid exposure and lung exposure (see NUREG-0654, page 18, Table 3).

(2) The principle inhalation dose will be from iodines and particulate material in the plume. Due to the ability of the thyroid to concentrate iodine, the thyroid dose resulting from inhalation of radioiodines may be several times greater than the corresponding whole body external gamma dose that would be received (State RERP, Annex B, C.2).

D. Selection of two options as a range of protective actions without including suitable protective support equipment or chemical prophylaxis to enhance the effectiveness of a selected option over time renders said option to be ineffective under the definition of the two options contained in the SOP, pages 8-3, 8-4, and 8-5.

E. The U.S. Food and Drug Administration has found the use of potassium-iodide (KI) to be safe and effective as a thyroid blocking agent to prevent the uptake of radioactive iodines by the thyroid glands. Since said Federal agency has publically rendered such judgment on the use of KI, it is felt that said KI should be made an optional defensive measure that the general public can take in a sustained shelter situation to protect against thyroid damage or loss, especially in children/infants. Public warnings on packages/bottles can advise of possible reactions to use of this drug by persons who are allergic to KI (similar to the warnings on cigarettes and patent medicines), if officials are concerned about ingestion of KI by alergenic residents of the EPZ.

F. NUREG-0654, page 63, J. Protective Response, e, states:

> Provisions for the use of radioprotective drugs, particularly for emergency workers and institutionalized persons within the plume exposure EPZ whose immediate evacuation may be infeasible or very difficult, including quantities, storage, and means of distribution.

Such evaluation criteria is applicable to State and Local governments and indicates that use of KI or similar drugs is a required criteria for a satisfactory plan (see NUREG-0654, page 5, lines 13-15):

> FEMA and NRC regard all of the planning standards identified herein as essential for an adequate radiological emergency plan.

6. Common sense and reason indicates that a situation such as this is not in the best interest of providing protection for the public health and safety. If a situation precluding evacuation is possible, and shelter phases may exceed two hours (the effective limit of homes -- see SOP, Procedure #8, 5.1.1) and the public is to be afforded protection from radioiodines, KI or some other thyroid protective drug or device must be made available to shelterees.

Reed Contention 16 reads as follows:

#16. MESSAGES WITH INSTRUCTIONS FOR LONG-TERM SHELTERING

State and local governments shall provide written messages intended for the public which shall include the appropriate aspects of sheltering, ad hoc respiratory protection, thyroid blocking or evacuation (see NUREG-0654, II, E.7.). Messages contained in the proposed Offsite Plan does not provide for instructions relating to thyroid blocking or respiratory protection if prolonged sheltering is necessitated.

A. Ad hoc respiratory protective devices (handkerchief or towel over mouth and nose, etc.) are known to be less effective than filter-type respirators whose effective lifetime under use is from 2 to 3 hours (see EPZ-520/1-75-001, Chapter 1, 1.6.3.4, page 1.40, lines 13 & 14) and shelter in buildings suitable for winter habitation (see SOP, Procedure #8, 5.1.1) will provide reasonably good protection for about two hours. Given these facts, reasonably adequate respiratory and thyroid protection is provided if shelter is restricted to two or three hours. In cases of flooding, snow and/or ice on area roads; travel in rural areas of all counties have been curtailed for days. In the event of an accident/release of nuclides, shelter must be considered necessary for as long as two to four days. In such circumstances, residents are placed in a situation wherein they cannot move out of the area and do not have protective options which insure their safety if they stay. This situation clearly places public health and safety at risk.

B. Instructions in the Offsite Plan and SOPs must be rewritten to include instructions for the provision of long term shelter instructions which are available to residents who will be advised to take shelter versus evacuation in the event of an accident/release of nuclides at the plant.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
UNION ELECTRIC COMPANY	)	Docket No. STN 50-483 OL
	)	
(Callaway Plant, Unit 1)	)	

CERTIFICATE OF SERVICE

I hereby certify that copies of "NRC STAFF'S PROPOSED FINDINGS OF FACT AND CONCLUSIONS OF LAW" in the above-captioned proceeding have been served on the following by deposit in the United States mail, first class, or, as indicated by an asterisk, through deposit in the Nuclear Regulatory Commission's internal mail system, this 21st day of October, 1983:

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