UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING APPEAL BOARD

In the Matter of	)	
	)	
DUKE POWER COMPANY	)	Docket Nos. 50-369-OL
	)	50-370-OL
(William B. McGuire Nuclear Station, Units 1 and 2)	)	

CESG'S BRIEF--APPEAL OF INITIAL AND SUPPLEMENTAL INITIAL DECISIONS

CESG took exceptions to the Initial Decision (ID) and Supplemental Initial Decision (SID) in the instant matter June 8, 1981. It herewith files its brief in support of the exceptions. The brief is in three parts, General, Procedural, and Substantive.

GENERAL

1. CESG appeals the ID and SID because it perceives that neither of these decisions reflects an impartial reading of an equitably developed record but is, instead, the product of a process, the object of which is the fostering of a nuclear generation industry by the issuance of licenses once the criteria of NRC staff have been met.

2. An ASLB is given control of the course of a hearing, 10 CFR Part 2. A consequence is a substantial degree of control over the outcome of the hearing. By the rejection of witnesses, the denial of subpoenas for witnesses, the selective exclusion of proferred exhibits, the Atomic Safety and Licensing Board (ASLB) materially interfered with and hampered CESG's opportunity to make its contribution to the record.

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3. The SID is an exercise in making a license authorization appear credible to one unacquainted with the full record and with intervenor's proposed findings of fact. The primary, implicit consideration of the ASLB appears to have been the implementation of the current NRC policy of the expedited issuance of operating licenses. This is consistent with the NRC's concern that "the cost of . . . delay could reach billions of dollars." (Statement of Policy on Conduct of Licensing Proceedings, p. 2, May 20, 1981)

4. No intervenor has succeeded in having an operating license application denied. The several construction permit applications that have failed were withdrawn, not denied by the NRC. Yet there have been serious accidents. The licensing process clearly cannot be relied on to provide a safe plant.

5. The Fermi-1 license was vigorously contested. The license issued. An accident involving partial meltdown occurred early in the operation of this newly licensed "commercial reactor". The NRC I and E process did not detect the operational absurdity of leak detection in the vicinity of combustible polyurethane foam at Browns Ferry. The result was a grave accident which, but for the ingenuity of an operator in devising an unspecified procedure, would have resulted in an exposed core and possibly meltdown. The public will be a long time paying the hundred million dollar cost to repair the gutted electrical system of the plant. The accident at Three Mile Island unit 2 is the best known

and most extensively documented case of the failure of the NRC's regulatory process to work. The Appeal Board is urged to refer to the two articles by Daniel Ford in the New Yorker magazine, . Repeated valid indications of technical faults were ignored at the management level.

6. Although the NRC has appeared to make a fetish of learning lessons from the TMI experience it has shown no indication of having learned the major lesson. Given the enormous amount of radioactivity generated by fission, and the geologically long periods of time for some of the radionuclides to decay to harmless levels; given a process which requires of some items of equipment completely reliable performance and freedom from failure; given a dependence on the making of correct judgments and the correct execution of a variety of actions of a great number of ordinary human beings ranging from pipe fitters to corporate presidents and NRC commissioners: the regulatory process is doomed to be inadequate for the near term and far term preservation of public health and safety.

7. The instant ID and SID have the potential for irreparable harm to the public by reason of the immediate effectiveness rule. It is reasonable and proper for the actions of an agency staff to be reviewed by authority within the agency. However in matters of cardinal importance a competent review by an authority outside the agency is necessary. The immediate effectiveness rule of the NRC authorizes licensing action before review in a federal court. If the action has

the potential for harm, the harm can be done before a stay can be ordered by higher authority. A complicating problem is the reluctance of the D.C. Circuit to deal with substantive matters outside the area of legal expertise. More often than not these matters are returned to the NRC for reconsideration. A science court of competent, disinterested persons would be a valuable adjunct to the Circuit.

8. The mindset within the NRC is an almost insuperable obstacle to unbiased decisions. CESG's psychologist witnesses speak to this point. The structure of the NRC is hierarchical. Lower level members in the organization accept the values of higher level members; they act in accord with policy (Tr. 3840-3). In a group situation individual judgments tend to a higher level of risk taking than the individual, by himself, would take (Tr. 3837-40). Once committed to a course an individual takes note of items that support that course, ignores or under-weights items that do not (Tr. 3854-5). An organization involved in a risky venture develops a coherence of views. The Pentagon is apparently comfortable in a process which would make nuclear warfare a viable military option. The coherence of views within nuclear industry and the NRC regarding both the near term and the long term risks of nuclear generation is another case in point. Psychologists recognize this form of behavior and term it group think (Tr. 3856-8). They also recognize means, not visible in the present matter, for counteracting group think, cognitive dissonance and risky shift (Tr. 3843, 3858-9).

9. Group think and risky shift in the NRC are clearly present. In the face of three unexpected, costly and dangerous accidents in 400 reactor operating years, NRC dogma still asserts the probability of a serious accident as one in 20,000 years. After the humbling experience of TMI-2, the agency requires supplemental EIS's for very serious accidents, after June, 1980. McGuire, a thin shell containment near a population center is grand-fathered. Although CESG pointed out these two special circumstances in its argument to accept Contention 5, calling for such an EIS supplement, the ASLB denied the request. The Staff, in this proceeding, accepted the Applicant's theory that TMI-2 was the only credible accident. Credibilty has to do with believeability. Is the event possible? The greatest number of postulated accidents involve pipe breaks. Pipe breaks are not unusual. Indeed a large pipe break occurred at Indian Point. It was on the secondary side. Had it been on the primary side it would have been regarded as a major accident. The Staff concern with the structural integrity of the primary side, the requirement of an ECCS are all prima facie testimony to the credibility of pipe breaks on the primary side.

10. Group think and risky shift are evident in regard to the waste problem. Although it is recognized that geological, seismic, and glaciation changes will occur during the period radioactive waste remains significantly active, and although there is no demonstrated capacity to accurately predict such changes, and although clearly no one is in a position to impose monitoring responsibilities on governments and peoples of the

future, nevertheless it is NRC policy to generate ever increasing amounts of waste by continuing to license plants for construction and operation.

11. The Applicant made it clear to the ASLB that it wished to obtain its operating license in time for summer peak, alleging that it was necessary to shut down Oconee-1, an 871 MW nuclear station, for a fifteen week period for refueling and maintenance in July. The ASLB was responsive to the Applicant's plea. In accordance with the Applicant's proposal, the ASLB decided to not hear admitted contentions 3 and 4, both concerned with the consequences of containment breach based on a determination made during the course of the hearing that the Applicant was not likely to repeat the sequence of events resulting in core exposure at TMI-2. The ASLB left CESG dangling in regard to its determination. CESG's counsel raised the matter in the closing hours of what proved to be the final day (Tr. 5233). Applicant's counsel, having announced that he was prepared to make a closing argument (Tr. 5230), proceeded to do so with the concurrence of the ASLB (Tr. 5233). Staff was not ready with concluding remarks and did not think "it is appropriate to conclude" (Tr. 5242). The Chairman's inquiry as to whether CESG was ready to proceed on Contentions 3 and 4 gave no intimation that the ASLB was not disposed to hear these contentions (Tr. 5247). In the course of what CESG's counsel was permitted to believe were "intermediate remarks" in response to Applicant (Tr. 5248) the Chairman interjected that Contentions 3 and 4 "were acceptable in this proceeding contingent upon other

matters being met which the Commission set for us" (Tr. 5249). This was the first clear indication to CESG that Applicant's theory had been accepted by the ASLB. The hearing closed (Tr. 5257) without an explicit ruling in the matter, or any further reference to it. It was a de facto decision with no opportunity provided for reply.

12. Although the hearing was reopened to deal with the hydrogen question, research in the matter is far from complete. There are serious differences in some of the findings. Four research reports were provided the ASLB and the parties during the hearing, all without evaluative comment from the Staff as to significance, despite the rules in this regard (Tr. 3648). These were the Sandia report, and covering letters, CESG Exh. 40 and 40A; the Strehlow report and covering memorandum, Staff Exh. F; the Brookhaven report and memorandum, CESG Exh. 59; and an R&DA report, Staff Exh. M. Of these the Strehlow report was not offered into evidence by the Staff and the Brookhaven and R&DA reports were not admitted for the truth of the matter (SID Exhibits, footnote). The last minute appearance of these documents, which relate igniter performance, hydrogen detonation, and alternative means of dealing with hydrogen generation to accident scenarios, made impossible further discovery or the securing of witnesses by CESG. CESG's efforts to subpoena witnesses who could validate these documents were opposed by the other parties and denied by the ASLB (Tr. 4874-5012). Staff's counsel was concerned with closing the record; research, however unresolved the matter, is ongoing (Tr. 5012-3).

13. The ASLB rejected CESG's technical witness on the grounds of lacking qualification. This witness has been active as a witness for and representative of CESG since the construction permit stage. The voir dire by Applicant showed that he was not a structural engineer. Witness' prefiled testimony (Tr. at 3780) and supplemental direct testimony (Tr. 3767-3875) at no point have him expressing opinion as a structural engineer--unless it be that he testified on the basis that after a containment pressure exceeds the failure pressure that it no longer can be relied on to contain its gaseous content. Even if his testimony relating to containment capability were excluded there is no basis for excluding his testimony on chemical and physical matters, as the ASLB did. By excluding the testimony of CESG's witness and denying subpoenas which could have resulted in the validation of NRC contract reports raising doubts about the efficacy of the hydrogen igniter system and considering scenarios more hazardous than S2D, Applicant's approximation to the TMI-2 event, the ASLB assured a record which, on balance, would provide more testimony supporting license authorization than not. The destruction of CESG's proferred contribution to the record was completed by the refusal to receive as exhibits 18 CESG exhibits, seven of which were from NRC contracted research, six from NSAC studies of the TMI-2 accident, and five of which were NRC letters.

14. In the SID conclusion that operation of the plant would pose no undue risk to public health and safety the ASLB ignored

the Staff conception of risk which is embodied in the supplemental environmental statement for the Virgil C. Summer plant (NUREG-534, discussion of risk). Risk involves accident probability and consequences. An accident not credible is an accident not possible. An accident not possible has a zero probability of occurrence. An accident that is possible has a finite probability of occurrence, however small. When consequence becomes involved, a major consequence requires the probability of occurrence to be correspondingly small. The possibility for McGuire plant operators, sometime during the 40 year term of the license, to fail to follow correct procedure in the case of a stuck PORV exists. The probability may not be known to us, but it is finite, nonzero. There are other accidents that are credible, possible. Pipes and valves can break or seriously leak. Over-pressure events can occur. The credibility of such events, indeed the actual occurrence of necessary preconditions is attested to in the ATWS paper (WASH-1270). Over-pressure substantially increases the probability of reactor coolant system boundary failure. There are many points in the coolant system which can be the site of a flaw or of damage or metal fatigue. These all contribute to the increased probability of failure. A seismic event by additionally stressing a weak spot contributes further to the probability of failure. A proper consideration of accident sequences is recognition that the ECCS may fail, at least in part, to operate. Earlier use may have reduced accumulator content. An onsite power failure will deprive the plant of coolant pump,

air return fan, and containment spray operation. The proper combining of these probabilities, some as sums, some as products, is necessary to obtain a reasonable and justifiable assessment of the overall probability of hydrogen release. Reliable probabilities are actuarially, empirically determined. The probabilities of CESG Exh. 61, Table 9-1, Dominant accident Sequences--Sequoyah Plant, are estimated. They are also non-zero. It is obvious that a large release from a McGuire containment could, depending on wind direction, do substantial harm to people in Charlotte. There is the potential for a PWR-1 release making a large area unfit, dangerous for occupation. Such a risk, the product of a major consequence and a non-zero probability does not support the conclusion that substantial quantities of hydrogen will not be generated and that the McGuire facility can be operated without undue risk to the public health and safety. One TMI-2 accident in 400 reactor operating years reduces to farcicality the probabilities estimated in the Reactor Safety Study (Wash-1400) and in Table 9-1. There is no demonstration, just continued wishful thinking, that the results of "Lessons Learned" will have any effect in the real world. Undue. What on earth in quantifiable terms is "undue"? Just how many deaths would qualify as not "undue"? Just how much property damage and loss? If the NRC is going to play a numbers game as it has done in its first supplemental environmental statement in regard to the consequences of serious accidents then it must, in consistency and fairness permit a hearing as to the consequences of containment breach

at McGuire. This requires hearing Contentions 3, 4, 5 and 6. 15. After disqualifying the technical witness proferred by CESG and excluding all testimony by this witness from the record the ASLB chairman indicated that CESG still had the opportunity to make its case, based on the record and reasoning in its proposed findings of fact. This CESG did. In the ID the ASLB formally rebutted the findings proposed by CESG. In the SID there was neither rebuttal of CESG's proposed findings nor a recognition that they existed. The findings proposed show, based on exhibits received into the record, primarily Applicant's 5A and 5B, that for the S2D scenario taken as Applicant's base case, that there will be regions of the ice condenser from which hydrogen, unmixed with air, will issue. In the absence of air this hydrogen will not ignite. Due to its low density it will rise to the top of the containment. After a sufficient time for diffusive mixing with air this mass will become combustible and will be ignited by the dome igniters (CESG Findings of Fact, 36-40). The only supportable conclusion is that, during the course of a hydrogen release accident the hydrogen in the several regions of the containment will not be uniformly mixed with air and will not combust in the manner testified to by Applicant and assented to by Staff. This is not a unique view on the part of CESG. It is advanced by Batelle in NUREG/CR-1219, CESG's disallowed Exh. 44. It is advanced in the Sandia National Laboratories report on an analysis of hydrogen mitigation for Sequoyah degraded core accidents (CESG Exh. 40A). The supervisor of this study, Dr. Marshall Berman, was a Staff

witness (Tr. 4020, 4023-43, 4046, 4082-4111, 4120-25, 4128-59, 4164-5, 4198-4261, 4264-65, 4270-4317). Of the witnesses introduced, Berman was best qualified. His research group of five members had been working on the problem of hydrogen releases in an ice condenser containment for a year and a half. Various mitigation schemes had been evaluated, including igniters. Berman repeatedly testified that there was danger in reliance on the igniter system, not only of combustion but also of detonation (Tr. 4094-4101, 4102, 4125). It is his testimony that the risk of igniters exceeds the benefit (Tr. 4103). Sandia and NRC staff are not in agreement (Tr. 4084). Much research is yet to be done (Tr. 4159). In fact the final rule, the present rule is an interim rule, may be as far off as 1985 (Tr. 4052). The ASLB dismisses Berman's concerns with an argument that does not recognize that high concentrations of hydrogen are not combustible and can occur (SID pp. 26-7). Although the ASLB concludes there is no danger of detonation, a meeting with Dr. John Lee, an expert on detonation the day after the hearing, but not the record, closed, NRC staff concluded that detonation in an ice condenser containment was a possibility and should be made the subject of further research to be undertaken by AEP, Duke, and TVA. Staff did not copy the summary of this meeting to the Board and the parties until it was too late to affect the SID. Staff and ASLB down-played the most extensive, competent and impartial study of the matter of hydrogen combustion to arrive at an apparent basis for a finding that McGuire may be licensed to operate.

16. On June 24, 1981, the Commissioners requested a response by the parties to two questions. One concerned the triggering signal for the igniter system in a LOCA. CESG's technical witness, after responding to the questions, was permitted to discuss another, related matter, the indication for turning the igniter system off. He commented that the CLASIX computer code, on which Applicant's defence against dangerous concentrations of hydrogen is based, assumes uniform hydrogen/air ratios in the several parts of the containment and that this is unrealistic. He further observed that at the high rates of steam and hydrogen release predicted by the MARCH code for the S2D event that the flow of the air return fans would be dwarfed and the result would be the issuance of substantially pure hydrogen from large portions of the ice condenser. Roger Matson, Director of Reactor Safety, concurred in the observations as to the inadequacy of available computer codes and recognized that the observations as to how pure hydrogen would be produced and make its way to the dome contributed an additional nuance to his understanding of the problem. These matters would be the subject of NRC research during the remainder of 1981 (Transcript of Commission Meeting, June 24, 1981, 2:00-3:30 PM). Dr. Matson's response to CESG's technical witness does not accord with the ASLB's rejection of this witness.

17. The Commissioners decided June 29, 1981, to permit authorization of the McGuire license. This CESG believes, is due to the predisposition mentioned foregoing, Staff input to the Commission, lack of a detailed familiarity with the record,

particularly the Berman testimony, and a failure to think through the matter of hydrogen non-combustion due to an insufficiency of oxygen. The last line of defense of the public is this Appeal Board who, it is fervently hoped, will consider the problems in depth and not issue a decision until each member has arrived at his position by his own processes, electing the difficult course of thinking the matters through rather than choosing a witness to rely on. The consequences of proceeding with authorization are grave. Although an ice condenser containment will withstand more than 15 psig internal pressure, the range of hydrogen deflagration pressures goes to a high of about 190 psig (CESG Exh. 46). In a detonation mode the pressure can reach twice this value (CESG Exh. 40A, p. 31). There has been no proof that LOCA's other than the TMI-2 stuck PORV cannot occur at McGuire. There is no experience based probability number for the range of core exposure accidents to which McGuire may be subject. The CLASIX computer code on which igniter performance in the S2D scenario is based is inadequate in that it assumes uniform concentrations of hydrogen in the lower containment and ice condenser. The evolution of essentially pure, non-combustible hydrogen from the ice condenser and the accumulation of this hydrogen in the dome has been ignored. The transformation of a mass of essentially pure hydrogen in the containment dome to a detonable mixture by slow inter-diffusion with air has not been comprehended. The ignition of such a detonable mass by the dome igniters has not been cognized. The results of the major research project to date, Sandia,

have been disregarded. No account has been taken of the present incomplete status of active research. The Staff decision after the March 20,1981 meeting with Dr. John Lee that in-containment detonation is a credible event and that, as a consequence, Applicant and licensees are to support further research did not enter the record. No finding has been made as to the consequences of very severe accidents, those involving containment breach. No basis has been provided for assessing risk, which involves both accident probability and accident consequences. No evacuation plan has been required for Charlotte, the nearest population center. Instead the ASLB has relied on Applicant's operator training program and the addition of some instrumentation to prevent a replay of TMI-2. It has given no consideration to other hydrogen generating accidents, despite admitting Contention 1 which refers to LOCA's in a generic sense. Applicant has failed to satisfactorily respond to CESG's Contentions 1 and 2; essential Contentions 3, 4, 5 and 6 were either admitted and not heard or denied. The ID and SID should be reversed.

Procedural Issues

A. Introduction

This was the first contested hearing concerning the operating license of an ice condenser plant. It was not, however, the first ice condenser nuclear power plant licensed. As a consequence of conditions attached to the Sequoyah licensing, a program of study of hydrogen consequences and mitigation was undertaken by the ice condenser owners and by the nuclear power consultants' network (e.g. Sandia, Brookhaven and Livemore Laboratories). See, Separate Views of Commissioners Gilinsky and Bradford, Full Power License for McGuire One, Order re Immediate Effectiveness, June 29, 1981, page 9., hereinafter, Separate Views. During the preparation for the hearings in this matter (and after: see, e.g. notice of meeting dated April 7, 1981, meeting with Dr. J. Lee re H_2 Combustion) there was an outpouring of scientific information from the NRC consultants to add to hydrogen information and other relevant material from investigation of Three Mile Island (TMI-2). At issue in the procedural problems raised by Intervenor is how an Atomic Safety and Licensing Board is to treat new information; what predicate must be laid to allow its introduction; who can utilize the information; what burden of proof is on Intervenor, post-TMI, re credibility of accidents; and, generally, how is the notorious TMI-2 event to make a difference in hearing, licensing and operation of nuclear power plants. If there is to be no difference; indeed, if the burden on Intervenor is to grow, as has happened in this Board's decision, and seems to be happening in changes in NRC rules, then it would be candid and politically fruitful at this time, for the NRC to announce the new style. If deference is to be made to TMI 2, it is necessary to start by correcting the sort of errors that appear

in this case.

B. Evidentiary Contentions: Exhibits.

2. The ASLB erred in neglecting the affidavit of J. L. Riley referred to as Exhibit 63 and in its decision that the affidavit was not responsive to the Staff's affidavit concerning the pyrolysis of polyurethane foam and other matters before the Board. See findings 6 and 54. (Tr. 5252)

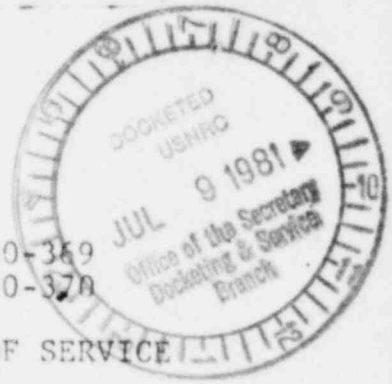
3. The ASLB erred in rejecting exhibits offered by CESG as evidence for all purposes including Exhibits 42-56, 58, 59, 62 and Staff M. Note that CESG's Exhibit 59 and Staff's Exhibit M were not admitted for the truth of the matter contained therein. (Tr. 4654, 4663)

5. The ASLB erred in refusing to grant subpoenas for witnesses to substantiate and allow the introduction of documents as followws: Staff Exhibit M, H. W. Hubbard, R. P. Hammond, or S. M. Zivi; CESG Exhibit 59, W. T. Pratt; CESG Exhibit 62, John Doe, an NRC staff person. (Tr. 4879-82, 4984-5021)

11. The ASLB erred in not keeping the record open to determine why the igniter system failed in tests at Livermore. (Tr. 5227-8; R. L. Tedesco, Memorandum for the ASLB, May 19, 1981, 3 enclosures)

12. The ASLB erred in not keeping the record open until studies on in-containment detonation had been made. (Tr. 5229; R. A. Birkel, Summary of Meeting Held on March 20, 1981 enclosing Memorandum, W. Butler to L. Rubenstein, April 7, 1981, Meeting with Dr. J. Lee Re: H_2 Combustion)

13. The ASLB erred in not considering CESG Exhibits 61 and 62 as evidence in regard to accident credibility. (Tr. 4879-82)



UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

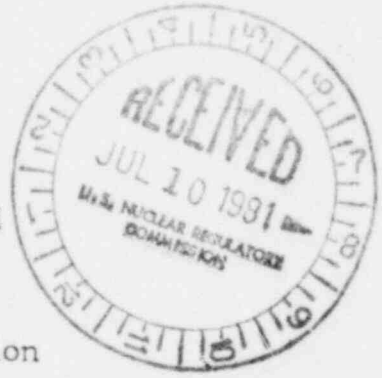
In the matter of	)	Docket Nos. 50-369
	)	50-370
DUKE POWER COMPANY	)	
	)	AFFIRMATION OF SERVICE
(William B. McGuire Nuclear Station)	)	
	)	OF CAROLINA ENVIRONMENTAL
	)	STUDY GROUP.

I hereby affirm that copies of:

Brief in support of Appeal

were served as follows:

A. On the following persons at the Nuclear Regulatory Commission by mailing sufficient copies to Mr. Samuel Chilk, Secretary, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, and hereby requesting him to distribute them to:



Mr. Joseph HenrdrieChairman
Mr. Victor Gilinsky, Commissioner
Mr. Peter Bradford, Commissioner
Mr. John F. Ahearne, Commissioner
Mr. Samuel Chilk, Secretary
Chairman, Atomic Safety and Licensing Appeal Board
Mr. Alan S. Rosenthal, Chmn. ASLAB
Dr. John H. Buck, ASLAB
Ms. Christine N. Kohl, ASLAB
Mr. Chase R Stephens, Docketing and Service Section
Edward G. Keuchen, Esq., Counsel for NRC Staff

B. By mailing copies to the following persons, via U.S. Mails, postage prepaid:

Dr. John M. Barry
Mecklenburg County Dept. of Health
1200 Blythe Blvd.
Charlotte NC 28203

William L. Porter, Esq.
Assoc. Gen. Counsel, Duke Power Co.
P.O. Box 33189
Charlotte, N.C. 28242

J. Michael McGarry, III, Esq.
Debevoise and Liberman
1200 17th St. N.W.
Washington DC 20036

Diane B. Cohn, Esq.
Public Citizen Litigation Group
Suite 700
2000 P. St. N.W.
Washington DC 20036

Dated: July 7, 1981

Shelley Blum

Shelley Blum, Counsel for CESG
1402 Vickers Ave.
Durham NC 27707
(919) 493-2233

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16. The ASLB erred in that the entire procedure was so rushed that the Board was unable to consider dangerous gaps in our knowledge and to utilize ongoing research that changed the safety equation as the Board was sitting. The Staff was unable to inform Intervenor as to the state of knowledge and did not provide witnesses to authenticate reports it has contracted for. The Intervenor was unable to secure and to analyze information produced in the ongoing research in relation to the Sequoyah licensee and by other NRC consultants. (Tr. 4655-63, 3860)

Evidentiary consideration, handling of new scientific material, conjunction of the need for scheduling a hearing and the parties legitimate need for more time to work with newly received reports are generally within the discretion of the Board. The test for some of these issues is whether there was such an abuse of discreation that the Intervenor was deprived of its right to procedural due process. See North Anna, 11 NRC 451 (1980). With regard to abuse of discretion, however, in evidentiary matters, it should be axiomatic that it is a violation of due process to hold to a higher standard of evidence in an administrative hearing than before a federal court jury. The Administrative Law Judge (ALJ) has the ability to separate reliable from unreliable hearsay, for example, and can judge proffered scientific reports on a relevancy and reliability standard. Thus, the Federal Rules of Evidence should apply as the most severe standard of evidence. If a document or an expert could be used in evidence under the Federal Rules, they must be admitted in the Commission's proceedings.

Similarly, if new material bears on the subject of a hearing, i.e. is relevant under ordinary rules, and is proximately forthcoming, an administrative board must admit the evidence via judicial knowledge. The public interest demands no less.

Focusing on Exception 3, Intervenor offered a long list of exhibits for the purpose of using the contents to demonstrate its case. (The initial use of many was to have been to support the testimony of Jesse Riley.) The documents are listed in the Order below, but should also be noted here:

Exhibit #	Title/contents	Nureg #, etc.
42	Analysis of TMI Accident, abstract, Ch. 1,2	CR-1219
43	same ch. 5	"
44	same, ch. 8	"
45	Duke's proposed testimony of H.D. Miller and documents	NSAC-1,HYD p. 1-11, etc.
46	H_2 problems in Sequoyah Containment, Aug., 1980	R&D Assoc.
47	Proposed Interim Hydrogen Control Requirements for Small Containments	SECY 80-107
48	ECCS diagrams	TH 9,10,11
49	Plant Computer	NSAC-1, PDS
50	Butler, memo on Selected Containment Related Issues	
51	Sequoyah Containment Analysis, July, 1980	R&D Assoc.
52	Supplement to SER on Hydrogen Control . . .	11.B.7&3
53	Minutes re McGuire Incident, loss of "ambient cooling system."	248th ACRS meeting
54	Electromatic Relief Valve	NSAC-1, ERV
55	Plant Data Systems	NSAC-1, PDS
56.	pressurizer diagram	NSAC-1, OTSG
58	Staff Answers to CESG Interrogatories	McGuire discovery
59	Hydrogen Combustion during degraded core accidents in Sequoyah, Brookhaven, 1/15/81	CR-?
62	Ch. 8, "Accident process analysis" Sandia Labs re Sequoyah	CR-1659
Staff M	Hydrogen Control Considerations for Ice-Condenser Nuclear Plants, (Feb. 1981)	R&D Assoc.
63	March 27, 1981 Affidavit of Jesse L. Riley (Post McGuire plant tour, re pyrolysis)	

The "New" Federal Rules of Evidence were adopted July 1, 1975, a date probably after that on which the legally trained ALJ on the NRC Boards entered NRC service. Rule 803(8) [28 U.S.C.] allows

admission, as an exception to the hearsay rule concerning "Public records and reports" . . .

> in any form, of public offices or agencies, setting forth . . . (B) matters observed pursuant to duty imposed by law . . . or (C) in civil actions and proceedings . . . factual findings resulting from an investigation made pursuant to authority granted by law, unless the sources of information or other circumstances indicate lack of trustworthiness.

This Rule has been interpreted broadly by the courts, to allow admission of the following:

(1) reports prepared by the Judge Advocate General's office and by the Naval Rework Facility on circumstances surrounding an air-crash and engineering analyses based on the airplane wreckage, both containing hearsay from doctors, eyewitnesses and law enforcement officers. Sage v. Rockwell International Corp., 477 F. Supp. 1205 (D. New Hamp. 1979). [The analogy to TMI-2 reports is obvious.]

(2) Airworthiness Directives of the FAA, describing unsafe conditions in an aircraft. Melville v. American Home Assurance Co., 584 F.2d 1306 (3rd Cir. 1978). See p. 1315. The analogy here is to the Brookhaven analysis, exhibit 59.

(3) FAA circulars containing recommended landing procedures for certain airports. Muncie Aviation Corp. v. Party Doll Fleet, Inc., 519 F.2d 1178, 1182 (5th Cir. 1975).

(4) police auto accident report, including witness statements. Baker v. Elcona Homes, 588 F. 2d 551 (6th Cir. 1978).

There can be no question of the trustworthiness of the documents Intervenor attempted to introduce. They are government agency or consultant reports, and, presumably, the author's "only conceivable interest was in insuring safety," Muncie Aviation at 1182. The bulk

of the exhibits are NRC consultants' reports, e.g. CR-1219 (42-44), NSAC-1 (45, 48, 49, 54, 55, 56), R&D Associates reports to an NRC Commissioner or to Livemore Labs (46,51,M), SECY 80-107 (47), McGuire SER (52) an ACRS meeting (53) and Brookhaven (59) and Sandia (62) lab studies. Can there be any question of the governmental connection, the fact that the authors had no goal in mind other than safety, or of the relevance of the documents? How can an Intervenor prove a credible accident without reference to a report of a prior accident (#53)? How does an Intervenor make reference to TMI-2 investigations without use of documents? Why is a document that an Applicant's witness would have relied on no longer trustworthy when an Intervenor seeks to use it? (#45 was testimony and documents from H.M. Miller on TMI-2.) Although Intervenor can build a case defensively, via cross-examination, Hartsville, 7 NRC 341 at 356 (1978), it ought not be limited to such a case.

It is particularly hard to determine why 59, 62 and M were not admitted for the truth of the matters contained therein. #59 concerns computer analyses of various accidents by the Brookhaven National Laboratory. A beginning was made in investigation of operator intervention by re-start of the ECCS. This is a likely event. Further, some of the scenarios studied in #59 are those pointed out by #61 and #62 to be more probable than S2D, the closest programmable accident to TMI-2. Since Duke believes in operator intervention (see Board finding 33), computer predictions of the outcome must be relevant. Eliminating from consideration a study (albeit hurried) that points out as a consequence of ECCS

restart, the production of Hydrogen in large quantities, is far from harmless error.

Similarly, #62 is Chapter 8 of a Reactor Safety Study, Methodology Applications Program, Sequoyah # 1, NUREG/CR-1659. It was introduced to explicate #61, table 9-1 of the full study. Chapter 8 was mentioned at the hearing by a staff witness (Tr. 4880). It appears that the entire report, clearly relevant to the subject ice-condenser McGuire Plant hearings, should have been introduced by the Board itself. [Why documents of this nature are not circulated early on in the production stage remains unanswered. It is clear that Witness Meyer had a draft long before the hearing started.] It is not harmless error to keep out a document which points out there are more probable accident sequences than that closest to the one which actually occured at TMI-2.

Staff M was offered as an exhibit by CESG. It is an R&D Associates analysis for Livemore Laboratories of steam inerting experienced by the Livemore people in tests of hydrogen burning. It both supports the Sandia report (Mr. Berman's testimony) and much future investigation. A steam inerting sequence, found unlikely by Duke's witnesses, would be promoted by admission of this document, making the Board's dismissal of Dr. Berman's theory less simple. That is, they would have had to rebut his testimony, if possible.

After the documents were ruled out of order and not admitted under 803(3), a subpoena request for the authors was filed (Tr 4879-82, 4984-5021). In what appears to create a dilemma for the Board, on which it squarely impaled itself, those persons whose distance was

too great for their work to be sponsored as a government admission were found to be too close to the NRC to be able to be subpoenaed. The NRC agent subpoena shield, 10 CFR 2.720(h) was invoked. Either documents 59, 62 and M should be admissible, or CESG should have been allowed to bring in experts to introduce them. [Note that ALJ Cole voted for admission of M and 59, Tr. 3021.]

In this regard, see Greene County Planning Board v. Federal Power Commission, 559 F.2d 1227, 1232-33 (2nd Cir. 1976) allowing subpoena of FPC experts under the National Environmental Planning Act, 42 U.S.C. 4321, et seq., "when consideration of alternatives and collateral effects is unreasonably constricted." All that was necessary for subpoenas of applicant's witnesses under the APA, 5 U.S.C. 555(d), "is [illegible]t or showing of general relevance and reasonability of the evidence sought." The relevance and reasonability of the evidence has been argued above. The Board had just held that we needed a sponsoring expert, and then did not allow us to bring their experts in. Such subpoenas are appropriate where (1) applicant for the subpoena is unable to afford its own experts [the case here, although we could have afforded air fare. We could not afford to repeat the experiments performed at Brookhaven, for example.]; (2) the testimony is highly relevant; and (3) the employer is a government entity with a corresponding obligation to serve the broad public interest.

Exhibit 58 is Staff's Answers to CESG Interrogatories. It is not clear on what basis the document was kept out. 10 CFR 2.740 appears to make this document introducable, in a manner parallel to Federal Rules of Civil Procedure, Rule 33. That is, there should be no question about Intervenor's ability to use such responses.

Again, a major portion of CESG's case was kept out.

[Exceptions 13, 14 and 17 are subsumed herein.]

It continues to be apparant that there is a need for ongoing research on the questions raised by this hearing. Such research is, in part, a condition on the license. Exceptions 11 and 12 relating to this point show the abuse of discretion in not waiting for results on topics of a serious nature or limiting the license, pending the results. Exception 2 refers to the admission of an affidavit by Jesse Riley, submitted after visiting the plant with ALJ Cole (Exhibit 63) and being invited to comment on polyurethane burning. (See Tr. 5252.) It raises a possibility, with some expertise (see C. below), touched on in the hearing, e.g. the hydrogen flame in the ice condenser, structural steel strength of galvanized sheet steel, and hence accessibility of oxygen to polyurethane foam. It is obviously relevant and should have been accepted into the record.

As exception 16 states, the entire pace was such as to bring to the mind of Intervenor (and Commissioners Gilinsky and Bradford, Separate Views, p. 10) the notion that the conclusion was reached pre-hearing. The burden of proving a credible accident was placed on CESG, although not articulated until the end of the hearing. Documents leading to the conclusion that there were credible accidents, or accidents more credible than that which occured at TMI-2 (S2D) were only delivered in the course of the hearing, (argument supra). The goal was to let Duke prove its case, without paying attention to Sequoyah data, consultants reports or areas of expertise. CESG called attention to the pace, the failure of discovery, the incarceration of documents in a semi-public document room (open short hours), and other defects on various occasions (Tr. 2778-2813, e.g.).

Intervenor believes that the NRC rule that allows service of documents on the public document room rather than on an Intervenor, after a discovery request, is a clear violation of due process. The rule was apparantly adopted in the name of not helping Intervenors by giving them transcripts. What discovery has to do with transcripts, and how it all squares with Freedom of Information requests is an interesting question. It is clear than CESG was hindered in its trial preparation by placing the documentation of Staff answers in a library of limited hours 14 or so miles from the center of Charlotte.

C. Evidentiary exception: expert testimony.

1. The ASLB erred in rejecting the testimony of J. L. Riley as evidence, in whole and in part, and in its decision that Riley was not qualified to testify as an expert. See finding 24. (Tr. 3967-69)

CESG was denied the use of Jesse Riley as an expert witness on all topics. Experts, of course, under Rule 702 (Federal Rules of Evidence) are persons who "assist the trier of fact to understand the evidence or to determine a fact or issue" and are persons with appropriate "knowledge, skill, experience, training or education." (Rule 702) The expert may analyze circumstances by "reading, calculations, and reasoning process from known scientific principles . . . even though he has not had actual practical experience in [a product's] manufacture," Gardner v. General Motors Corp., 507 F.2d 525, 528 (10th Cir. 1974). Diablo Canyon, 8 NRC 567 (1978) equates expertise with actual practical knowledge, academic training,

and relevant experience. This seems a somewhat stricter standard than Rule 702, and hence erroneous, but may be necessary in security matters. Boards have been reversed on expertise rulings (Seabrook, 6 NRC 33 (1977) and some expert's testimony has been discounted by being given less weight than others, after admission, Hope Creek, 7 NRC 752 (1978), at 647, fn 8, and see 6 NRC 227 (1977) at 231 and fn 20. Apparantly, in a limited appearance, this lesser expert raised an unconsidered point, parallel to CESG's Riley raising of the polyurethane point. An expert witness with knowledge, skill, experience, training or education, practical or academic, may not be refused, Holmgren v. Massey-Ferguson, Inc., 516 F.2d 856 (8th Cir. 1975).

The proposed Riley testimony and qualifications, plus additional testimony and extensive voir dire appear of record (Tr. 3767 and ff.). He was held not to be an expert on topics sought to be testified about in this hearing despite earlier testimony on seismicity, radiological monitoring, the ice condenser and technical qualifications (tr. 3878-9), operation of the cooling system, suspended solids, need for power, alternative sources of power, Southport exercise, cost of fuels, ATWS, stud bolt failure, quality assurance, borate sealing, cask drop, and health effects (3880-82). He characterized his proposed testimony, with Mr. McGarry's help, "as focusing upon hydrogen burning characteristics and resultant pressures" Tr. 3883-3). Now, Mr. Riley is a physical organic chemist, who has done studies on explosive, combustible mixtures. He has read the TMI-2 investigative reports and has the background through academic and practical training, including, obviously, years of reading AEC

and NRC documents, to understand and evaluate them. He has the early engineering background to understand containment information.

It is the essence of an expert to take a variety of scientific works and analyze them for reliability, much as Dr. Berman took Dr. John Lee's works and found them relevant to ice condenser plants. A scientific expert has the knowledge to link these sources in a piece of testimony that may assist the trier of fact in reaching a conclusion. Certainly accident investigation, of TMI-2 or those described by Mr. Riley or correcting manufacturing problems are this sort of process. It should be noted that if to be an expert you must have "designed a nuclear reactor" (Tr. 3386), then the only experts are NRC staff, applicant staff and consultants. No outside opinions would be relevant. (Indeed, this was the treatment given the CESG witnesses on psychology. They had, after all, never seen a control room.)

We have a situation in which, in the name of keeping out non-expert testimony on the strength of containment structure, and hydrogen burning or detonation (Finding 24) testimony on other matters was excluded. A physical chemist was not allowed to testify on the gas laws, chemical reactions, reactor systems, reactor operator performance, hydrogen generation and burning, alternate mitigation systems, orifice calculations, pyrolysis and other matters squarely within his training, knowledge, industrial experience and education Rejection of an expert in this way is not harmless error.

D. Evidentiary exception: subpoena.

4. The ASLB erred in refusing to grant a subpoena for Louis Charles Barbe on application of CESG. (Tr. 3446-8, 3480-1)

CESG submitted its first subpoena application on 2/26/81, and although some requests were granted, that of Louis Charles Barbe was not. The standards for granting a subpoena request have been discussed above.

Barbe, CESG stated, "is relevant to contentions 1 and 2 in that he can also testify about the human factors involved in reactor operation and to safety factors. He is an engineer and has worked for Westinghouse in the nuclear division." The affidavit of Stephen West was introduced to point out that strenuous efforts had been made to locate such a person. Barbe answered an advertisement in Human Factors magazine. He has certificates in fire protection and safety engineering. Questions proposed to ask him were set forth in the application, and relate to fire, safety, human factors and similar hazards in nuclear plants.

Barbe could have grounded the five academic psychologists' testimony in a "background with respect to operation of nuclear power reactor facilities and . . . relate the general phenomena discussed to nuclear power plant operations or to control room activities." As finding 25 makes clear, this was only allowed to be done by Duke Power's witnesses after Barbe was not called.

One definition of a failure of due process is governmental action that turns one's stomach. Preventing the appearance of an Intervenor witness who can bridge theory and practice (finding 26) and then calling attention to Applicant's witnesses who performed that

feat, unchallenged except by cross examination, is such an act. Since the only ground for denial of a subpoena is the failure of general relevance, this error was clear and damaging.

E. Admission of Contentions.

6. The ASLB erred in not allowing evidence to be taken on Contentions 3 and 4, in that evidence as to the dire consequences of a breach of containment must be entered into the balance as a measure of risk should an unlikely accident occur. See finding 58 (3). (Tr. 5233, 5247)

7. The ASLB erred in not allowing Contention 5 which stated that an environmental impact statement for the most severe class of accidents was required. (CESG's Memorandum of Jan. 21, 1981; ASLB's Memorandum and Order, February 17, 1981; CESG's request for certification to the Commission, March 2, 1981; ASLB's Memorandum and Order denying certification, April 21, 1981)

8. The ASLB erred in not allowing Contention 6 which stated that the McGuire emergency plan be revised to include a response for Charlotte, N. C. in the event of a Class 9 accident. (cf. 7. foregoing for references.)

9. The Board erred in accepting Applicant's theory that it was necessary for CESG to demonstrate a specific "credible" accident. (Tr. 5236, 5248-9)

10. The ASLB erred in giving inadequate consideration to the lessons learned from the TMI-2 experience.

Although the Board admitted CESG Contentions 3 and 4 concerning the consequences of a breach of containment, it did not allow evidence on these areas. CESG was ready to provide such and had requested subpoenas of doctors and others and had prefiled testimony in this area. The Board, at the urging of Staff and Duke, silently adopted a bifurcated hearing procedure requiring that CESG prove a credibile accident (finding 8), a failure to react adequately (finding 33) and a breach. Having this unannounced burden in mind and determined to find no accident credibile despite TMI-2 (See Separate View, p. 10), they then never got to contentions 3 and 4. The contentions must be taken as true, i.e. proved, at this stage, having essentially lost via a decision to grant summary judgment. If so, they establish a serious residual risk, which must be taken into account under the regulations and placed in the balance of a cost/benefit analysis. The only possible conclusion therefore, is that the risk is unacceptible and the project should not go forth.

Contentions 5 and 6 are the subject of exceptions 7 and 8 and have been briefed by CESG in connection with its request for certification and that need not be reprinted here. CESG requests the review of the documents referred to in exception 7 by the ASLAB.

Similarly, Exceptions 9 and 10 have been briefed in Separate Views by Commissioners Gilinsky and Bradford.

> Still, the Board read its unfortunate mandate in the narrowest possible way and laboriously evaluated the "credibility" of an accident similar to that at TMI-2. The Board found that, in view of new instructions to reactor operators and other

> improvements, an event which actually occurred two years ago was no longer "credible" and that, therefore, there was no need to pursue possible remedial steps. It is a finding that could only have been made by a group schooled in the arcane subtleties of nuclear regulation. No ordinary person is capable of such foolishness. After the TMI experience, this review of the "credibility" of an accident involving hydrogen has been a waste of the parties', the Board's, and the Commission's time. It can only contribute to public cynicism about nuclear regulation and the role of public hearings in the decisionmaking process.

But the Commissioners' cursory look at the problem is no substitute for an in-depth review, foreclosed by the Board below. TMI-2 was an occurence to be prevented and it is now likely that the industry can prevent that exact accident from happening again. This Board seems to have not learned the lesson, however, that there are other possible accidents waiting to happen.

Based on the enormous procedural defects herein, and more, on their cumulative effect resulting in Intervenor being unable to present its case, the entire matter must be remanded for rehearing before another, unbiased, Board, after reversal by this Appeal Board, and the license heretofore granted must be withdrawn.

SUBSTANTIVE MATTERS

Exception 6 states that the ASLB erred in not hearing Contentions 3 and 4. Contention 3 stated that an emergency planning radius of 10 miles was insufficient to protect the public from the releases from a hydrogen-explosion-ruptured ice condenser containment. The Appeal Board is asked to note the NUREG report advising communities on emergency procedures. For a PWR-5 atmospheric release a city the size of Charlotte could anticipate several hundred fatalities and twice as many illnesses. A PWR-1 release, using the notation of WASH-1400, would be much more severe. Information of this type is an essential to making a finding in regard to risk which the Staff recognizes contains elements of likelihood and consequence (NUREG-0534, Sec. 6.1). Severe accidents would require crisis relocation planning, Contention 4, which has not been undertaken by Applicant nor required by Staff.

Exception 7 holds that the ASLB erred in not requiring a supplemental ES concerned with the impacts of severe accidents. Such an ES supplement would be a basic document in arriving at an estimate of the consequences of containment breach.

Exception 8 maintains that as the possibility of a containment breach accident has not been precluded by the actions of Applicant or Staff assuming operation of McGuire, that the welfare of the people of Charlotte receive consideration by providing a suitable emergency evacuation plan.

Exception 9 asserts that the ASLB erred in accepting the Applicant's theory that CESG must "demonstrate" a specific

"credible" accident. As Applicant holds that only the TMI-2 accident is credible, because it happened, it is clearly impossible for CESG, which does not own a string of nuclear plants, to demonstrate according to this standard. The NRC provides massive evidence of the credibility, in the engineering sense, of a variety of accidents. The entire regulatory concept requiring PSAR's, RESAR's, FSAR's, Staff evaluation of applicant's submissions, reviews, research and requiring the expenditure of great effort and cost is based on the credibility of a wide range of accidents. There is no point in seeking to prevent accidents unless the accidents are possible, i.e. credible. CESG has pointed to the spectrum of LOCA's as credible accidents. It is only necessary to have an inoperative ECCS to have a potential hydrogen generation scenario. Indeed such scenarios are computer modeled in two of CESG's exhibits (40A, 59) one of which was received and would attest to the credibility in the view of experts of sequences more damaging than Applicant's S2D "base case". Given the generally recognized credibility of a spectrum of potential hydrogen release accidents, and CESG's recognition thereof, any further, arbitrarily conceived "demonstration" is an absurdly improper requirement to place on CESG. Further views in the matter of the demonstration by intervenor of a credible accident have been expressed by Commissioners Gilinsky and Bradford (Separate Views, June 29, 1981, pp. 8, 10, 11) and by Bradford (Separate Opinion, June 29, 1981, p. 1 and footnote 2). (Tr. 5236, 5248-9)

Exception 10 avers that the ASLB gave inadequate consideration to the lessons learned from TMI-2. Clearly it is credible for a hydrogen release involving 50% metal water reaction to occur (CESG Exh. 45, Gilinsky and Bradford, Separate views, June 29, 1981, pp. 1-2, 6-7). And clearly the NRC failed to take adequate measures to prevent this type of accident. Nor has it learned yet to look before leaping--as Gilinsky and Bradford state, "the problems of hydrogen control are not yet fully understood" (Separate Views, June 29, 1981, p. 11).

Exception 11 recognizes that the ASLB erred in not keeping the record open until the matter of igniter system failure at Livermore had been resolved. (Tr. 5227-8) If steam fogging prevents the ignition of otherwise combustible hydrogen/air misxtures, whatever limited predictability inhered in the CLASIX code predictions of pressure/temperature/time relations will be lost. There will no assurance that when ignition does occur that peak pressures will fall within the range of containment capability.

Exception 12 maintains that the ASLB erred in closing the record before the detonation question had been resolved. In detonation flame spread is so rapid as to be almost instantaneous. A consequence is the development of pressure peaks of the order of twice that reached in a slower burn. All witnesses were agreed as to the higher pressures reached in detonation. A discussion of detonation pressures is given in the Sandia report (CESG Exh. 40A, pp. 30-34, Fig. 16). Small scale detonations are less likely to be damaging than large ones.

A large combustible cloud would put the containment at risk. The plenum at the top of the ice condenser is such a region (CESG Exh. 40A pp. 29, 30). An accumulation of a combustible cloud in the dome would present a similar hazard, although the geometry is less conducive to inducing detonation. Detonation in large volumes is not well understood and recent findings by Dr. John Lee make it credible that detonation could occur in the containment (Tr. 4094-4097). Dr. Berman is of the view that detonation in containment cannot be ruled out and that further study and analysis are called for (Tr. 4097-4101). Dr. Berman cannot rule out a detonation in the upper plenum and regards the igniter system as causing an overall risk which exceeds the benefit in reactor safety (Tr. 4103). The ASLB erred in disregarding this testimony and in going forward toward the licensing of a plant in such uncertain status, considering the magnitude of the hazard.

Exception 13 states that the ASLB erred in not receiving CESG Exh. 62, Chapter 8, Accident Process Analysis (Sequoyah) and in not finding, based on Exh. 61, Table 9-1, Dominant Accident Sequences--Sequoyah Plant, in conjunction with Exh. 62, that CESG had provided sufficient evidence to demonstrate the credibility of hydrogen release accidents. It would be a strong and unfavorable reflection on the NRC if it spent vast sums of public money contracting for studies concerned with incredible, non-possible circumstances. This is the sort of arcane subtlety of nuclear regulation to which Gilinsky and Bradford refer which would be seen by ordinary people as foolishness.

(Separate Views, June 29, 1981, p. 10) Similarly the MARCH code effort and the Brookhaven National Laboratory studies (CESG Exh. 59) are wasteful foolishness if the subject of concern, LOCA'S, including those without ECCS operation, is not credible.

Exception 14 holds that the ASLB erred in not receiving CESG Exh. 59 for the truth of the matter. The computer studies are simply an extension of those in CESG Exh. 40A, a received exhibit./ (Tr. 4304) This material surfaced to ASLB and parties during the course of the hearing. The ASLB denied CESG's request for an authenticating expert witness. Again a matter of arcane, legalistic foolishness. Dr. Denwood Ross, the NRC's officer for executing research contracts (Tr. 4032, 4045, 4058, 4063) authorized the BNL study (CESG Exh. 59)(Tr. 4067-8). He testified extensively as to the background for the study and the prior experience of BNL with such studies (Tr. 4068-4070). Applicant's received Exh. 5A and 5B are based on the same MARCH code. The computer studies of the BNL report show other hydrogen release scenarios, including resumption of ECCS operation during the course of the LOCA, which causes a large hydrogen release, and meltdown, which causes a very large, very rapid release. This confirms CESG Exh. 40A which, also operating with the MARCH code, indicates that "Calculations carried beyond core slump always predicted containment failure." (Exh. 40A, p. 35) The exclusion of such material militated against a finding that McGuire was not in a status to be licensed.

CESG is convinced that the ASLB erred in making findings that neither reflect the record nor comprehend scientific truth. The failure of the SID to recapitulate and to rebut CESG's proposed findings (32-45, 47-51) support the view that comprehension and cognizance of these findings would be totally incompatible with accepting Applicant's and Staff's findings and with authorizing a license. The CLASIX code contains patently erroneous assumptions. This Appeal Board is asked to note the record of the Commissioners meeting re McGuire on June 24, 1981. There Dr. Matson confirms the discrepancy between available codes and the situation in containment (Comm. Tr. 43-45) This observation was made by CESG in Finding 32. The flow model considered by Applicant and Staff is overly simple. This was recognized by Dr. Matson as a nuance new to him. (Comm. Tr. 36) The mixing rate of return air with steam/hydrogen is patently unrealistic (Finding 33). The distribution of air/hydrogen ratios around the condenser over the course of the S2D was mistakenly assumed to be uniform by Applicant and Staff. Careful consideration will show that it could not be (Findings 37-40). The explicit projections of pressures and temperatures in the containment compartments, and specifically the maximum 16 psig pressure peak of Applicant's base case are not supportable (DPC Exh. 5B, Table 6, Fig. 1-8; CESG Finding 41). All hydrogen consideration stops short of core slump. No adequate basis was developed for this exclusion (Finding 51, Tr. 4071,2), "Our interest at this point was limited to the events which produced 75 percent core metal/water

reaction" Yet it was postulated that "seventy-five percent core metal water reaction would produce enough hydrogen, which if burned all at once, and without any energy absorption, could produce pressure to fail the containment", Denwood Ross (Tr. 4056,7). CESG supplicates the members of this Appeal Board to take the effort and the pains to comprehend what it is saying in its proposed findings 32-45 and 47-51. It may assist in the understanding of this complex subject to read a presentation in different words made before the Commission (Comm. Tr. 25-30, attached). The possibility of forming large accumulations of hydrogen during a LOCA despite the operation of the igniter system, and the subsequent touching off of these accumulations after they have become enriched with air poses a hazard the ASLB did not comprehend. This matter, which is recognized by the division of reactor safety (Comm. Tr. 35,6, attached), should be resolved before conclusion of the McGuire license proceeding.

The ASLB clearly erred in exceptions noted, 18-28. Most of these matters have been defined by experience in the passage of time since the closing of the ID record in 1978. Growth in peak demand nationally has decreased from the 7% at the time the CP was applied for to ½%. Applicant's growth in peak demand has reduced from 9% to 3%. The growth pattern is not exponential, it is most nearly linear. Despite Applicant's expectation that the plant would be required in the winter of 1975-6, Applicant's reserve still lies between 15 and 20%,

depending on the deviation of temperature at the time of peak from average peak temperature. The effect of the business cycle, contrary to the ASLB's finding, is accomodated in the economic correction factor in CESG's IONCOE model. To our best knowledge IONCOE has outperformed all other models for predicting peak electrical demand.

The allegation that nuclear generation is cheaper than coal is now known to not be generally true. It appears to be true for Applicant. If McGuire goes on line, it will no longer be true due to the tremendous capital cost escalation from under $400 million to over $1.8 billion. Applicant has already requested a rate increase of 10.7% from the N.C. Utilities Commission to accomodate increased earnings when, and if, McGuire goes on line. The ASLB's finding that nuclear generation would lower costs neglects to say for whom. Fuel costs will be less for the Applicant. Electrical costs will be more for the consumer due to the enormous fixed charges associated with nuclear generation. Any comparison of coal/nuclear generation costs must take cognizance of fixed charges, as well as expense, i.e. fuel and salary costs. At the present slow rate of growth in peak demand, correctly forecast in the record by CESG of about 300 MW per year, small coal units would, as CESG contended, cost less to the consumer than the large McGuire units. These are still not required to meet demand though the consumer has been paying bond interest, and AFDC and CWIP earnings for a decade. Very obviously the building of generating units in smaller denominations decreases the cumulative time in which generating

capacity stands idle, but fixed charges and earnings continue to accrue. Perhaps the most ironic finding is that a cost comparison of McGuire nuclear to coal should not include the cost of the nuclear plant (ID p.45). This finding was made at a time when the cost of McGuire was about $900 million. It has since more than doubled. A finding denying an OL to McGuire in 1978 would have resulted in a saving in consumer costs and disposed of the safety problems which all parties recognize exist. Of course the finding that added small coal units would not result in lower reserve requirements was erroneous. The more large, 1000 MW or greater, units in the system, the larger the reserve requirement, as several units can be down simultaneously. Denial of a McGuire OL would hold down to two the number of large units in Applicant's system (the Belews Creek coal fired units).

The ASLB erred in considering only the small costs of electric production and operating costs in the cost benefit analysis. The McGuire plant when, and if, unit 2 is completed, will cost about $2 billion. The present estimate is above $1.8 billion and growth has been continuous in estimates since the plant was first proposed. Plants over 1000 MW in capacity have demonstrated capacity factors of about 0.5. This would lead to an annual electrical energy production of 1.034×10^{10} kWh. At a combined return and indebtedness interest rate of 12%, the fixed charge calculates to 2.32¢/kWh. This compares to a prenuclear, busbar cost in 1970 of 0.69¢/kWh.

The actual outstripping of coal generating costs in the

Applicant's system by the anticipated McGuire nuclear generating cost at McGuire. This disposes of the ASLB's finding that capital costs could be disregarded for McGuire in finding that McGuire generation would be immune from the tendency for the prices of equivalent energy sources to equalize.

It has been noted foregoing that depending on fluctuations from average seasonal peaks that Applicant will have between 15 and 20% reserve capacity in 1981. The other utilities in the SERC are appreciably overbuilt. Applicant has access to the TVA system, the largest in the nation, and frequently interchanges with TVA. It is far more cost effective, and beneficial to the rate-paying public, to meet peak demands at times of unexpected outage with firm purchase commitments than uneconomic, excess base load capacity. In fact over an eight year period in the 1960's Applicant operated with an average reserve of 3.7%. There were two minor brownouts during this period which most customers became aware of by noticing the news reportage after the event. The continuing decline in growth rate as Applicant's customers turn increasingly to woodstoves for heating and ventilation for cooling, and the economic impact of ever increasing energy prices, and of the continuing outstripping of wage increases by consumer prices, make it appear likely that McGuire generation will not be needed to maintain a reasonable reserve level through the 1980's. CESG anticipates that demand will level out before 1990 and that the peak will be approximately 11,500 MW.

The ASLB erred in concluding that the "no plant" alternative did not merit consideration on the basis that McGuire was nearly completed. By no stretch of the imagination or act of charity can one concede that a project at the halfway mark in expenditure is nearly completed. Within the last several months the largest brokerage firm in the U.S., Merrill Lynch, Pierce, Fenner & Smith, has published a study finding that, in view of the extremely high and ever escalating nuclear plant capital costs, and the great overestimation of the growth in electrical demand, that plants no more than 30% complete are better abandoned. In view of the sum of McGuire costs not yet having been reached, it is altogether possible that CESG's contention at the time of the hearing met the Merrill Lynch criterion. The returns are far from being in for the actual costs of decommissioning and spent fuel disposal. Ignoring for the moment safety considerations, the cost today of abandonment may be less than the cost of use. When safety considerations are entertained, abandonment appears to be by far the best alternative.

Respectfully submitted,

Shelley Blum
1402 Vickers Avenue
Durham, N.C. 27707

(Of counsel on brief:
Debby Allen, second year
law student at N.C. Central
Law School.)

Jesse L. Riley
854 Henley Place
Charlotte, N.C. 28207

July 8, 1981

NUCLEAR REGULATORY COMMISSION

COMMISSION MEETING

In the Matter of: PUBLIC MEETING

MCGUIRE APPLICATION FOR AN OPERATING LICENSE

DATE: June 24, 1981 PAGES: 1 - 49

AT: Washington, D. C.

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Telephone: (202) 554-2345

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

McGUIRE

PUBLIC MEETING

Nuclear Regulatory Commission
Room 1130
1717 H Street, N.W.
Washington, D.C.

Wednesday, June 24, 1981

The Commission met, pursuant to notice, at 2:10 p.m.

BEFORE:

JOSEPH M. HENDRIE, Chairman of the Commission
VICTOR GILINSKY, Commissioner
PETER A. BRADFORD, Commissioner

ALSO PRESENT:

S. CHILK
L. BICKWIT
J. SCINTO
R. MATTSON
D. RATHBUN
J. ~~KILHOORI~~ MILHOAN
M. MALSCH
E. KETCHEN
C. TINKLER
J. RILEY, Carolina Environmental Study Group
M. McGARRY, Duke Power Company
W. RASIN, Duke Power Company
W. PORTER, Duke Power Company

Despite I am sure the effort that was made to train its operators to follow certain procedures, as there is a possibility of attempts at mitigation of pressure increase, I feel that early activation of igniters would be essentially harmless.

With respect to vacuum effects, the containment I feel would be well equal to it. Mr. Rasin I think correctly points out that some systems would start operating with a negative quarter pound being reached, and again it would be a matter of inconvenience.

I would like to indicate, though, a source of concern in turning on the igniters and not making provision for turning them off, because I believe that your analyses in the future are going to show that a time will be reached in which the less hazardous thing to do is to turn off the igniters and permit the recombiners to dispose of the hydrogen in the environment. If it would be the pleasure of the Commission I would like to indicate why I think this is the case.

The second part of the handout indicates some of the situation. There are seven attachments to the pipe which leads to the pressurizer relief tanks. One of these is a spray nozzle. Three are power relief valves and three are safety valves. I have red-checked the pressures at which these operate.

COMMISSIONER GILINSKY: I wonder if we could return to this after we have completed dealing with the actuation question, or however you want to do it.

CHAIRMAN HENDRIE: Why don't we let them go ahead and get the proposition stated. Then I want to go around the table again, and people will have a chance to comment on the other parties' remarks, including this point.

COMMISSIONER GILINSKY: Good enough.

MR. RILEY: Further information on the pressurizer relief tank from the FSAR is given in the following pages.

The next stapled portion of material is from NUREG-CR-1219. I really think that this is the heart of the matter. When the Commission asked a question about 3 percent hydrogen, I assume it meant a uniform concentration throughout the containment of 3 percent. Now it is argued very persuasively in this NUREG report that the hydrogen concentration at Three Mile Island was not uniform, that the place where ignition occurred was a much higher concentration than that on the average of the containment and certainly the same heterogeneity and hydrogen concentration will be true for McGuire.

I really think that this is the heart of the matter. Until our analyses deal with the case of a range of hydrogen concentrations, I feel that we are going to come out with mistaken conclusions with regard to when to turn

igniters on and when to turn igniters off.

Now the remaining documents are from McGuire FSAR. They will enable you to visualize where the various elements in the plant are. On the first sheet you will see in elevation the location of the pressurizer and pressurizer relief tank. On the second sheet you will see the location of pressurizer relief tank, plan, and of the nine hatches through which return air is provided to the lower compartment which contains the reactor and where the leak would presumably occur.

The elevation of the sheet just referred to is 738. The elevation of the next one is 768. We see where the air return fans are. We see that the inlets for the air return fans are diametrically opposite the location of the pressurizer. If we go on to the next sheet, we see the layout of the ice condensers and we see that the air return fan inlets are between the ends, the open space in the ice condensers. And when we go to the last of these legal-size sheets, we see that the hatches venting the ice condenser correspond to, of course, the condensers themselves, and are uniformly distributed ~~in~~ that section.

Now 21 minutes after hydrogen release begins, it will reach a maximum. This information is ~~for~~ from the S2D scenario. You will find it in Duke Power's analysis of hydrogen control measures in Volume 1, and the information is given in Table 2 where the hydrogen release rate, mass

release rate is given.

The water release rate is given in Table 1. Some simple calculations show that at the peak of the accident the flow of steam and hydrogen into the lower compartment will be three times that of the return air, which means that three-quarters of the parts into the ice condenser are going to receive hydrogen and steam. Under these conditions the thorough mixing of that one-fourth of air with those three-fourths of steam and hydrogen is certainly not going to be complete. There is going to be a small transition region where there is some mixing.

But what it means is that a very substantial part of the steam and hydrogen is going to go into an ice condenser unaccompanied by any air. Now the steam will condense out. And the air in the portions of the ice condenser adjoining will laterally move toward the close-in to make up for the volume of the steam.

What it amounts to is that there is going to be a channel of approximately 30 feet by 10 feet in the ice condenser emerging at the top on the opposite side of the air return fans where you are getting up to pure hydrogen. There is going to be a transition band but you are going to have an extremely high concentration of hydrogen in the center. That hydrogen has about 7 percent the density of the air atmosphere. It will be enormously buoyant.

As you can see from the plans, the thing that will happen is that that hydrogen will move to the top of the dome where there are a group of igniters. For a while that hydrogen will burn off because there will be enough oxygen present. In the last sheet of the handout you see the ternary ~~burning~~ diagram which indicates the vicinity in which hydrogen burns in relation to air and steam composition and the region in which it detonates.

But after that portion of the hydrogen which has had sufficient air to combust has combusted and the supply becomes hydrogen which is unburnable because it lacks oxygen, one will accumulate a volume of hydrogen in the dome with the igniters below and nothing happening except that the air return fan system will still be operating, causing some circulation. There is what engineers call a flow net which will have maximum flow in the vicinity of inlets, the air return fans, and minimum flow in the region from which the hydrogen will have issued.

But slowly there will be mixing and there will be diffusion. It is very obvious, if you visualize this, that the minimum concentration of air will be at the top in the vicinity of the igniters and slowly oxygen will rise, increasingly making the mass combustible.

Finally there will be a combustible composition in the vicinity of an igniter with a large combustible and

probably detonable volume of hydrogen below it. That I think is what Dr. Berman had in mind when he said the use of the distributive ignition system under certain circumstances is fraught with danger, and I believe that is the circumstance.

For that reason I would recommend that a study be made by this Commission to determine that point where it is safer to turn off the igniter system and every other electrical device in the containment except the recombiners and allow the recombiners to take care of that hydrogen.

CHAIRMAN HENDRIE: Thank you, Mr. Riley.

Depending on the inclination for questions from this side of the table, I propose to switch back across the parties, asking for comments on one another's remarks. You probably have some more questions as we go along.

MR. McGARRY: Could we have the Commission's indulgence for about one minute so we can caucus, as it were?

CHAIRMAN HENDRIE: I do not see why not. While you are caucusing maybe we can go ahead and ask the staff to comment.

MR. McGARRY: I think we can be ready in about one minute. If you would please hold for that one minute, we would like to hear the comments.

CHAIRMAN HENDRIE: Go ahead and caucus.

(Discussion was held off the record.)

enlarge the window of protection afforded by the igniters, that is a good reason to turn them on. That is the window we are exploring, and we had simply decided some months ago to take the rest of 1980 to answer that question.

CHAIRMAN HENDRIE: You mean 1981. You have already taken the rest of 1980.

MR. MATTSON: Yes, 1981.

(Laughter.)

MR. MATTSON: The question that Mr. Riley raised on when to turn the igniters off is not a new question and also is included in the work that we have ongoing, principally generated by some of the testimony in the McGuire hearing.

Suggestions have ranged broadly on how igniters ought to be controlled, when they ought to be initiated, should they be turned off in some situations, even so far as the suggestion that individual igniters may need local detection and control devices. That could get rather cumbersome and rather expensive but remains one possibility that is in front of us as we continue to look at what ought to be the required hydrogen mitigation system for the long term and the small containments.

So in addressing those kinds of questions we will have to come to grips with when on and when off. I welcome the suggestion that we look at that question.

In fact the record of this proceeding has on it a considerable discussion of the inerting of hydrogen by steam or fog. He seems to be adding -- this is the first time I have heard his argument -- the additional parameter of accessibility of air to concentrations of hydrogen once the steam goes away. You will leave concentrated areas of hydrogen and how will the air find its way to those concentrations: that is a nuance that was not on the record to my knowledge. But the question of lower plenum inerting followed by dry-out and steam leading to transitions to detonation and things like that you have heard on the record of this proceeding. You have heard us discuss them in the context of the interim rule for hydrogen control. These are questions very much in front of us between now and the end of this year.

Those are the only comments I would make in response to what I have heard.

COMMISSIONER GILINSKY: I do not have much more to add. I guess I would like to ask, are you familiar in detail with the calculations leading to the predictions in pressures during accidents? The question I want to ask is simply this. It seems to me it is one thing to predict that the pressure will be 10 psi or 20 psi or whatever. It is another thing to predict the difference between 1 and 2 and 3 and 4. And it seems to me, I would think that our ability

calculations.

COMMISSIONER GILINSKY: Do they take full account of the ice, the possibility of condensation?

MR. RASIN: Yes. They include the effects of the ice. From the beginning of the blowdown we take into account the heat transfer to the ice, the effects of the sprays, the air return fans. The CLASSIX Code also includes the structural heat sinks. So we do look at just heating up the metal and concrete in the containment.

COMMISSIONER GILINSKY: Thank you.

CHAIRMAN HENDRIE: Mr. Riley, it is your turn on this last round.

MR. RILEY: Thank you.

Mr. Rasin, does the CLASSIX Code assume homogeneous compositions within the lower compartment, the ice condenser and the upper compartment with respect to the concentration of hydrogen?

MR. McGARRY: As his counsel I am going to object to that form. I have held off on some objections. I think Mr. Riley of course is free to address the Commission. I did not think this session was an interrogation of one party by another party.

CHAIRMAN HENDRIE: No, it is not.

Tell me where you are aiming and maybe I can help you out and ask him a few questions for you. I am unwilling

to be a blind conduit.

MR. RILEY: I will be very glad to oblige.

The entire schema with respect to pressur. development and burns and so forth that has been provided by the Applicant in what is known as Exhibit 5-B makes certain code assumptions. What I am trying to determine is if one of these assumptions, the in my judgment ~~the~~ unrealistic one, that throughout the course of the accident the hydrogen concentration is uniform, though increasing and then later decreasing through the lower containment, and then a different one through the ice condensers and still a different one through the upper containment.

CHAIRMAN HENDRIE: I guess your aim would be to reinforce your previous comments about possible inhomogeneity in atmospheric composition at various times in an accident sequence.

MR. RILEY: Not only that; it would be to raise the question of whether or not we can rely on the predictions of CLASIX, because if CLASIX is based on faulty major assumptions then I think that we are in a position of distrusting its results.

CHAIRMAN HENDRIE: But with regard to the questions we asked this afternoon about feasibility on the one hand, reasonableness on the other of set points for turning the igniters on, I am not sure where that gets you.

MR. RILEY: I think that is a very fair observation. I will say this. It may relate to the discussion of achieving 3 psi pressure drop and the later pressure drop which I think Mr. Rasin said was 6.5 psi at which point the air return fans went on. It would have to do with predicting those times which have already been stated.

CHAIRMAN HENDRIE: I think once you get enough hydrogen so that questions of hydrogen inhomogeneity are of interest, we have certainly gone past the time and the sequence at which one would have hoped the igniters had been on.

MR. RILEY: The thrust of my testimony was that that assumes a known scenario like S2D. And certainly we did not play out anybody's known scenario at Three Mile Island because of the various interventions that took place. Just because it is a human possibility that if an accident occurs at McGuire it will not play out a precise scenario, I think that it is fair game to ask for mutations with respect to scenarios. That would be one.

CHAIRMAN HENDRIE: It is certainly fair game from your standpoint. But I have a feeling that that discussion leads us back into the merits of issues which have been adjudicated and they are on the record, people's points of view one way or another expressed. And it is not so clear

to me that it deals directly with the two questions here about the set point on the igniter triggering.

As I understand the thrust of your remarks with regard to particular questions here, I would assume you would be inclined to vote for a lower set point barring any good reason not thus far discussed for doing it. And I think there is a valid point to be made about trip points on the fans. Would that be an unfair characterization of your view with regard to the particular point on set points?

MR. RILEY: I think it would be a substantially correct view. I would feel more comfortable, all things considered, if the pressure set points were lowered. I am not so sure that I would want to see the fans go on before 3 psig. I am not certain that it would be that relevant.

I do think though that there is some surviving value in the question that I wish to propound to Mr. Rasin. That is it would be helpful I think for the Commission to know whether the underlying assumption of their calculations of events assumes homogeneity of hydrogen within the several containments at any instant in time.

The entire igniter operation is premised I believe on knowing what the hydrogen concentrations are. If at one small point you have a burnable 10 percent and at other points you have an unburnable 5 percent or unburnable 85 percent, our entire reliance on the igniter thing falls

apart. In the sense that I felt we were concerned about the efficacy of the igniter system, I would raise that question.

CHAIRMAN HENDRIE: I will tell you what I am going to do. I am going to use it in a somewhat different form. Rather than turning to Duke Power, I will turn to the people I have worked with for many years and ask whether I can comment about the way in which those codes currently are being hydrogen concentrations and once more ask him to sort of summarize by seeing whether he sees any significant difficulties in set point, safety objection.

MR. McGARRY: If I can just jump in, Chairman Hendrie, and give Dr. Mattson perhaps 30 seconds to reflect, I would like the record to reflect that during the exhaustive administrative adjudicatory hearing, the Applicant presented well over 20 witnesses and we discussed the CLASIX Code. We had the people there who developed the CLASIX Code and the underlying assumptions.

CHAIRMAN HENDRIE: Fair enough I guess to note that.

Roger?

MR. MATTSON: I would think that the fact that the Codes do treat the rather large volumes with single nodes, with homogeneous assumptions, would have little to do with the validity of the 3 psi set point. You are primarily interested in mass addition in the lower plenum. You add it

up; you put it in the volume; you calculate what the pressure will be.

The homogeneous assumption would have a lot to do with the question of can you inert large volumes of pure hydrogen with steam, isolate it from air, later remove the steam and then bring the air into the previously isolated volume of hydrogen. That is obviously a heterogeneous question for which the existing codes are not particularly good.

I also point out that that is what is known as multiphase, multicomponent flow at which very few codes in the whole world have ever been any good for any problem. It is a very difficult area of analysis. You often end up with not finite element codes of the sort with which we are accusomed in MOCA and containment analysis but a lot of qualitative arguments and qualitative analysis.

It is a difficult area. It is one we have said we would look into. I do not believe it is particularly germane to picking the 3 psig set point.

CHAIRMAN HENDRIE: Or some other.

MR. MATTSON: Yes.

CHAIRMAN HENDRIE: But the Codes do treat the containment subdivided into a number of nodes, lower compartment I guess, ice condenser, upper compartment at least.

MR. MATTSON: You can think of it as a one-dimensional representation with homogeneity in each node, yes.

CHAIRMAN HENDRIE: But in the calculation, different areas in the containment represented by the single node could have different and do have different compositions as the sequence goes along. It is still less than a highly detailed representation. On the other hand it is not so crude as to consider the containment a single volume either.

MR. MATTSON: For a burning and an energy transfer point of view, it would be important to treat it in multiple volumes so that you could somehow handle the inhomogeneity.

But for a mass, an energy addition to determine the pressure, there is no way to sustain much pressure difference across such a large space. The representation by a single node with an assumption of homogeneity would be very good.

COMMISSIONER GILINSKY: How many nodes are there? Are all the ice chests lumped together or are they treated individually?

MR. MATTSON: You are getting into a little more detail than I am close to. I could ask Mr. Tinkler of the staff to stand up and see if he could address the question.

MR. TINKLER: The original CLASSIX analysis had a one-node volume of the ice condenser region. Revised

analyses have modeled that region with two nodes, the separate node for the upper plenum of the portion of the ice condenser region.

CHAIRMAN HENDRIE: Mr. Riley?

MR. RILEY: Mr. Chairman, do I still have an opportunity to resume on our discourse with respect to questions?

CHAIRMAN HENDRIE: Let me allow you about two more minutes, Mr. Riley, because I am running out of time. I have some other appointments, and I sense that the Commissioners have had a fair chance to probe into the items that were of interest here.

MR. RILEY: I think it would be highly desirable to establish the pressure difference between the upper containment and the lower containment at times of maximum flow from the leak. The reason I say this is that the air return fans according to the PSAR have a pressure differential of two pounds per square foot. Psf is the abbreviation used. That adds up to a ltle over one-hundredth of a pound per square inch.

It is my belief that the pressure inside the lower compartment will have a differential much greater than that with respect to the upper compartment and that the fans will ~~be~~ back up if anything. And this aberration in the flow process I do not think has received any consideration. I

think it is a fair question.

CHAIRMAN HENDRIE: I will ask the Commissioners to take it under advisement.

Do you have other comments?

Peter?

COMMISSIONER BRADFORD: No, sir.

CHAIRMAN HENDRIE: I think we have then achieved the purpose from the Commission's standpoint of the briefing. I must say I want to thank all of the parties for a useful and, on your part, very focused and timely sort of discussion. I appreciate your coming.

MR. McGARRY: At the risk of sounding like a lawyer and coming in at the last minute, I am going to barge ahead anyway, Mr. Chairman, for 30 seconds.

Discussions with Commissioner Gilinsky and Mr. Rasin, indeed all the parties, centered on two points. The first one was whether or not it is necessary to lower the set point for the igniters. We are aware of course of the Sequoyah situation which is premised upon safety injection.

I would like Mr. Rasin to mention just one point to you because our people think it is very important. It really was not brought to your attention. But if indeed you are inclined to go in that fashion and make that a condition, we would feel strongly that that condition should read that the set point would be at safety injection with an