

AFFIDAVIT OF GREGORY C. MINOR
CONCERNING
NEED TO ANALYZE SYSTEM INTERACTION
ON SHOREHAM NUCLEAR POWER STATION

STATE OF CALIFORNIA)
)
COUNTY OF SANTA CLARA) ss.

GREGORY C. MINOR deposes and says under oath as follows:

I. BACKGROUND OF AUTHOR

1. My name is Gregory C. Minor. I have twenty years of experience in the design, development, research, start-up, and management of nuclear reactor systems. I worked for sixteen years for the General Electric Company and for the past four years

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as an independent technical consultant. I am a founder in 1976 and vice president of MHB Technical Associates. I received a B.S. in electrical engineering from the University of California, Berkeley, and an M.S. in electrical engineering from Stanford University. Since 1976, I have participated in a variety of reactor studies addressing nuclear safety issues. I am presently a consultant on several nuclear plant cases concerning the adequacy of current designs to meet existing regulations. I am a member of the Nuclear Power Plant Standards Committee for the Instrument Society of America. Also, I have recently participated in a Peer Review Group of the NRC/TMI Special Inquiry Group, under the direction of Mitchell Rogovin. My complete experience record is appended to this affidavit as Attachment A.

II. PURPOSE

2. The purpose of this affidavit is to discuss the need for system interaction studies on Shoreham and to show how this may be precluded by the recent NRC Policy Statement ^{1/} and TMI Action Plan (NUREG-0660).^{2/}

1/ "Statement of Policy: Further Commission Guidance for Power Reactor Operating Licenses," Federal Register, Vol. 45, No. 21, June 20, 1980, pages 41738 to 41741.

2/ NUREG-0660, Vols. I and II, NRC Action Plan Developed as a Result of the TMI-2 Accident, U.S. NRC, Washington, DC, May, 1980.

III. INTRODUCTION

3. Systems for nuclear power plants are designed with the criterion that they must be able to survive any single failure and still accomplish their safety goal or mission. This has resulted in a level of redundancy and in some cases, diversity, to make each system capable of complying with the single failure criterion. However, several accidents in the nuclear industry have shown that there are serious implications from failures in one system which affect or interact with other systems to cause additional complicating failures. To some extent this has been considered by analyzing common-cause and common-mode failures.

4. WASH-1400 ^{3/} made an attempt to quantify multiple failures due to common cause, but their effort has been criticized as being less than complete in that it would take extraordinary knowledge and insight to evaluate all the possible common-cause failures and their impact on safety. This is particularly true if a system interaction is studied on the basis of a paper analysis rather than a physical review of the as-built and plant systems.

^{3/} WASH-1400 (NUREG-75/014), Reactor Safety Study - An Assessment of Accident Risks in U.S. Commercial Nuclear Power Plants, U.S. NRC, Washington, DC, October, 1975. We refer hereinafter to the study and the draft report as "WASH-1400."

IV. DISCUSSION

5. In the accident at TMI-2, the combination of closed auxiliary valves, stuck open pilot-operated relief valves, and misinformation to the operator allowed the failure of adequate feedwater and the partial blowdown to create voids in the primary coolant and produced misleading pressurizer level indications. This resulted in termination of emergency cooling water and, eventually, failure of the fuel. The release of radioactivity was due to the high-sump level causing the pump to turn on and pump radioactive waste to the Auxiliary Building where it was released to the environment as a result of additional errors. The radioactivity in the atmosphere fed back through the control room ventilation system thereby raising the levels to the point where special breathing apparatus had to be worn by the operators trying to control the accident. After the accident, the high radiation levels in the containment and the primary loop made it very difficult to work on the system and to perform the necessary maintenance functions.

6. In general, these multiple, inter-related failures involving various systems and their interactions (with and without human intervention) were not foreseen in the safety analyses conducted as part of the licensing process.

7. Other events such as the Dresden-2 blowdown in June, 1970, the Browns Ferry fire in March, 1975, and the Crystal River short of non-nuclear instrument power resulting in a partial blowdown in February, 1980, and possibly the still unexplained causes of the Browns Ferry-3 partial failure to scram in June, 1980, also involved the effects of one system on another producing more severe consequences than had previously been expected. As a result, the NRC and its Advisory Committee on Reactor Safeguards (ACRS) have recommended several studies as discussed herein to re-evaluate common-cause failures and effects of system interactions on safety including a re-assessment of the NRC's single failure criteria. ^{4/} Ultimately, the question may be answered in terms of revised regulations. Is the single failure criteria adequate for licensing? Is the present limited consideration of common-cause failures adequate? Attempts to answer these questions have been started.

8. In November, 1974, the ACRS requested that the NRC Staff give attention to the evaluation of safety systems from a multi-disciplinary point of view, in order to identify potentially undesirable interactions between plant systems. The concern arises because the design and analysis of systems is frequently

^{4/} 10 CFR 50, Appendix A, Criterion 21.

assigned to teams with functional engineering specialties--such as civil, electrical, mechanical, or nuclear. The question is whether the work of these functional specialties is sufficiently integrated in their design and analysis activities to enable them to identify adverse interactions between and among systems. The recent accidents seem to indicate that these interactions often are not identified in advance.

9. In mid-1977, generic technical issue Task Action Plan A-17 (Task A-17) was initiated by the NRC to confirm that their present procedures adequately take into account the potential for undesirable interactions between and among systems. Sandia Laboratories, under contract to the NRC Staff, has conducted an independent review to assess the adequacy of the current process for identifying such interactions. The Phase I report by Sandia was issued on December 21, 1979 and identified some areas of potential interaction. However, these have not been reviewed against the Shoreham design specifically.

10. In parallel, the NRC's Lessons Learned Task Force, after reviewing the TMI-2 accident scenario, formed the following conclusion regarding the potential for system interaction:

"The interactions between non-safety-grade and safety-grade equipment are numerous, varied, and complex and have not been systematically evaluated. Even though

there is a general requirement that failure of non-safety-grade equipment or structures should not initiate or aggravate an accident, there is no comprehensive and systematic demonstration that this has been accomplished....." 5/

They recommended that comprehensive studies of system interaction be conducted by all license applicants. They further recommend that these studies cover both safety and non-safety systems, under normal, transient, and accident conditions.

11. The ACRS has requested that two specific sites conduct system interaction studies: Indian Point Units 2 and 3, and Diablo Canyon (with emphasis on seismically-induced system interactions). The approach on these studies is to perform an in situ examination of the as-built plant and systems. These study results have not been published yet.

12. In addition, the NRC's Integrated Reliability Evaluation Program (IREP) is being run on a trial basis on an operating reactor, Crystal River, Florida. The intent is to apply it to several more trial plants and eventually to all operating reactors as well as NTOL's. IREP is based on a probabilistic fault tree analysis and is also looking for system interactions. The preliminary

5/ NUREG-0585, TMI-2 Lessons Learned Task Force - Final Report, October, 1979, page 3-3.

IREP results were inadequate to foresee the possibility of a partial blowdown caused by a power short in an instrument (i.e., the February 26, 1980 event) and are therefore being extensively revised.

13. To summarize the situation prior to the recent Policy Decision, there was general agreement that system interaction was an unresolved safety issue, had not been adequately analyzed in the past, and needed to be reviewed on all OL's and NTOL's. Further, there were several approaches being tried to see whether any of them would be able to adequately analyze the problem of system interaction. These involved a range of techniques including: detailed studies of plant design, probabilistic fault tree analysis, and site (as-built) inspections. However, none of these alternative approaches has been proven adequate to discover and evaluate potentially dangerous system interactions.

14. Despite the developmental IREP and system interaction analyses, the Action Plan calls for a Regulatory Guide to be drafted by December, 1980 and implies this will be resolution of Unresolved Safety Issue A-17. Further, it mentions only Diablo Canyon as a plant under construction which is required to implement system interaction studies and gives no date for implementation on other CP's or NTOL's. Their plans for implementation or IREP on CP's and NTOL's is clearly "undecided." ^{6/}

^{6/} NUREG-0660, NRC Action Plan Developed as a Result of TMI-2 Accident, Vol. 1, pages 21 - 22.

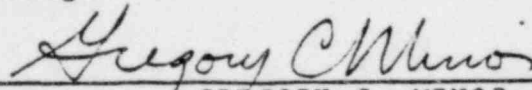
V. CONCLUSION

15. In my opinion, there is insufficient information on either IREP or System Interaction developmental approaches to conclude that the present trial programs will adequately resolve the Unresolved Safety Issue A-17 (System Interaction). Also, there is no mention of such a system interaction study included or referenced in the Shoreham FSAR, and thus there is no assurance that the present Shoreham design is adequate in this area. Therefore, the resolution of the System Interaction issue (A-17) and the approach used on Shoreham should be permitted public review in the Shoreham Licensing hearings.

16. I believe a detailed study of Shoreham Nuclear Generating Station is needed to assess the potential safety improvement available by careful consideration of system interactions and reduction in common-cause failures. The results of such a review would also serve to assess the adequacy of the present licensing criteria in these areas. Neither the Action Plan nor the recent Policy Decision should be allowed to preclude the review of such a study during the licensing process on Shoreham.


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I have read the foregoing affidavit and swear that it is true and accurate to the best of my knowledge.



GREGORY C. MINOR

Subscribed and sworn to before
me this 11th day of July, 1980.



NOTARY PUBLIC

My Commission expires Jan 11 1984



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June 9, 1980

John Ahearne, Chairman
Victor Gilinsky, Commissioner
Richard Kennedy, Commissioner
Joseph Hendrie, Commissioner
Peter Bradford, Commissioner
Nuclear Regulatory Commission
11th Floor
Washington, D.C. 20555



RE: Policy Statement for Operating License Requirements

Gentlemen:

The Commission voted today to approve in principle a policy that would permit utilities in individual licensing cases to challenge the need for any new TMI-related safety requirements but would prohibit intervenors from even raising the possibility that these requirements are not adequate to address the safety problems revealed by the TMI accident. Neither the so-called "Action Plan" which defines these new requirements, nor this remarkable policy was ever noticed for public comment. I am in the hope that there is some chance of deflecting the Commission from this course of action. I am convinced that, in addition to being unlawful, it is grossly unfair and insensitive to the pleas for increased openness and public participation in NRC proceedings included in every major post-TMI investigation of the NRC.

For some time the staff and the Commission, in consultation with the nuclear industry, have been engaged in determining how to solve the safety problems raised by TMI. The Action Plan is the result of these efforts. The public has at no time been invited to comment. The Action Plan addresses a great number of issues. For some of the most crucial safety areas, problems and uncertainties are identified but no solution suggested except studies which may offer the hope of solutions at some unspecified time in the future. The section on core degradation and fuel melting is a prime example (II. B. 5). In other cases, the schedules for implementing solutions are exceedingly long. In yet others, the Action Plan mandates a course of action, the efficacy of which is certainly disputable. It should come as no surprise to you

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that the contents of the Action Plan are open to considerable scientific and technical debate. Despite this, your action today would totally foreclose intervenors in licensing cases from attempting to prove that actions different from or in addition to those in the Action Plan are necessary to ensure safe operation of the plant in question.

Contrary to the observations of some today, the law not only attempts to define fundamental fairness; it requires it. No arcane parsing of legal precedent is required to conclude that the policy statement voted on today offends fairness and due process. It is self-evident that the Commission has given the industry two bites at the apple and the public none. The industry not only participated in the formulation of the Action Plan, but it will be free in each licensing case to try to prove that the safety measures included therein are not necessary. No argument as to their sufficiency will be heard. The law treats all parties to NRC proceedings equally; it does not countenance the unilateral abridgement of the rights of one side.

Less than a year ago, the U.S. Court of Appeals reminded the Commission that it cannot resolve issues of factual dispute by edict, State of Minnesota v. N.R.C., 602 F. 2d 412 (D.C. Cir., 1979). There are two ways in which this agency can develop precedent: by rulemaking or by adjudication. Each affords the public some right to be heard. This policy statement is neither, and it cannot lawfully be used to cut off the rights of intervenors. This is clear from the following statement of the court in Pacific Gas and Electric Co. v. F.P.C., 506 F. 2d 33, 38 (D.C. Cir., 1974):

The agency cannot apply or rely upon a general statement of policy as law because a general statement of policy only answers what the agency seeks to establish as policy . . . When the agency applies the policy in a particular situation, it must be prepared to support the policy just as if the policy statement had never been issued. An agency cannot escape its responsibility to present evidence and reasoning supporting its substantive rules by announcing binding precedent in the form of a general statement of policy. (Id. at 38 - 39, Emphasis added)

This issue goes beyond legalisms; it goes to the heart of this Commission's attitude towards the role of those outside

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the nuclear establishment, whose participation has too often been treated as an annoying obstacle to be evaded when possible and tolerated when necessary. I had thought that the Indian Point proceedings marked a change in that attitude, but this policy statement represents a major retrenchment to pre-TMI complacency.

I hope that you will reconsider.

Very truly yours,

Ellyn R. Weiss

Ellyn R. Weiss
Counsel for the Union of Concerned
Scientists

ERW/lc