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May 7, 1981

Mr. Frank D. Coffman
Systems Interaction Branch
Division of Systems Integration
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Frank:

Enclosed for your information and use is a revised draft letter report on "The Systems Interaction Branch Approach to Systems Interactions in LWR's". In revising the subject report we have tried to reflect the comments made in the continuing discussions between NRC and Battelle as well as some of the observations gathered as a result of our meeting with the AIF.

We look forward to your views on the enclosed draft.

Sincerely,

Peter Cybulskis

Peter Cybulskis

PC/llj

Enclosure

cc: R. Widrig, BNWL

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STAFF SUMMARY

LETTER REPORT

THE SYSTEMS INTERACTION BRANCH APPROACH TO SYSTEMS INTERACTIONS IN LWR'S

May, 1981

Systems Interaction Branch

Division of Systems Integration

U. S. Nuclear Regulatory Commission

THE SYSTEMS INTERACTION BRANCH APPROACH TO SYSTEMS INTERACTIONS IN LWR's

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1.0 INTRODUCTION

1.1 Purpose of Report

The purpose of this report is to summarize current staff thinking on the approach to be taken by the Systems Interaction Branch, Division of Systems Integration, for the evaluation of adverse systems interactions in LWR's.

It is also intended that t is report act as a vehicle to stimulate discussion and encourage feedback from interested groups within the NRC and from the industry for staff use in making future improvements to the evolving Systems Interaction Branch program.

The forthcoming development of interim regulatory guidance in FY '81, with technical assistance from Battelle Memorial Institute and Brookhaven National Laboratory, will generally follow the process described here.

1.2 Background

The need to design LWR's against adverse systems interactions was recognized prior to the accident at Three Mile Island. Generic Activity Task A-17, Systems Interactions in Nuclear Power Plants(1), was formally begun in May, 1978. Assessments of TMI-2 and other recent events, including those at Brown's Ferry 3(2-6) and Crystal River(7,8) have pointed to the need for increased review efforts in this area.

The objective of the Systems Interaction effort is to provide a systematic overview of the plant, including its design and operation, to search for hidden dependencies that may tend to degrade the safety of the plant. It is not the intent of the Systems Interaction activity to duplicate the numerous reviews, evaluations, etc., that are already in existence. Rather, it aims to draw on the results from other separate activities in order to provide the overview that is preceived to be missing.

The need to consider potential systems interactions is being addressed on several fronts within the NRC. The NRC Action Plan Developed as a Result of the TMI-2 Accident, NUREG-0660(9), provides for a systems interaction follow-on study in Section II.C.3, Systems Interaction. In the April, 1980, re-organization of the NRC, the Systems Interaction Branch of the Division of Systems Integration was formed and given the responsibility for coordinating the Office of Nuclear Reactor Regulation's activities in the area of systems interactions. As a part of its responsibility, and preparatory to the development of regulatory guidance addressing systems interactions, the Systems Interaction Branch conducted a review and evaluation of the state-of-the-art of methods that might be applicable for near-term analyses of systems interactions. Three laboratories (Battelle Memorial Institute, Brookhaven National Laboratory, and Lawrence Livermore National Laboratory) aided in performing the review and evaluation, and their final reports with recommendations are documented in References 10, 11, and 12. The laboratory reports address both near-term and long-term analysis capabilities and needs. This summary report makes extensive use of the results of the laboratory reviews as well as information gained from other reports and discussions with experts in the field both within and outside of the NRC.(13-16) The Systems Interaction Branch has contracted with Battelle Memorial Institute and the Brookhaven National Laboratory to assist in refining the systems interaction review process over the next six months for near-term application in pilot systems interaction reviews of six LWR's to be selected during FY '81.

2.0 DEFINITIONS

The term "systems interaction" has had a broad range of definitions. The definitions given here are basic to the Systems Interaction Branch approach for the near-term evaluation of nuclear power plant reactor susceptibilities to adverse systems interactions and serve to introduce the specific emphasis of the approach.

2.1 Adverse Systems Interaction - degradation of a vital safety function as a consequence of dependencies between two or more systems.

It is recognized that in a nuclear plant there are many systems interactions that are desirable and planned. The interest is in interactions that lead to undesirable consequences, thus "adverse" is an integral part of the definition. This definition reflects our expectation that adverse systems interactions may be more likely to result in violations of safety criteria than independent multiple failures (characterized by multiple event outsets). Systems interaction events may be initiated by malfunctions within functionally connected systems or may result from external events such as natural phenomena. The vital safety functions or vital safety criteria are discussed in Section 3.0 of this report.

Experience to date shows that attempting to systematically identify more generally defined systems interactions is a very broad problem. Therefore, the Systems Interactions Branch is attempting to narrow its scope of review to provide an initial focus on adverse systems interactions that are more likely to occur. Since normal design and safety reviews of nuclear power plants have focused on the elimination of single failures among safety-grade systems which are generally designed, installed, and maintained to higher standards than those systems considered to be non-safety-grade, it is expected more likely that violations of safety functions will occur from failures originating in non-safety-grade systems which have not received the same degree of attention. For this reason, we will initially concentrate our efforts on the identification and evaluation of common cause failures originating in non-safety-grade systems or associated with non-safety-grade system failures triggered by external events. The methodology being developed should not of course be restricted in its applicability.

Some overlap may exist between systems interaction studies defined here and risk assessment studies being conducted on several plants (e.g., the Interim Reliability Evaluation Program). There are substantially different thrusts to the two types of efforts, however. The risk assessment studies are aimed at the identification of the accident sequences that dominate reactor risk as measured by the potential radiation exposure of the population. This necessarily leads to the concentration on the identification and evaluation of core meltdown accidents. The scope of the systems interaction effort is broader in that it includes more likely and less severe events than core meltdowns. The former could of course be potential precursors of the latter. To illustrate this difference it may be noted that the Crystal River 3 incident(8) is of obvious interest to the present effort while being of no consequence to overall accident risk. Both types of efforts include consideration of common cause failures. The proposed systems interactions evaluations do not necessarily rely on numerical probabilities although they do identify cause-effect relationships regardless of the completeness of the accident sequences to core damage. The risk studies include independent multiple failures that will not be included in systems interaction studies. Several of the risk studies currently exclude failures triggered by external events that will be included in systems interaction studies. The Systems Interaction Branch intends to maintain close contact with other groups interested in systems interactions both within and outside of the NRC to enhance information sharing and to provide continuing feedback for use in the Branch's program planning.

2.2 Common Cause Event - multiple failures traceable to a single initiating event.

The initiating event could be a failure in a common, connected system or it could be an external event that triggers a sequence. As a result of the dependencies, the joint probability of failure in the multiple systems is higher than would be otherwise. Examples of the various types of systems interactions of interest to the Systems Interaction Branch are given in Section 4.0 of this report and serve to clarify the above definitions.

3.0 VITAL SAFETY CRITERIA

The intent of the definition of vital safety criteria for systems interaction review is to:

1) avoid unacceptable reactor core damage and release of unacceptable levels of radioactivity to the site environs,
2) be consistent with existing NRC rules and regulations, and
3) provide a basis for the early evaluation of LWR's for adverse systems interactions.

Accordingly, each of the following vital safety criteria must be satisfied to preclude unacceptable core damage and release of unacceptable levels of radioactivity to the site environs:

1) The integrity of systems required to achieve and keep the entire core subcritial shall be maintained,
2) An adequate inventory of reactor coolant shall be maintained,
3) The integrity of the systems required to transfer decay heat from the reactor to the ultimate heat sink shall be maintained, and
4) The integrity of Engineered Safety Features for the control of radioactivity shall be maintained.

As a test for an adverse systems interaction of interest, one of the listed criteria or safety functions must be violated as a consequence of a common cause.

The vital safety criteria as given above are rather fundamental and extremely broad. In the consideration of conformance with these criteria, it will probably be necessary to further subdivide these basic criteria into a more detailed list of safety functions, e.g., such as suggested in Reference 10. The safety functions can in turn be further subdivided into the specific systems that are required to fulfill them. While the safety functions are still very basic and applicable to all designs, the systems utilized to perform these functions will be very plant specific. The hierarchy of safety criteria, safety functions, and safety systems reflects the natural progression in the identification and evaluation of potential systems interactions. At the very broad and basic level the criteria would form the starting point for the process to search the plant for possible systems interactions. The more detailed criteria would guide the prioritization of the identified systems interactions by their relative importance to safety. These sets of criteria provide the flexibility needed for deciding which of the potential systems interactions are sufficiently adverse to require corrective action. Obviously not all potential interactions that may be identified will require corrective action. Alternate approaches to the breakdown of the plant design for purposes of systems interaction evaluation are also possible, e.g., definition of front line systems and support systems as they relate to the fulfillment of the basic safety criteria(11).

The above deterministic criteria are consistent with current regulatory defense-in-depth concepts; and can be applied within the current Title 10 of the Code of Federal Regulations (10 CFR). It should be clear, however, that this proposed systems interaction approach in extending safety reviews into non-safety-grade systems goes beyond past Commission staff practice in the application of 10 CFR safety reviews.

In keeping with existing NRC rules and regulations, we should also consider the "single failure" criterion for evaluating those safety functions noted in the current regulations that require redundant systems. Including single failure requirements for evaluations of systems interactions avoids the need to perform probabilistic analyses regarding the likelihood of additional failure(s) causing the violation of a vital safety criterion where the systems interaction failure affects only one train of a safety function. This means that adverse systems interactions will be considered for failures of redundant trains that are required to meet single failure requirements for the safety functions described in Appendix A to 10 CFR, Part 50, "General Design Criteria for Nuclear Power Plants". The single failure requirement in Appendix A to 10 CFR 50 is addressed by the deterministic safety criteria proposed in this report.

An alternative approach to using deterministic criteria to be pursued by Brookhaven might consider the use of probabilistic analyses to determine the probability of dominant event sequences involving potential systems interactions leading to unacceptable core damage. Although numerical probabilistic safety goals are still under development[1/], and not yet available, quantitative risk assessment techniques may be used to estimate the relative importance of potential adverse systems interactions identified to guide evaluation for implementation.

[1/] The Commission recently approved NUREG-0735(17), "Plan for Developing a Safety Goal". In this document, numerical probabilistic safety criteria were suggested by the staff that relate ranges of estimated probabilities of severe core damage per year to proposed corrective actions.

4.0 SYSTEMS INTERACTION TYPES

The classification of systems interactions by type is useful to guide the analysts in choosing the method(s) best suited to the particular evaluation. Systems interactions of interest to the Systems Interaction Branch may be placed in three broad categories related to the causes of the dependent failures. The three broad types of failures are external events, functional interdependencies, and human factors.

4.1 External Events

External systems interaction events (sometimes referred to as "physical" or "spatial") are common cause events often initiated by phenomena such as earthquakes, fires, floods, missiles, and abnormal environmental conditions within the plant. These types of systems interactions are characteristic of systems sharing a common space which allows an initiating event to link the systems within that space. Principally, unconnected systems would be included in this type of systems interaction. These events lend themselves to inspection methods such as Walk-Downs/Walk-Throughs. Some examples of external systems interaction events are the Brown's Ferry 1 and 2 fire, and the postulated Hosgri event involving an earthquake at Diablo Canyon.

4.2 Functional Events

Functional systems interaction events can be caused by a malfunctioning occuring in systems that are connected either through the sharing of components or where linking between systems is possible. Possible functional links between systems include electrical, hydraulic, pneumatic, and mechanical connections. Functional interdependencies can lead to adverse systems interactions in two ways: a change in the state of one component affects the probability of another changing its state, or improper input from one component (system) prevents another from performing its function.

Examples of functional adverse systems interactions are the Crystal River 3(7,8) loss of reactor coolant and the Brown's Ferry(2-6) partial loss of scram capability.

4.3 Human Factors

Human factors may also be considered as another form of functional systems interdependencies. Systems interactions due to human factors are possible when humans interact with more than one component of a system, or more than one system related to fulfilling a safety function. Human interactions can be considered either dynamic or latent types of errors. An example of a dynamic human error can be postulated in which an initiating event affects plant instruments such that the operator is misled into performing an unsafe act. We refer to such cases as having an element of "human error" although the operator's actions are not exactly at fault. A dynamic human error may often be part of the failure effects rather than the initiating event. Latent human errors include maintenance and equipment positioning errors related to some common cause such as faulty procedures or training. Latent human errors can result in adverse effects that may not appear immediately when committed.

In general, functional interactions as well as those due to human factors are not readily identifiable by physical inspection methods. Methods available for identifying adverse functional systems interactions are described in Section 5.0.

4.4 Examples of Types of Systems Interactions

As a further illustration of the intended scope of the systems interaction evaluation, one can consider the following as illustrations of various interactions.

1) Preclusive system failure, i.e., failure of one system prevents another from operating, although the latter may not be failed.

   E.g., during a small LOCA in a BWR failure of the automatic depressurization system, given the prior failure of the high pressure injection system, prevents the operation of the low pressure emergency core cooling systems due to too high reactor vessel pressure.

2) Failure of a single component or dependent failure of more than one component common to two or more systems.
   E.g., failure of the LPCI/RHR pumps, common to both the low pressure coolant injection and the residual heat removal systems, fails both these systems.
3) Failure of support system common to two or more systems.
   E.g., failure of AC electric power vital to a number of plant systems.
4) Dependent failure of different components in two or more systems.
   E.g., operator erroneously shuts off the control rod drive and the high pressure coolant injection pumps as sources of reactor vessel makeup water.
5) Failures due to a common location.
   E.g., failure of a non-safety component from an external event leads to failure of a safety system in the same location.

While there is nothing fundamental about the above breakdown of interactions, they tend to illustrate the types of dependent effects that are of interest to the systems interaction review.

5.0 METHODS, ALTERNATIVE APPROACHES, AND THE REVIEW PROCESS

The assessment of potential systems interactions can be considered as consisting of a qualitative (identifying) and a quantitative (evaluation) aspect. The qualitative part of the analysis tends to deal with the problem on a basic level and is concerned with fundamental relationships that exist in a complex arrangement of systems, subsystems, and components. The results of the qualitative analysis should be independent of any values that might be assigned. The quantitative analysis is concerned with the evaluation of the probability of an event (systems interaction) and/or the consequences associated with it. The results of quantitative analyses are subject to the uncertainties in the values and behavior of the input variables.

During the state-of-the-art reviews, there was a range of methods evaluated including Fault-Trees, Event-Trees, Cause-Consequence Diagrams, GO Methodology, Failure Modes and Effects Analysis, Walk-Downs, Operational Survey, Markov Modeling, Phased Mission Analysis, Diversion Path Analysis, and Generic Cause Analysis. An analyst could use these methods to discipline the review by formalized courses of reasoning. These methods can follow both deductive and inductive courses of reasoning. These and a few other methods were reviewed and evaluated by Battelle Memorial Institute, Brookhaven National Laboratory, and Lawrence Livermore National as reported in References 10, 11, and 12.

Each of the three laboratories recommended approaches by which systems interactions reviews could be performed. The laboratories concluded that no one method can singlehandedly perform an adequate review for adverse systems interactions. Although each laboratory recommended an approach using different combinations of methods, they all attempt to screen out adverse systems interactions by following a three-step review process. We agree that an adequate review follows a three-step process and that each step in the process is distinct in its objective. It appears beneficial to iterate among the three steps to adequately complete a review.

The three-step process is as follows.

The Systems Interaction Review Process

1) The identification of intended dependencies and selection of systems for detailed evaluation,
2) The identification of hidden dependencies, and
3) The ranking and evaluation of the hidden dependencies.

Step 1

The first step, the identification of intended dependencies, is akin to the first step in a reliability analysis since it leads to a comprehensive understanding of the design under review. The systems, including redundancy needed to satisfy each vital safety function (Section 3.0), must be determined for the principal operating modes of the plant.(10) All possible success paths should be identified. These success paths will then be the points of departure for the subsequent analyses.

Following the identification of the intended dependencies, the analysis may choose to narrow its focus and select specific functions, or systems, for detailed evaluation. While a comprehensive systems interaction evaluation must, in principle, cover the entire plant, the narrowing of the scope of the evaluation may be a practical requirement. As was noted earlier, the emphasis of the current Systems Interaction Branch effort is on events originating in the non-safety-grade systems as they might influence the operability of the vital safety functions. Further narrowing of the scope of the systems interaction evaluation will be sought in its initial applications.

An alternative determination of the systems needing detailed evaluation can be derived either from the dominant accident sequences (<u>systematic event trees</u>) leading to core damage,(11) or from the current Design Basis Events (Chapter 15, Regulatory Guide 1.70). However, we expect that any approach will eventually lead to the determination of the same systems relied upon at the plant to meet each safety criterion noted in Section 3.0.

Step 2

During the second step, there is further development of subsystems and identification of dependency interfaces using insights gained from previous risk studies, operating experience, and functional dependency analyses to guide the development down to the component level. The principal linking characteristics creating dependencies listed in Section 4.0 should be systematically analyzed here. Methods for the selection of systems and the evaluation of functional dependencies for adverse systems interaction can include:

- operational surveys,
- success trees, and
- directional graphs (e.g., dependency diagrams, diagraphs).

For external ("physical" or "spatial") type of systems interactions, FMEA's, generic cause analysis, and plant walk-through inspections by qualified teams can be the principal methods used.

Given the number of safety functions, operating modes, and systems, the problem becomes very large. In order to keep the problem tractable, it will be necessary to develop a system of identifiers to track the systems and subsystems in each of the success paths, and the interfacing support systems for the potential linking characteristics being considered. It is also important to screen for important dependencies at the systems level using the methods suggested above before proceeding deeper.

Initially Steps 1 and 2 are carried together out to the systems level where support systems interfaces can first be identified. A significant amount of design and operational information is needed to derive the systems for a plant. The analysts will need electrical elementary diagrams ("one line" diagrams), control logic diagrams, piping and instrumentation drawings, and engineering drawings of specific subsystems. Some of the needed information about systems interfaces may be obtained only at the site both by inspecting the physical facilities and by meeting with plant personnel familiar with design, operation, and maintenance. Plant walk-downs are needed to get information not readily available in engineering documents.

As the review proceeds into more detailed analyses, Failure Modes Effects Analyses and Fault Trees can be used to resolve linking characteristics to the subsystem and component level. The application of Fault Trees here should be contrasted with the use of Fault Trees in the "Systems Interaction Methodology Application Program".(1) That program used Fault Trees to begin the review process and carried the resolution to the component level. There was a practical problem from the enormous number of potential failure combinations down to the expected levels of interest. However, as proposed in this report, the application of Fault Trees for the evaluation of systems interactions should be limited to the detailed evaluation of specific systems following the screening evaluation at the systems level.

Significant functional dependencies are often tied to "human errors", and we intend to manage some of these functional dependencies in close coordination with the designated responsible groups within the NRC. Some latent human errors (as noted in Section 4.0), due to improperly written procedures, inadequate training, or deficient control room design can be a common cause in an adverse systems interaction. However, our reviews are not expected to concentrate on these types of latent human errors; rather we rely upon the Division of Human Factors to identify and evaluate the most likely common causes of these errors. Also, we exclude malevolence and random errors as adverse systems interaction initiators. We rely upon the safeguards activities and other to evaluate such human errors.

Our reviews regarding human errors will concentrate on systematically identifying potential dynamic human errors that are part of the failure chain from a common-cause ingredient in an adverse systems interaction scenario. These are the type of human errors that propagate some initiating malfunction across otherwise independent systems. We want to predict only those human errors where the operators' actions depend upon a system's response to a malfunction. The best examples are from the machine-to-man transmission interface (the displays). Thus, we will treat the operator as a component that has the potential to connect systems that are otherwise independent.

Emerging from this step in the review process will be a list of adverse systems interactions to which the design is susceptible. The adverse systems interaction should be identified by three characteristics:

1) a single malfunction or condition that initiates the event,
2) the linking characteristics that promulgate the malfunction, and
3) the vital safety function that may be compromised.

Step 3

The final step in the review process is the ranking and subsequent evaluation of the hidden dependencies by the relative importance to safety for the purpose of considering the need for corrective action. Adverse systems interactions are already important to safety simply because they threaten vital safety functions. However, the proposed application of deterministic safety criteria is expected to yield a range of adverse systems interaction down to those that have a small likelihood of occurrence. Thus, every adverse systems interaction that may be identified need not necessarily imply the need for specific corrective action. Either qualitative or quantitative methods may be used to provide a ranking for purposes of judging the need or schedule for implementation.

There are many methods that could be used for ranking the hidden dependencies. However, from the state-of-the-art reviews it is evident that this step in the process requires more refinement than the other steps before beginning the pilot reviews. The five methods recommended by the laboratories are briefly identified below only to illustrate the range available.

Methods to Rank Adverse Systems Interactions

1) The first method ranks the hidden dependencies by the number of safety functions potentially threatened.

2) The second method ranks the hidden dependencies by the degree of the resultant degradation. For example, a failure that results in the loss of two residual heat removal trains is more important than a failure that results in the loss of only one train.

3) The third method weights the vital safety criteria listed in Section 3.0 of this report with regulatory judgement and then ranks the hidden dependencies by the criterion violated.

4) The fourth method uses probabilistic methods to supplement the deterministic screening for those failure combinations needing further review regarding implementation priority.

5) The fifth method ranks the hidden dependencies by relative risks in accordance with the release categories of Appendix V of the Reactor Safety Study.(15) Obviously, this method would apply only where the hidden dependency can be associated with a scenario from the Reactor Safety Study.

It is expected that the affected utilities and functional review groups within NRC will participate in the ranking and subsequent evaluation process. The Systems Interaction Branch will manage the tracking of the identified systems interactions through their eventual dispostion.

6.0 REFERENCES

1) G. Boyd, et al, Sandia National Laboratories, "Final Report - Phase I, Systems Interaction Methodology Applications Program", USNRC Report NUREG/CR-1321 (SAND80-0884), April, 1980.

2) Memorandum from P. S. Check, NRC, to G. C. Lainas, T. H. Novak, R. L. Tedesco, NRC, "BWR Scram Discharge System Safety Evaluation", December 1, 1980.

3) G. Lanik, U.S. Nuclear Regulatory Commission, "Report on the Interim Equipment and Procedures at Brown's Ferry to Detect Water in the Scram Discharge Volume", September, 1980.

4) U. S. Nuclear Regulatory Commission, Verbatum Transcript of Advisory Committee on Reactor Safeguards, Fluid Dynamics Subcommittee Meeting, Tuesday, August 19, 1980. Inglewood, California.

5) Memorandum from C. Michelson, OAEOD, to H. R. Denton, NRR, Subject: "Potential for Unacceptable Interaction Between the Control Rod Drive System and Non-Essential Control Air System at the Brown's Ferry Nuclear Plant", August 18, 1980.

6) S. Rubin and G. Lanik, U.S. Nuclear Regulatory Commission, "Report on the Brown's Ferry 3, Partial Failure to Scram Event on June 28, 1980", July 30, 1980 (with Executive Summary).

7) U. S. Nuclear Regulatory Commission, "Transient Response of Babcock & Wilcox - Designed Reactors", USNRC Report NUREG-0667, May, 1980.

8) Nuclear Safety Analysis Center and Institute of Nuclear Power Operations, "Analysis and Evaluation of Crystal River Unit 3 Incident", Joint NSAC/INPO Report NSAC-3-/INPO-1, March, 1980.

9) U. S. Nuclear Regulatory Commission, "NRC Action Plan Developed as a Result of the TMI-2 Accident", USNRC Report NUREG-0660, Vols. 1 & 2, May, 1980.

10) P. Cybulskis, et al, Battelle Memorial Institute, "Review of Systems Interaction Methodologies", USNRC Report NUREG/CR-1896, January, 1981.

11) A. Buslik, I. Papazoglou, R. Bari, Brookhaven National Laboratory, "Review and Evaluation of Systems Interactions Methods", USNRC Report NUREG/CR-1901, January, 1981.

12) J. Lim, R. McCord, T. Rice, Lawrence Livermore National Laboratory, "Systems Interaction: State-of-the-Art Review and Methods Evaluation", USNRC Report NUREG/CR-1859, January, 1981.

13) U. S. Nuclear Regulatory Commission, "Safety Evaluation Report Related to the Operation of Diablo Canyon Nuclear Power Plant, Units 1 and 2", USNRC Report NUREG-0695, Supplement No. 11, October, 1980.

14) Memorandum from F. D. Coffman, NRC, to J. F. Stolz, NRC, "SIB Peer Review Meeting - November 12, 1980", December 2, 1980.

15) U. S. Nuclear Regulatory Commission, "Reactor Safety Study - An Assessment of Accident Risk in U. S. Commerical Nuclear Power Plants", USNRC Report NUREG-75/1014 (WASH-1400), October, 1975.

16) H. W. Lewis, et al, Ad Hoc Review Group, "Risk Assessment Review Group to the U. S. Nuclear Regulatory Commission", USNRC Report NUREG/CR-0400, September, 1978.

17) U. S. Nuclear Regulatory Commission, "Plan for Developing a Safety Goal", USNRC Report NUREG-0735, October, 1980.

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April 16, 1982

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FREEDOM OF INFORMATION
ACT REQUEST
FOIA-82-202
Rec'd 4-19-82

J. M. Felton, Director
Division of Rules and Records
Office of Administration
U. S. Nuclear Regulatory Commission
7735 Old Georgetown Road
Bethesda, Maryland 20814

Freedom of Information Act Request

Dear Mr. Felton:

Pursuant to the Freedom of Information Act, as amended, 5 U.S.C. §§ 522 *et seq.*, and the rules of the Nuclear Regulatory Commission, 10 C.F.R. §§ 9.3 *et seq.*, we request copies of all documents, materials or written matter of any kind whatsoever produced, disclosed or made available by the NRC pursuant to the Freedom of Information Act request dated April 5, 1982 from Christopher M. McMurray to Mr. Felton. Mr. McMurray's request has been designated by the NRC as FOIA-82-176 and was received on April 5, 1982. A copy of Mr. McMurray's request is attached for your convenience.

We will pay search and copying fees pursuant to NRC regulations. If search and copying fees are expected to exceed $200.00, please call me. If you should have any questions regarding this request, please do not hesitate to call me.

Sincerely,

T. S. Ellis, III

75/634
Enclosure

PDR
~~8205260009~~

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April 5, 1982

FREEDOM OF INFORMATION
ACT REQUEST
FOIA-82-176
Rec'd 4-5-82

(BY HAND)

J. M. Felton, Director
Division of Rules and Records
Office of Administration
U.S. Nuclear Regulatory Commission
7735 Old Georgetown Road
Bethesda, Maryland 20814

Re: Freedom of Information Act Request

Dear Mr. Felton:

Pursuant to the Freedom of Information Act, as amended (5 U.S.C. § 522), and the rules of the Nuclear Regulatory Commission ("NRC") issued thereunder (10 C.F.R. § 9.3 et seq.), we request copies of the following written materials:

1. All documents, reports, records, studies, memoranda, data, correspondence, analyses and any other written material utilized in developing the standard definitions for safety classification terms. These terms are set forth in a memorandum from Mr. Harold Denton, Director, Office of Nuclear Reactor Regulation, dated November 20, 1981. Such written materials should include, but not be limited to, a memorandum from Mr. Thomas Murley to Mr. Denton dated October 13, 1981.

2. All documents, reports, correspondence, studies, memoranda, analyses and any other written materials prepared by or for the NRC which comment on the adequacy and consistency of the standard definitions for safety classification terms set forth in the above request. Without limiting the scope of this request, but merely to assist the NRC in its search, the written material that we are requesting may include the following items set forth in Mr. Denton's memorandum of November 20, 1981:

   a. All written materials developed as a result of a review of Regulatory Guides, Standard Review Plans and applicable portions of the regulations upon which they are based, conducted for the purpose of determining what consistency exists in the applications of safety classification terminology.

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b. All written materials developed as a result of discussions among cognizant NRR, RES (Standards Development), and ELD representatives regarding proper interpretation and application of safety classification terms, including any written materials considering or describing alternative standard definitions of such terms.

c. All written materials developed as a result of consultation with the cognizant ACRS subcommittee regarding standard definitions for safety classification terms as well as all written materials resulting from consideration of this matter by the full ACRS.

3. All documents, reports, studies, memoranda, data, correspondence, analyses and any other written material utilized in developing a proposed rule regarding the "Applicability of Appendix B to Appendix A (Part 50)." Without limiting the scope of this request, such written materials should include:

a) All written materials relating to the proposed rule prepared or received by Messrs. Francis Nolan, William Belke, Steve Richardson and Walter Haass;

b) A document or documents prepared by or for the NRC related to TMI Action Plan Item I.F.1 entitled "Quality Assurance - Expand QA List."

c) All expanded QA lists developed by the NRC for special plants such as TMI-1 restart, Zion 1 and 2, Indian Point 2 and 3.

4. All documents, reports, studies, memoranda, correspondence, analyses or other written materials regarding Unresolved Safety Issue A-47. Without limiting the scope of this request, such written material should include:

a) All written materials relating to Unresolved Safety Issue A-47 prepared or received by A. Szukiewicz, D. Basdekas, C. Rossi, J. Conran, F. Orr, J. Beard, and M. Chirmal;

b) All written materials relating to meetings held on July 20, 1981 with EG&G, Batelle Northwest and Lawrence Livermore Laboratory regarding A-47 issues;

c) All written materials relating to meetings held on July 9 and November 4 and 5, 1981 with ORNL and Sandia regarding A-47 and related research activities.

5. All documents, reports, records, studies, memoranda, data, correspondence, analyses and any other written materials prepared by or for the NRC since January 1, 1980 regarding Generic Unresolved Safety Issue A-17 and TMI Action Plan Item II. C. 3 ("Systems Interation"). Without limiting the scope of this request, such written materials should include:

a) All written materials relating to Unresolved Safety Issue A-17, or relating to the issue of systems interaction, that were prepared or received by F. Coffman, P. Norian, J. Conran, and F. Rowsome;

b) All written materials related to a San Onofre Systems Interaction Study;

c) All written materials related to a meeting conducted on April 1, 1981 with the Atomic Industrial Forum involving systems interactions issues;

d) All written material revising or updating a letter report dated June 25, 1981 summarizing the PRAB/DST approach to systems interaction. Such revisions or updates may include but should not be limited to, comments from the Atomic Industrial Forum and the NRC Staff;

e) All written materials related to technical assistance provided by Sandia on the issue of "Importance Ranking of Systems Interaction," such assistance having been authorized on June 24, 1981;

f) All written material related to technical assistance provided by Brookhaven National Laboratory, Lawrence Livermore Laboratory and Pacific Northwest Laboratory on the issue of "Systems Interaction Evaluation of Selected LWRs," such assistance having been authorized on July 20, 1981.

6. All documents, reports, records, studies, memoranda, data, correspondence, analyses and any other written materials prepared by or for the NRC since January 1, 1980 related to TMI Action Plan Item II. F. 5 ("Classification of Instrumentation, Control, and Electrical Equipment"). Without limiting the scope of this request, the written material should include:

a) All written material regarding TMI Action Plan Item II. F. 5 prepared or received by E. Weiss, C. Rossi or M. Madeiros;

b) A draft of a standard designated IEEE P-827 and all staff comments thereto.

7. All documents, reports, records, studies, memoranda, data, correspondence, analyses and any other written materials prepared by or for the NRC since January 1, 1980 related to the adequacy of the single failure criterion in the analysis of transients, accidents, and normal operation.

8. All documents, reports, records, studies, memoranda, data, correspondence, analyses and any other written materials prepared by or for the NRC since January 1, 1980 related to the conditions and circumstances under which a single failure of a passive component in a fluid system should be considered in designing a safety system against a single failure.

We expect to receive your response to this request within ten (10) working days.

We will pay search and copying fees as set out in the NRC's regulations. If the search and copying fees to be incurred are expected to exceed $200.00, please notify the undersigned before this sum is exceeded.

In the event that access is denied to any part of the requested materials, please identify and describe the withheld or deleted material in detail and specify the statutory basis for the denial, as well as your reasons for believing that an exemption applies. We also request that your description of the deleted or withheld material include the title of the material, a description of its essence, the identity of its author, and the identities of any parties that have received copies or have had access to such materials. Please separately state your reasons for not invoking your discretionary powers to release the allegedly exempt materials.

Sincerely yours,

Christopher M. McMurray

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