April 21, 1975

SECY-75- 178

# COMMISSIONER ACTION

For: ~~The Commissioners~~

Thru: Executive Director for Operations

Subject: LETTER FROM PRESIDENT, EDISON ELECTRIC INSTITUTE, W. DONHAM CRAWFORD (APPENDIX B)

Purpose: Approval of proposed letter to W. Donham Crawford (Appendix A).

Category: Letter concerns a major Commission policy.

Issue: Restatement of Commission policy concerning Nuclear Power Plant Reliability.

Discussion: Mr. W. Donham Crawford's letter advises Chairman Anders that NRC should not establish reliability criteria and discusses the memorandum of December 2, 1974 by Dr. Triner to L. Manning Muntzing concerning reliability which was the subject of an item in the New York Times on March 9, 1975 (Appendix C). Mr. Crawford volunteered to arrange for a group of Utility Managers to discuss their activities regarding reliability.

The proposed response restates the position that the Commission's responsibility is to protect the health and safety of the public and give appropriate consideration to environmental values.

Dr. Triner is afforded an opportunity to comment on the EEI letter in an enclosure to the Commission response. Response also agrees to a meeting between the staff and a group of utility managers.

Recommendation: That the proposed letter be approved.

Coordination: The Office of the Executive Legal Director has concurred with the proposed letter, and has no legal objection to the Triner memo.

Edwin G. Triner, Acting Director
Office of Planning and Analysis

Enclosures:
1. Appendix A - Proposed Ltr to W. D. Crawford
2. Appendix B - Ltr frm W. D. Crawford
3. Appendix C - Triner Memo to L. M. Muntzing, 12/2/74 with N.Y. Times Article, 3/9/75

Contact: E. G. Triner
Extension 7575

Commissioners' comments should be provided directly to Mr. Triner by cob April 28, 1975.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

Mr. W. Donham Crawford, President
Edison Electric Institute
90 Park Avenue
New York, New York 10016

Dear Mr. Crawford:

This is in response to your letter to Chairman Anders in regard to the article in the March 9, 1975 issue of The New York Times concerning an informal memorandum written to L. Manning Muntzing, then Director of Regulation, Atomic Energy Commission. We have provided Dr. Triner an opportunity to respond to your comments in an enclosure to this letter. In addition, we would like to advise you of existing NRC policy.

The functions of the Nuclear Regulatory Commission (NRC) are regulatory in nature. Under the Atomic Energy Act of 1954, as amended, the Commission's substantive regulatory authority is confined essentially to matters of radiological health and safety, the common defense and security, and certain antitrust considerations. Under the Atomic Energy Act the NRC has not been accorded general responsibility for the efficiency and reliability of energy sources.

Some special considerations are applicable, however, with respect to the matter of reliability. The Commission is required under the National Environmental Policy Act of 1969 (NEPA) to examine the construction and operation of a nuclear power plant to determine whether any adverse environmental impacts are justified in light of the benefits of the facility. In most cases, the principal benefit that is identified is meeting demands for electric power. The extent of such demands, and alterrative means for meeting the demands, are discussed in the Commission's environmental impact statements prepared pursuant to NEPA.

A decision by the Commission to issue a construction permit or operating license for a nuclear power plant following a full NEPA review in these cases reflects a judgment that the plant will be sufficiently reliable to produce the electric power that has been assessed as the benefit of the licensing action and that is needed to balance any adverse environmental impacts. While we would be concerned if plant operation in any given case did not comport with this judgment, we have not promulgated any general standards in this area of reliability since the level of benefit required to balance any environmental impact varies depending upon the nature and extent of the impacts in the particular case.

Some of the Commission's nuclear safety regulations do have an impact on reliability. For example, the quality assurance requirements set forth in 10 CFR Part 50, Appendix B, provide confidence that safety-related systems and components will perform their function satisfactorily in service. Since in many cases proper functioning of the same systems and components is essential for reliable operation, compliance with the cited quality assurance requirements serves to enhance reliability.

We appreciate your offer to meet with our staff to discuss your activities regarding power plant reliability and views on methods to further improve generating unit availability. My staff will contact you by telephone to make further arrangements. It may also be beneficial for you to meet with ERDA and FEA who have formed a joint task force to examine means of improving LWR plant availability. I will provide ERDA and FEA with copies of your letter along with our response.

Sincerely,

Enclosure:
Comments of Dr. E. G. Triner

COMMENTS OF DR. EDWIN G. TRINER IN REGARD TO EEI LETTER,
MARCH 28, 1975 RE NEW YORK TIMES ARTICLE

I appreciate the opportunity to comment on your letter of March 28, 1975 concerning the New York Times article that discussed my memorandum to L. Manning Muntzing, then Director of Regulation, Atomic Energy Commission.

You are correct in your finding that my memo was not critical of the utility industry on safety matters. The record attests to the fact that the nuclear industry has enjoyed a most enviable safety record. However, the record also indicates that the reliability of nuclear power plants and large fossil plants is not as good as the public expects. In the case of nuclear plants, the public, rightly or wrongly, relates reliability with safety. This is indicated by the statement quoted from the Report of the Committee on Government Operations on the Energy Reorganization Act: "Yet, the breakdown of a simple valve has potentially catastrophic implications." Although we are convinced that our application of the principle of defense in depth through redundancy has reduced the possibility of accident to the lowest order, certain segments of the public do not share this assurance.

I am fully aware of the relationship between the utilities and their A&Es. Whether the utility does its own design, designs in concert with an A&E, or relies on the A&E to do the design is not the point. What matters is the degree to which the utility assures that reliability is explicitly built into the design process. It has been suggested that the utilities form a design analysis group that would combine the talents of design engineers and operations and maintenance specialists to focus upon improved plant productivity. Such a group would service the entire industry in a manner somewhat similar to the relationship between the utilities and EPRI. In this way the wide variance that the utilities have in their experience in designing and constructing nuclear power plants would be offset by a central core of experience. The costly learning curve of each utility would be enhanced by the aggregation of experience gained by the design analysis group.

I am most familiar with the way in which utility regulatory commissions carry out their responsibilities. I am also aware of the difficulty the utilities are experiencing in raising debt and/or equity funding.

April 15, 1975

To the degree that they can reduce design and construction costs, the amount of capital needed is similarly reduced. The utilities have not adequately considered life cycle cost analysis as a means to trade off increased design cost to effect reduced operation and maintenance cost. There is inadequate consideration being given to Reliability, Maintainability, Human Factor/Human Engineering Analyses during the design phase. I call to your attention some recent work done by Ontario Hydro and the Canadian AECL to quantify the trade off between design cost and O&M cost. Their use of the man-rem as a design parameter is an interesting approach to answer the question of how much marginal cost to invest in design.

I certainly consider the EEI Prime Mover's Committee a positive influence upon plant performance improvement. Their work could be helped substantially by developing an industry wide failure reporting and analysis system. The industry has taken a step in this direction by developing the Nuclear Plant Reliability Data System (NPRDS) administered by ANSI. The amount of participation, however, is less than satisfactory. Am I correct that only 4 of 53 plants are presently participating? In addition, the NPRDS has two shortcomings that should be corrected in order to provide the empirical data upon which design decisions should be based. These are: data are collected only for safety and related components and information is not being collected to provide an understanding of the basic cause of failure.

On your last point, I completely agree that primary responsibility for power plant reliability should continue to rest with the electric utility industry. I would hope that more aggressive action is taken by the utility industry to meet this responsibility to the satisfaction of the public we serve.

Edwin G. Triner, Acting Director
Office of Planning and Analysis

EDISON ELECTRIC INSTITUTE
90 PARK AVENUE • NEW YORK 10016 • (212) 573-8700 31 PM 3:52

March 28, 1975

Hon William A Anders, Chairman
U S Nuclear Regulatory Commission
1717 H Street, N W
Washington, D C 20555

Dear Mr Chairman

In the March 9, 1975 issue of the New York Times, an article written by David Burnham stated that a Nuclear Regulatory Commission study concluded that utilities are not sufficiently concerned about the safety and performance of their nuclear reactors. While it appears that Mr Burnham accurately reflected what Dr Triner's report said about utility companies' attitudes toward reactor reliability, we believe Dr Triner's conclusions are entirely erroneous in this regard. Despite Mr Burnham's commentary, we find nothing in Dr Triner's report to suggest that he was critical of the utility industry on safety matters.

Although we understand that Dr Triner's memorandum does not represent the official position of NRC, we are concerned that the article will imply that it does. Consequently, we wish to comment on his observations regarding the utility industry's role in power plant reliability matters.

Often utilities rely on architect/engineers to provide power plant design and construction services. In many instances, the relationship between a utility and its architect/engineer is of such long standing that each is intimately familiar with the design and operating philosophy of the other. The utility considers the architect/engineer as an extension of its own engineering department and exercises control over the activities of the architect/engineer by reviewing layouts, specifications for major equipment, costs and the like. These relationships provide an economic and technically sound method of designing and building steam-electric generating plants, particularly for small and medium-size utility systems which cannot justify a large engineering department. We are not aware of any data which demonstrate that plants designed and constructed under such arrangements are less reliable than generating units built utilizing only the services of utility company personnel.

You may wish to discuss the role of architect/engineers with several such firms. We believe they have a continuing interest in providing for reliable plant operations in their designs, otherwise their reputations would suffer and further business opportunities would be limited.

Rec'd Off. Dir.
Date 4/8/75

Appendix B

Dr Triner has asserted that "it is advantageous for the utilities to reduce front end costs even at the expense of accepting higher long-term operating and maintenance costs since the latter can be passed on to the customer." This suggests that Dr Triner is not familiar with the manner in which utility regulatory commissions carry out their responsibilities or with the attention utilities pay to plant performance. While regulatory bodies do not participate in the details of power plant design, they concern themselves with all costs upon which rates are based, including operating and maintenance expenses. This is particularly true at a time when utility rates are increasing due to rising costs of every description.

Operability and maintainability are important criteria used in developing power plant design. First costs are not the only consideration. In addition, throughout the life of an electric generating unit efforts are made to improve plant operations. The Edison Electric Institute's Prime Movers Committee provides one of the principal means of achieving this objective. At meetings of this committee, utility engineers responsible for power plant design and operations exchange information and experiences regarding plant performance. Through this forum, which is aided by the power plant operating statistics available through the annual EEI Equipment Availability Report, utility engineers develop modifications to plant designs and to operating and maintenance procedures in order to decrease plant outages. Problems of a generic nature are promptly brought to the attention of architect/engineers and appropriate equipment manufacturers. This procedure also involves a feedback for improving future plant and equipment design.

Primary responsibility for power plant reliability, both fossil and nuclear, should continue to rest with the electric utility industry. Because of their operating experience, utilities are best qualified to oversee the work of architect/engineers and equipment manufacturers to provide component and plant designs for maximum reliability. The establishment of nuclear power plant reliability criteria by NRC is unnecessary and would undoubtedly result in additional expense and delay in the construction of nuclear generating units.

We would welcome an opportunity to arrange for a group of utility managers with responsibilities for power plant design, construction, and operations to meet with your staff to discuss our activities regarding power plant reliability, as well as our views on methods to further improve generating unit availability.

Sincerely yours

W Donham Crawford
President

rce

December 2, 1974

L. Manning Muntzing, Director of Regulation

IMPROVING THE RELIABILITY OF NUCLEAR POWER PLANTS - A POINT OF VIEW

Reference is made to the meeting you held on Friday afternoon, November 22, to discuss various aspects of the reliability of nuclear power plants. The following represents a point of view that has not had the benefit of detailed analysis. Nonetheless, it does pull together a number of the issues that need to be further considered in coming to grips with the important area of improving nuclear plant reliability. (I am using the term "improved reliability" in a broad sense to mean increasing power generation rather than a statistical definition of being able to predict failure with a high confidence factor.)

The subject of improving nuclear power plant reliability is at once controversial, technically and managerially challenging and fraught with potential problems as might be expected in almost any new Regulatory initiative that impacts industry. As can be seen by the attached article (Attachment 1) from Nucleonics Week, the subject of plant reliability is beginning to be of considerable concern to the industry taking the form of nuclear plant occupational exposure. If for no other eason, reliability and its corollary - maintainability - need to be aggressively pursued by Regulation. The following is a discussion of pertinent aspects of reliability for your consideration.

Is Improved Nuclear Power Plant Reliability in the Public Interest?

Frankly, I cannot think of one argument against this concept. I'm sure that the degree of reliability achieved when traded off against the cost expended for each incremental reliability gain would be the subject of cost benefit analysis. Aside from the detailed economical assessment of increased marginal utility, improving reliability has to have a beneficial impact upon both safety ard economics. An increase in average nuclear power plant generation of 5% over the current 60% average capacity factor could result in a net capital cost avoidance of approximately 50 million dollars. Fewer power plants would be needed to produce the same amount of generation or, from a different point of view, a given number of nuclear power plants generating increased electrical output would reduce the need for oil-fired plants. I believe there is general agreement that improving the reliability of nuclear power plants is clearly in the public interest with the proviso that careful assessment be made of the comparison of incremental costs to increases in reliability.

Who Should Be Concerned with Achieving Enhanced Reliability?

It is apparent that the utilities in their role as customers for nuclear power plants have prime responsibility for assuring that the plants they purchase are both safe and cost effective. The reality, however, is that without external suasion, the likelihood of the utility customer taking aggressive action to improve plant reliability in the near term is not very great. This stems from a number of reasons.

By and large, the utilities are not that sophisticated. There is no evidence, for example, that they have contractually imposed reliability standards upon their A-Es. Very few of the utilities exercise much influence at all over the design process as it impacts reliability.

Utilities are also reluctant to incur additional design costs which would increase the front end load upon their requirement to generate construction capital. There is no incentive for them to make a total life cycle cost analysis that includes both design and construction cost and the thirty or forty years of operating and maintenance cost. Instead it is advantageous for the utilities to reduce front end costs even at the expense of accepting higher long term operating and maintenance costs since the latter can be passed on to the consumer.

Similarly, the A-Es who are largely responsible for power plant design have little incentive to consider increased reliability during the design process. Their interest is primarily short term. Once a plant is constructed, the A-E fade out of the picture. Except for a few utilities, like Duke Power, who not only design and build the plant as well as operate it, the organization responsible for design does not usually have to live with the results. Parenthetically, our very limited investigation into this area seems to indicate that Duke Power, because of the all inclusiveness of its responsibility for design, construction and operation, is more concerned with the question of reliability than most other utilities. They have production engineers assigned as an integral part of the design group.

The public utility commissions (PUC) have an interest in the cost to the consumer of plant operation. They certainly should be interested in the question of how to make a plant more reliable and more efficient. The fact is that they have little or no influence upon the design process.

Additionally, to my knowledge, the appointment of individuals to these commissions is not normally based upon their technical knowledge of the design and operation of a power plant. In all-too-many instances the quantity and quality of the staff assigned to this function within the state is inadequate. Should the PUCs become more concerned with improved reliability and actively take the initiative in this area, they would have to look to the Nuclear Regulatory Commission (NRC) to provide guidance related to the design of power plants to achieve increased reliability standards.

Clearly, the FEA has an organizational responsibility to improve energy availability. Hence, increased reliability of nuclear power plants should be of considerable interest to them. Realistically, they do not have any control over the nuclear power plants and certainly have no way of impacting design considerations without, similar to the PUCs, interacting closely with the NRC.

NRC has responsibility for the safety of nuclear power plants along with the public utilities. Insofar as reliability is closely connected to safety, the responsibility of NRC is well established. The question of how active a position Regulation should take to improve plant reliability arises as the connection between safety and reliability becomes more tenuous. A most important issue that NRC needs to consider is whether, in its public interest role, NRC should more broadly interpret its mandate to influence the design of nuclear power plants to improve reliability to insure not only safety but more cost effective operation as well.

What Should Be the Role of the NRC to Improve Nuclear Power Plants Reliability?

If we believe - as I firmly do - that the most significant impact upon plant reliability can be achieved during the design phase, then the NRC has probably the most important role to play of any Federal Agency in improving nuclear power plant reliability. The NRC is the only agency that regulates the design of nuclear power plants. The contributory roles that could be played by FPC, FEA and the PUCs could only be accomplished by some agreement with the NRC. Hence, regardless of the effort expended by other government agencies having an interest in improved nuclear power plant reliability, the NRC would necessarily be involved in order to enhance the likelihood of success.

What Actions Can the NRC Take?

Given that the NRC is willing to take on this new initiative, and it is determined to be in the NRC's mandate to do so, there are a number of steps that can be taken. All of these steps can be justified either within our legislative responsibilities for safety or our requirement to evaluate the need for power.

1. We could expand our program of failure data reporting by the utilities. These data would be collected and analyzed by the NRC and a systematic program developed to feed the results of this analysis back into the design process. Where we find that parts, components and systems are developing histories of failure, we would systematically force adjustments by modifying design requirements.

2. We can work with the PUCs and educate them concerning the relationship between design investment and operating and maintenance costs. This could result in the PUCs influencing the utilities to impose upon A-Es contractual requirements for improved reliability.

3. We could modify our application format to include the requirement that the utilities explicitly identify the plans they have for assuring high reliability. While this tends more toward "jawboning" than the establishment of firm mandates, it would start identifying an area of interest that over some period of time would result in improved sophistication on the part of the utilities. Additionally, at some point of time we could establish criteria against which the utilities' reliability plans could be evaluated. (This would lead us away from "jawboning" to a position of exercising positive control.)

4. The illustration that is sometimes used of NASA developing high reliability systems is not immediately transferrable to the NRC since NASA was the customer whereas NRC is not. However, there are lessons that can be learned if, as a Regulatory agency, the NRC develops an active program to transfer NASA's experience in reliability to the utilities. This transfer of experience can be done in connection with the action proposed in paragraph 3. above.

5. NRC could selectively interact with officials of the public utilities as well as with the architect and engineering companies to express our interests in improved system reliability and solicit their ideas on the subject. This could be followed by an industry wide workshop to air the question of improved reliability. Our approach to improving reliability would take the form of public airing of the issues and by so doing persuade the industry to take positive action.

In summary, improving the reliability of nuclear power plants is clearly in the public interest. While other government agencies including FEA,

FPC, the State PUCs all have some share of the responsibility in improving the efficiency and effectiveness of power plants, the NRC is the single agency with the best front end leverage. A decision needs to be made concerning how active a role NRC should take in executing its responsibility for protecting the public interests. If protecting the public interest is narrowly defined to mean only those aspects that are directly relatable to safety and environment, then the actions we're taking at present are probably adequate. If, however, public interest is interpreted more broadly, then the NRC may wish to consider new initiatives like those mentioned above to improve nuclear power plant reliability.

Edwin G. Triner, Director
Office of Program Analysis -
Regulation

Attachment:
Article frm Nucleonics Week

# Federal Study Charges Little Concern By Utilities With Reactor Reliability

By DAVID BURNHAM
Special to The New York Times

WASHINGTON, March 8—A Federal study has concluded that the utilities that own most American nuclear reactors—which have recently been generating only about 55 per cent of their power capacity—are not sufficiently concerned about the safety and performance of their reactors.

The study further charges that the state commissions that are supposed to regulate the utilities have "little or no influence" on the design process that could make reactors more reliable and efficient.

The analysis of reactor reliability and what steps the Federal Government should take to improve it was written by Edwin G. Triner, director of the Office of Policy Planning in the Nuclear Regulatory Commission.

Dr. Triner said the utilities, in theory, should have prime responsibility for making sure that the reactors they buy are both safe and efficient.

"The reality, however, is that without external suasion the likelihood of the utility customer taking aggressive action to improve plant reliability is not very great," he said.

There are 55 nuclear plants operating in the United States that generate about 7.5 per cent of the country's electricity. Because of various problems in the continuing supply of oil and natural gas, the Ford Administration is committed to building hundreds of additional reactors in the next 10 years.

### Comment on Reliability

Norman C. Rasmussen, a professor of nuclear engineering at Massachusetts Institute of Technology who is the director of a major Atomic Energy Commission study on reactor safety, commented on the reliability issue at an industry conference last year.

"Probably one of the most serious issues that the intervenors can raise today, with good statistics to back their case, is that nuclear plants have not performed with the degree of reliability we would expect from machines built with the care and attention to safety and reliability that often has been claimed for nuclear plants," Dr. Rasmussen was quoted as saying in an April report by the Atomic Industrial Forum, an industry lobbying group supported by major reactor builders, the utilities and engineers.

Dr. Triner's five-page analysis of reactor reliability, dated Dec. 2, 1974, was made available by the Nuclear Regulatory Commission in response to a request by Daniel Ford, staff director of the Union of Concerned Scientists, an organization that has been critical of atomic power.

Dr. Triner's study described a number of factors that he felt contributed to the reliability problem.

"By and large, the utilities are not that sophisticated," the official said. "There is no evidence, for example, that they have contractually imposed reliability standards upon their architect-engineers. Very few of the utilities exercise very much influence at all over the design process as it impacts reliability."

### Costs a Factor

He said that a second factor was the reluctance of the utilities to incur extra design costs during the early stages of a nuclear reactor building project that would require them to generate additional capital.

"There is no incentive for them to make a total life cycle cost analysis that includes both design and construction cost and the 30 or 40 years of operating and maintenance cost," Dr. Triner wrote.

The official said another part of the problem was that the "architecture engineers who are largely responsible for power plant design have little incentive to consider increased reliability during the design process. Their interest is short term. Once a plant is constructed, the architecture engineers fade out of the picture."

Dr. Triner said one exception to the general pattern was Duke Power, a major utility in the Carolinas, which assigns its own production engineers as part of the reactor design group. He said that a limited investigation indicated that because of the all-inclusiveness of its responsibility for design, construction and operation, Duke "is more concerned with questions of reliability than most other utilities."

Concerning the role of the state utility commissions, the official said that besides having virtually no influence on the design of reactors, "to my knowledge the appointment of individuals to these commissions is not normally based upon their technical knowledge of the design and operations of a power plant."

He added that another problem was that "in all too many instances the quantity and quality of staff assigned to this function [nuclear reactors] within the states is inadequate."

The person who has publicly raised the most persistent questions about the reliability of reactors is David Dinsmore Comey, a member of the Chicago-based Business and Professional People for the Public Interest. In a statement last September, Mr. Comey said that the average capacity of the large nuclear reactors was 50.4 per cent during the first six months of 1974.

Put another way, this means that, because of breakdowns, inspections, fuel loading and other reasons, these reactors produced only about half the amount of power they were designed to generate during the period in question.

### A Second Analysis

Using a slightly different group of reactors, Dr. Triner in a second analysis of 44 reactors found the average capacity during the same period examined by Mr. Comey was 53.7 per cent.

Because Mr. Comey's study prompted strenuous debate within the industry, he recently issued a second one aimed at answering some of the criticism.

One industry response is that Mr. Comey's criticism of the reactors for not producing at least 80 per cent of their designed capacity is a straw man and that no one ever expected them to achieve such levels.

Mr. Comey, in a Feb. 14 paper, replied to this point by noting the final environmental statements prepared for more than 20 reactors by the Atomic Energy Commission included cost benefit calculations assuming 80 per cent capacity.

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