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Docket Nos. 50-213
50-336

Commissioner Joseph M. Hendrie
U. S. Nuclear Regulatory Commission
1717 H Street
Washington, D. C. 20555

References:
(1) TMI-2 Lessons Learned Task Force Report (Short-Term) NUREG-0578.
(2) D. G. Eisenhut letter to All Operating Nuclear Power Plants dated September 13, 1979.
(3) W. G. Counsil letter to D. G. Eisenhut dated October 18, 1979.
(4) H. Denton letter to All Operating Nuclear Power Plants dated October 30, 1979.
(5) W. G. Counsil letter to H. Denton dated November 21, 1979.
(6) W. G. Counsil letter to B. H. Grier dated April 24, 1979, Docket No. 50-213.
(7) W. G. Counsil letter to Dr. Denwood Ross dated May 31, 1979, Docket No. 50-213.
(8) W. G. Counsil letter to B. H. Grier dated April 24, 1979, Docket No. 50-336.
(9) W. G. Counsil letter to Dr. Denwood Ross dated May 31, 1979, Docket No. 50-336.
(10) R. Reid letter to W. G. Counsil dated June 7, 1979.
(11) W. G. Counsil letter to B. H. Grier dated June 29, 1979.
(12) W. G. Counsil letter to R. Reid dated February 12, 1979.
(13) D. G. Eisenhut letter to D. C. Switzer dated October 11, 1979.
(14) D. G. Eisenhut letter to W. G. Counsil dated October 23, 1979.
(15) NUREG-75/087, NRC Standard Review Plan, Revision 1.
(16) W. G. Counsil letter to D. L. Ziemann dated September 22, 1978.
(17) W. G. Counsil letter to D. L. Ziemann dated October 20, 1978.
(18) D. L. Ziemann letter to W. G. Counsil dated October 24, 1978.
(19) W. G. Counsil letter to R. Reid dated February 12, 1979.
(20) R. Reid letter to W. G. Counsil dated May 12, 1978.
(21) W. G. Counsil letter to R. Reid dated March 21, 1978.

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Dear Mr. Hendrie:

Haddam Neck Plant
Millstone Nuclear Power Station, Unit No. 2
Automatic Initiation of Auxiliary Feedwater

We are addressing this correspondence to your office, and request that you give it your personal attention, as recent communications with your Staff have indicated the arguments presented below require Commissioner-level attention to be recognized.

In Reference (1), the NRC Staff initiated promulgation of the recommendation for all operating PWR's to be equipped with automatic initiation of auxiliary feedwater via NUREG-0578, Item 2.1.7.a. Connecticut Yankee Atomic Power Company (CYAPCO) and Northeast Nuclear Energy Company (NNECO) were first requested to commit to implement this recommendation in Reference (2). In Reference (3), CYAPCO and NNECO indicated that this recommendation was considered to be unnecessary, that it was not credible to assume that auxiliary feedwater would not be manually initiated when required. The NRC Staff request was reiterated in Reference (4), wherein CYAPCO and NNECO were advised to reconsider improving the implementation schedule to comply with the Staff requests. CYAPCO and NNECO responded in Reference (5), continuing to disagree with the Staff on Item 2.1.7.a, and indicated that additional correspondence would be forthcoming. The purpose of this letter is to fulfill that commitment, and comprehensively address the various considerations supporting CYAPCO's and NNECO's conclusion that automatic initiation of auxiliary feedwater need not be implemented to ensure continued safe operation of the Haddam Neck Plant and Millstone Unit No. 2, respectively. Further, it is our purpose to assemble all relevant considerations in one document to facilitate achieving the proper perspective on this issue. It has been addressed in numerous documents on the CYAPCO and NNECO dockets as well as in lengthy telephone conversations. It is imperative that the synergistic impact of the factors upon which our conclusion is based be recognized and evaluated.

CYAPCO's and NNECO's review of the TMI-2 accident has concluded that automatic initiation of auxiliary feedwater is not a "lesson learned". It is noted that TMI-2's auxiliary feedwater was automatically initiated. One may speculate that had one of the plant operators been required to physically manipulate the controls, block valve closure would have been identified earlier in the accident. This point is certainly subjective and is noted here primarily because of a related consideration which will be identified later in this letter. More importantly, the eight-minute absence of feedwater at TMI-2 is not judged to have had a substantive impact on either the nature or consequences of the accident. Thus, it appears that undue emphasis has been placed on this system by the NRC Staff/Lessons-Learned Task Force. The uniqueness of the B&W ESSS with respect to its limited secondary water inventory in the steam generators could elevate the importance of maintaining an uninterrupted flow of feedwater in B&W plants, but this is not applicable to the Haddam Neck Plant or Millstone Unit No. 2. An evaluation of GDC-20 indicates that the auxiliary feedwater system is not a candidate for automatic initiation, in the context of the term "appropriate" in GDC-20. Manual initiation has been demonstrated to prevent anticipated operational occurrences from resulting in the specified acceptable fuel design limits (SAFDL's) being exceeded for approximately twelve years at Haddam Neck and over four years at Millstone Unit No. 2. Not only has it been demonstrated that the SAFDL's have not been exceeded with the current design, but auxiliary feedwater has always been established at these two facilities well before steam generator dry-out has been approached. It is

noted that this has been achieved with systems which are currently being upgraded in other respects to improve reliability.

CYAPCO and NNECO first documented objections to the Staff requirements regarding auxiliary feedwater mandated in the I&E Bulletin No. 79-06 series in References (6) and (8). The adequacy of manual initiation was further reinforced by the control room manning requirements described in References (7) and (9). These discussions led to the interim resolution, which is currently in effect, documented in Reference (10) and confirmed in Reference (11). A licensed operator who has direct responsibility for control and operation of all main and auxiliary feedwater systems will be in the main control room at all times. A backup is provided in the event the licensed operator is not available at any time. The operator assigned to this function will, at the time of a transient requiring such action, take immediate control of the main and auxiliary feedwater systems, with no other concurrent responsibilities, until the steam generator levels return to a stable condition. When considering transients of an extended and complex nature such as TMI-2, it can be argued that the above described measures constitute an alternative comparable to that proposed by the Staff with respect to achieving plant safety.

An integral factor supporting CYAPCO's and NNECO's position is the lengthy period of time associated with steam generator dry-out, in light of the short time necessary for the plant operators to recognize the need for corrective action and to take that action. Typically, the operators have responded in approximately thirty seconds, and these data were compiled from plant transients which preceeded the TMI-2 accident. Considering all the attention given to auxiliary feedwater since that time, it is difficult to envision operator response declining in this respect.

As previously stated in Reference (2), the minimum time to steam generator dry-out at Millstone Unit No. 2 following a total loss of feedwater is in excess of fifteen minutes. The details of this conservative calculation were provided in Reference (12). Neglecting other analytical conservatisms, the use of the ANS decay heat curve without the 20% conservatism would result in a minimum dry-out time in excess of twenty minutes.

For the case of Haddam Neck, substantially longer time is available. The calculations supporting this statement are provided in Attachment 1, Calculation of Steam Generator Dry-Out Times. As shown in Table 1 of the Attachment, even assuming ANS + 20% for decay heat, a minimum of 27 minutes before dry-out is available. Depending upon the availability of offsite power, either 33 or 43 minutes would be available using ANS + 0% for decay heat.

Previous Staff analyses, as documented in Reference (13) and (14), have stated that the dominant failure mode for the AFWS is the failure of the operator to manually actuate the system. For the purposes of this letter, CYAPCO and NNECO believe it appropriate to recognize the attention being focused on the auxiliary feedwater system since the TMI-2 accident. "Typical" operator performance or human reliability factors are not judged to be applicable to this circumstance. This consideration further dilutes the need to automate this system in order to justify safe plant operation.

CYAPCO and NNECO recognize that factors discussed to this point have not, to date, been successful in altering the Staff position. For that reason, efforts have continued to engineer, design, and procure the necessary components to

automate auxiliary feedwater at both facilities. First, it is noted that conceptually the system merely consists of an automatic start of the auxiliary feedwater pumps. The valves would be pre-positioned to provide the appropriate flow rates. In order to comply with the January 1, 1980 implementation date, a more appropriate, sophisticated design incorporating automatic isolation in the event of a steam or feedline break cannot be completed. CYAPCO and NNECO are quite familiar with the complexity of this feature through the Millstone Unit No. 3 project. In early 1978, Westinghouse Electric Corporation first identified the design requirement to couple automatic initiation with a provision to recognize the potential for steam or feedline breaks, such as flow restrictive orifice plates or automatic isolation, in order to ensure that minimum RCS cooldown rates would be achieved. The automatic isolation feature of the Millstone Unit No. 3 design has been under investigation for many months and to date, the design is not complete. It is noted that a hastily designed automatic isolation scheme has the potential to in fact decrease the reliability of the auxiliary feedwater system, due to inadvertent isolation of an intact loop. CYAPCO and NNECO suggest that reliability studies of a depth comparable to that recently conducted by the NRC Staff are appropriate before an automatic initiation and isolation is implemented. This position is further reinforced by the regulatory guidance of Item I.14 of Section 10.4.9 of Reference (15). Therefore, CYAPCO and NNECO have reviewed the system that is feasible to implement by January 1, 1980, namely automatic pump start without automatic isolation, pursuant to the requirements of 10CFR50.59, and have determined that installation of such a system constitutes an unreviewed safety question. Without prejudging the Staff evaluation of the arguments presented in the first portion of this letter, it is noted that implementation is prohibited without documented Staff approval of the concept under consideration.

The basis for this determination involves the increases in the severity of the consequences of a postulated feedwater line break and steamline break. As presently conceptually designed, a two-out-of-four low steam generator level signal in either steam generator would start both motor-driven AFW pumps and place the turbine driven pump at the minimum governor speed at Millstone Unit No. 2. Flow control valves would be preset to result in delivery of approximately 300 gpm to each steam generator at the no load steam generator pressure, approximately 900 psia, assuming an intact secondary system and all three AFW pumps operating. The operator would then be expected to adjust flow as necessary to maintain level in the proper range. At the Haddam Neck Plant, the conceptual design calls for a low steam generator level in any of the four steam generators to start both steam driven AFW pumps and fully open all four bypass flow control valves, delivering water to all four loops through a common header. The operator would then be expected to throttle the valves as necessary to maintain level in the proper range.

If a feedwater line rupture were to occur, the auxiliary feedwater, once automatically initiated, would preferentially flow to the break location rather than to the intact loop(s). Using the conservative assumption that all AFW flow is delivered to the break, only the water inventory remaining in the intact steam generator(s) is available to remove decay heat. In the absence of operator action, time to dry-out would be 75% of that for four intact loops at Haddam Neck, and 50% of that for two intact loops at Millstone Unit No. 2. Thus, the operator must recognize that even though AFW has been initiated, none of the water is providing a heat sink for the RCS. Manual isolation is, therefore,

required for such a break, despite automatic initiation. With the presently installed AFW configuration, the operator must recognize the cause of the accident, initiate AFW, and direct flow to the intact loop(s). The corresponding scenario for the proposed automatic scheme is that AFW would not be provided to an intact loop until the operator correctly diagnosed the effects of the feedwater line break as perturbed by the effects of AFW system initiation, and isolated the affected loop. The nature of the perturbation is a function of the break size and location. The time available for operator action is comparable for both cases.

In the case of a steamline break, assuming a loss of normal power, the proposed AFW system would be automatically initiated when the affected steam generator reaches a low level setpoint. Since the intact steam generator remains at a higher pressure than the generator with the break, the majority of the AFW flow will be to the depressurized generator, thereby feeding the break and excessively cooling down the RCS. For the Haddam Neck Plant, docketed steamline break analyses described in References (16) and (17) and approved in Reference (18) assumed that for the limiting case, the main feedwater system performed properly and that auxiliary feedwater flow was not initiated during the accident. A preliminary investigation of the flow characteristics of the installed AFW system indicates that if both AFW pumps are in operation, the flow into a broken steam generator would be substantial.

For Millstone Unit No. 2, steamline break analyses documented in Reference (19) and approved in Reference (20), assumed that five percent of full main feedwater flow was maintained throughout the incident. Any fluid injected by the AFW system during the incident exceeds that assumed in the current analysis. For both plants, this phenomenon results in a positive reactivity insertion in excess of that documented in current safety analyses potentially resulting in a return to criticality. Another adverse effect of this phenomenon is the steam produced from the auxiliary feedwater increases the mass and energy released to the containment. Currently, the LOCA is the governing incident with respect to mass and energy releases in containment. In the absence of quantification of the effects to the contrary, the potential exists for the above scenario to be more severe, considering both containment integrity and the environmental qualification issue, than currently approved analyses. It is noted that such quantification would not change CYAPCO's and NNECO's determination with respect to the unreviewed safety question issue, but rather affect only the magnitude of the analytical and possibly procedural and hardware efforts associated with resolving these safety questions.

Assuming that automatic initiation is mandated, recognizing that CYAPCO and NNECO have concluded that such is not the case to ensure safe plant operation, some form of automatic isolation or flow restricting orifice plates are judged to be an integral and necessary feature of the design. An additional concern with the concept under discussion is that it is not automatic in the context normally associated with automatic protective functions, in that some form of operator intervention is required to control flow even under non-accident conditions. Therefore, it alters the operator function from one in which the operator consciously plans and implements AFW delivery to one in which he has merely a corrective role. It can be argued that during postulated feedline breaks or steamline breaks, necessary operator actions may be delayed since the operator would tend to concentrate on required manual actions first and be passive with respect to the "automatic" systems.

The shortcomings forming the bases for the unreviewed safety question determination do not exist with a manually initiated system, because of the sequence of operator actions as prescribed by current operating procedures. CYAPCO and NNECO have determined that an accurate and timely diagnosis of the accident by the operators can be accomplished with a manual system. At this point, it is essential to recognize the comment made on Page 2 of this letter regarding accident diagnostics; during a steamline or feedline break, an automatic system initiates a detrimental process serving to complicate the diagnostic evolution. With a manual system, the operator would be cognizant of relevant plant parameters prior to initiation and just as importantly, be cognizant of the effects of his actions, whether beneficial or detrimental. This point is most relevant considering the substantial amount of time available before steam generator dry-out.

It is further acknowledged that the above points only identify the existence of unreviewed safety questions, and does not quantify their significance. It is again noted that quantification would not alter the determination made pursuant to 10CFR50.59, based upon our interpretation of the intent of the requirements and precedence established from evaluations of related issues. Forwarding this determination to the NRC Staff is one of the principle purposes of this submittal. Quantification would be difficult to perform at this time, due in part to the absence of a crucial criterion from the Staff, namely a specified time delay from the start of a steamline or feedline rupture before operator action to isolate the broken loop. Regarding this question, a Staff response of any time duration less than the steam generator dry-out time would be viewed as the ultimate paradox, wherein credit could be taken for the more complex diagnostic evaluation involving automatic initiation, yet could not be taken to justify the adequacy of the less complex evaluation involving manual initiation.

Other points previously identified to the Staff remain supportive of CYAPCO's and NNECO's position. In the case of Millstone Unit No. 2, the license condition restricting the flow of feedwater under certain conditions due to water hammer concerns remains in effect. In Reference (21), NNECO justified and proposed deletion of this condition, but it has yet to be dispositioned by the Staff.

In the case of the Haddam Neck Plant, topic evaluations associated with the SEP have the potential to significantly impact the ultimate configuration of the AFW system. These concerns were articulated in Reference (3).

The information presented above is also responsive to the Staff requests documented in recommendations GS-8 and GL-5 of Reference (13), and recommendations GS-8 and GL-1 of Reference (14).

We trust you find the above information adequate to comprehend the basis for CYAPCO's and NNECO's positions, determinations, and evaluations. We look forward to a detailed Staff reply to the above-noted concerns.

Very truly yours,

CONNECTICUT YANKEE ATOMIC POWER COMPANY
NORTHEAST NUCLEAR ENERGY COMPANY

W. G. Counsil
Vice President

Attachment