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62 FR 26729
May 20, 1997

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The Northeast Utilities System

(27)

June 19, 1997

Docket No. 50-443
NYN-97066

Chief, Rules Review and Directives Branch
United States Nuclear Regulatory Commission
Mail Stop T-6D-69
Washington, DC 20555-0001

Seabrook Station
Comments on Proposed NRC Bulletin 96-01, Supplement 1
(Control Rod Insertion Problems)

This letter forwards North Atlantic Energy Service Corporation's comments on the proposed supplement to Nuclear Regulatory Commission (NRC) Bulletin 96-01 (62 Fed.Reg 27629, 5/20/97). North Atlantic Energy Service Corporation (North Atlantic), is the managing agent for Seabrook Station.

The proposed supplement requests all licensees of Westinghouse and Babcock & Wilcox designed plants to ensure the operability of control rods during operations. This would be accomplished by verifying the full insertion and rod drop times of control rods in fuel assemblies that exceed prescribed burnup levels, and repeating this testing periodically until the end-of-cycle. In addition, the proposed supplement suggests end-of-cycle rod drop time tests and drag testing of all rodded fuel assemblies should be performed.

Seabrook Station is currently shutdown for its fifth refueling outage, and expects to return to service before the end of this month. During its next cycle (from July, 1997 to March, 1999), the peak rodded fuel assembly burnup (without IFM grids) is expected to be about 50,000 MWD/MTU. Under the proposed bulletin supplement, Seabrook Station would have to shutdown for rod drop testing after 35,000 MWD/MTU burnup for the highest burnup rodded fuel assembly (expected to occur in February, 1998), and to repeat this evolution every 2,500 MWD/MTU burnup thereafter (about every two months). As a result, Seabrook Station would be directly affected by the proposed requirements.

North Atlantic endorses the concerns and considerations presented on this topic by the Nuclear Energy Institute (NEI), Westinghouse, and the Westinghouse Owners Group (WOG). Specifically, the control rod testing, as currently proposed by the NRC, affects over fifty nuclear units and would necessitate a number of several day shutdowns for each unit. The increased number of reactor shutdowns and startups necessary for control rod testing will have a significant operational and economic impact on Seabrook Station, and for the nuclear industry. It would interrupt power generation, increase the potential for inadvertent plant transients, and place added stresses on fuel and mechanical equipment, without any net safety benefit.

North Atlantic requests that consideration or clarification be provided prior to issuance of the bulletin supplement in the areas noted in Attachment 1. Also, North Atlantic has determined that it is likely that the periodic shutdowns to do testing (due to the challenges to the trip system as the plant transitions from 100% to 0% power and back to full power) is greater than the reduction in risk from detecting sticking control rod conditions. Accordingly, the NRC should apply Backfit Rule guidance in determining whether or not Bulletin 96-01, Supplement 1 should be issued to licensees.

North Atlantic believes that the appropriate approach to resolving this issue is to conduct rod drop testing (for rodded fuel assemblies that have exceeded 35,000 - 40,000 MWD/MTU burnup) at any outage (planned or unplanned) and to further conduct drag testing at scheduled refueling outages. The time frame for this testing should be limited to two years, absent any regulatory concern that might develop based on test results. For the large number of plants involved, this period would provide a substantial database of information for NRC staff assessment.

The impact of forcing Seabrook Station to shutdown to perform rod drop testing is significant, and especially during summer months in New England when power restrictions (e.g. demand exceeding supply) are likely to occur in 1997 and beyond. If Seabrook has to shutdown six times during its next cycle, it is estimated that the economic impact could be over $10 million during the next cycle alone. This total impact consists of replacement power costs and increased production costs (due to operating and maintenance and station service costs incurred during the non-productive periods).

Should you have any questions regarding this response, please contact Mr. Terry L. Harpster, Director of Licensing Services, at (603) 773-7765.

Very truly yours,

NORTH ATLANTIC ENERGY SERVICE CORP.

Ted C. Feigenbaum
Executive Vice President
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cc: Mr. H. J. Miller, Region I Administrator
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Attachment 1

Seabrook Station, Unit No. 1

Detailed Comments

on

Proposed NRC Bulletin 96-01, Supplement 1

(Control Rod Insertion Problems)

Enclosure

Detail Comments
Proposed NRC Bulletin 96-01, Supplement 1
(Control Rod Insertion Problems)

The following comments are provided to address the Safety, Operations, Fuel Cycle Design, and Economic impact of the proposed bulletin supplement.

Operations Impact

Incomplete rod insertion (IRI) is a known phenomenon and specific data has been obtained at the plants where IRI occurred. Additionally, fuel assembly drop time and drag testing at Seabrook Station and throughout the industry has provided further understanding of IRI.

However, it seems that some of the additional requirements in the supplement are based only on testing and are not based on data taken following an IRI occurrence. An example of this is that the bulletin implies that the top spans of fuel might be the most susceptible to IRI, however, as the Westinghouse Owners Group has indicated, there is no data which supports this conclusion.

The stuck rod risk has several components to it: (1) the frequency of a single or multiple stuck rods - with and without high burnup; (2) the consequence of single or multiple stuck rods; and (3) the value of periodic rod drop testing. Each of these items is addressed below.

a) Generic Probability of Stuck Rod. For Seabrook Station, the probability of a stuck rod is 3.3E-5 per demand, based on generic data used in the Seabrook Station Individual Plant Examination (IPE) approved earlier by the NRC, and the probability of two (or more) of the 57 assemblies being stuck is 5.4E-6 per demand. The recent industry operational data does not give us any basis for updating the probability of rods failing to insert since the events that occurred would be classified as successes from a functional standpoint. It would be only speculation to try to extrapolate these events to the condition of multiple rods failing to function.

b) Consequence of a Stuck Rod. For a stuck rod to have any impact on reactivity, it would have to be stuck well out of the core. Also, UFSAR Chapter 15 analysis assumes a single stuck rod. Thus the event would have to be multiple rods, stuck well out of the core. The consequences of multiple rods failing to insert, given a trip demand, would be ATWS - overpower in the primary side compared to the secondary side. With a loss of feedwater, this could lead to vessel integrity challenge or long-term criticality concerns if boration from the RWST is not successful.

   For Seabrook Station, an IRI assessment for its next cycle (Cycle 6) shows minimum shutdown margin would be lost if all RCCAs stuck at 20 steps (far more than the experience at Wolf Creek or South Texas plants) withdrawn in assemblies of exposure greater than 35,000 MWD/MTU. The excess shutdown margin available at Seabrook is much more than the reactivity margin that would be lost with stuck control rods. The assessment also determined a potential loss in instantaneous scram reactivity. This loss is completely bounded by the difference between the minimum cycle 6 scram reactivity and the analysis limit.

c) Value of Rod Drop Testing. The primary value to the NRC in rod drop testing appears to be to detect the onset of rod "sticking" - assuming this is a progressive condition - that sticking a few steps from the bottom of the core is an early indication of rods not inserting at all. That premise has not been established. It is not clear that the process of dropping rods has any benefit beyond establishing whether they work (as exercising a valve does).

Safety Impact

The risk of incomplete rod insertion has not been compared to the risk of forcing plants to perform the additional shutdowns necessary to perform the proposed control rod testing. For Seabrook Station the requirements of the bulletin would result in six additional shutdowns during the next cycle.

- Evaluation - Multiple Shutdown - Startup Cycles

  - To perform the rod drop testing, the plant must be in Mode 3. Thus, for each test, the plant must transition from 100% power to Mode 3 and then back to power. This transition mode risk, for a controlled shutdown, has been estimated by determining the probability of a trip given a controlled shutdown and using the conditional probability of a core damage accident given a plant trip. This assessment reveals that there is a small risk increase in performing these tests.

  - There are other potential risk impacts that are difficult to quantify, such as the impact on long term reliability of plant equipment due to the shutdown and startup stresses and the potential for an ATWS from the very condition the test is being run to detect. Additionally, multiple shutdowns unnecessary challenge the operators with no resultant net safety benefit. Any potential risk benefits appear to be marginal at best, and largely unknown.

  - Given that the risk is greater for having to cycle the plant for rod drop testing, than to continue operations, there is no risk benefit to the proposed Bulletin 96-01, Supplement 1.

Economic Impact

The impact of forcing Seabrook Station to shutdown to perform rod drop testing is significant, and especially during summer months in New England when power restrictions (e.g. demand exceeding supply) are likely to occur in 1997 and beyond. If Seabrook has to shutdown six times during its next cycle, it is estimated that the economic impact could be over $10 million during the next cycle alone. This total impact consists of replacement power costs and increased production costs (due to operating and maintenance and station service costs incurred during the non-productive periods).

Fuel Cycle Impact

It is reasonable to expect that utilities will seek to develop alternative core loading patterns that could eliminate, or reduce, the number of times that shutdown would need to occur to conduct rod drop testing. Alternative loading patterns would allow the highest assembly burnup to be reduced, and thereby avoiding potential shutdowns for testing. However, these loading patterns introduce higher ($F\Delta H$) peaking factors (lower DNB margin) that, while within the licensing envelope, provide minimal operating margin for plant operators. This matter is far more important from operational and safety perspectives than periodic shutdown for rod drop testing.

After review of the proposed supplement, we request that consideration or clarification be provided in the areas noted below.

1. Our interpretation of the bulletin is that the specified burnup levels/criteria for testing apply to the individual fuel assembly burnups and not the core average burnup. Is this interpretation correct?

2. The bulletin has proposed criteria of "approximately 2,500 MWD/MTU" as an acceptable testing interval. North Atlantic would intend to treat this similar to a surveillance interval and place a 25% grace period on the interval. This same grace period (e.g. ± 25% of 2,500 MWD/MTU) would also apply to the 35,000 MWD/MTU trigger. Is this acceptable?

3. Our interpretation of the bulletin is that any rod drop test performed in the last 2,500 MWD/MTU is sufficient to meet the test interval criterion for a rodded fuel assembly. This would allow enveloping assemblies rather than requiring each fuel assembly to be tested as they pass the burnup level. Is this interpretation correct?

4. Our interpretation of the bulletin is that testing (i.e., rod drop time tests) is required to be performed only for control rods in fuel assemblies which have exceeded the burnup levels, not for all control rods. Is this interpretation correct?

5. Is a safety analysis assuming multiple stuck rods, or 1 stuck rod plus suspect control rods not fully inserted, acceptable to allow cycle operation without testing at the stated intervals?