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DUKE POWER

March 3, 1992

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D. C.   20555

Subject: McGuire Nuclear Station
Docket Nos 50-369 and 50-370
Proposed Technical Specification Amendment
Increase Allowable Temperature of the Standby
Nuclear Service Water Pond (SNSWP)
Response to Request for Additional Information
(TAC Nos. M79018 and M79019)

Gentlemen:

By a letter dated September 25, 1991, the NRC staff requested additional information regarding their review of our proposed request to revise the Technical Specification 3/4.7.5 (Standby Nuclear Service Water Pond) that was submitted by a Duke Power letter dated October 23, 1990. Accordingly, please find attached our response to your questions.

If you have any questions regarding our response or the amendment request, please contact Paul Guill at (704) 875-4002.

Very truly yours,

T C McMeekin

Ted C. McMeekin, Vice President
McGuire Nuclear Site

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Corporate Records
Master File: 1.3.2.9
MNS-RC File: 801.01
/tssnswp.nrc

ATTACHMENT

DUKE POWER COMPANY
MCGUIRE NUCLEAR STATION
RESPONSE TO
REQUEST FOR ADDITIONAL INFORMATION

NRC QUESTION 1

Why hasn't the higher seasonal temperature and reduced rainfall affected the constant exchange coefficient that is assumed for heat transfer from the pond? (Attachment 1, page 3 of the submittal).

Given the availability of site specific data, is the constant exchange coefficient still conservative with regard to heat transfer from the pond?

DPC RESPONSE 1

There is limited amount of applicable meteorological data available for the McGuire site. Meteorological parameters and their associated periods of availability are:

Dew Point Temperature	1976 - 1987
Wind Speed	1976 - 1991
Solar Radiation	1976 - 1984

The site meteorological data described above was reviewed and the worst monthly average values were extracted from the summer months (June, July, August). Although these extremes were not historically coincident, they were used for conservatism to compute the parameters used to determine heat exchange in the SNSWP (heat exchange coefficient, equilibrium temperature). The SNSWP computer model was then run with these parameters to determine their effect on the pond thermal analysis. Based on this model run, the inclusion of the available recent site meteorological data does not affect the acceptability of the previous pond analysis. The original heat exchange parameters still result in a conservative pond analysis.

NRC QUESTION 2

Provide the calculations, assumptions, and other relevant data and information that was credited in concluding that 2400 gpm auxiliary spray flow is available. This includes the 10 CFR 50.59 evaluation supportin, the change from 1841 gpm to 2400 gpm and a description of the periodic test that verify the 2400 gpm flow rate can be achieved.

DPC RESPONSE

Enclosed is a copy of the 10 CFR 50.59 evaluation of the changes to the input assumptions for the peak containment pressure transient for the Loss of Coolant Accident described in the McGuire FSAR. As noted in the evaluations, one of the input assumptions that was changed was the auxiliary spray flow from the sump. The new input assumption assumed in the analysis is 2400 gpm.

A one time functional test of the ND Auxiliary Containment Spray System was performed several years ago. The site test alignment used temporary piping to connect the auxiliary spray ring headers. No flow was passed through the spray nozzles. Rather, the total auxiliary header flow was taken by temporary piping outside of the containment. The results of this test were utilized to benchmark a hydraulic simulation model that would be used to determine the minimum auxiliary containment spray flow rate. The results of the functional test indicated that the flow rate was 2539 gpm for train A and 2576 for train B.

The functional test that was performed was a special one time only test, which required special temporary piping and placing the plant in an unusual configuration. Performing this test on a periodic basis is impractical and could result in unnecessarily spraying down the containment.

The following is a brief summary of the ND auxiliary containment spray flow capacity analysis that was performed to support the availability of a flowrate of 2400 gpm for the ND Auxiliary Spray System. The files containing the actual engineering calculations that were performed in support of this determination can be reviewed at our corporate headquarters. Please note that this is a completely different, and separate system from the primary Containment Spray System (NS).

Synopsis
of
ND Auxiliary Containment Spray
Flow Capacity Analysis

OBJECTIVE

The objective of the analysis was to determine the minimum auxiliary containment spray flow rate which may conservatively be used as an assumption in the design basis containment analyses. This was accomplished by developing a RETRAN computer model of the auxiliary containment spray system and benchmarking it against the McGuire functional test data. The focus of the McGuire site functional tests was to determine the validity of the Westinghouse original prediction of 1841 gpm flow rate.

DESCRIPTION OF ANALYSIS

A detailed model was developed to simulate the actual site spray functional test setup. The results of the tests were used to adjust the calculated hydraulic form loss coefficients within the RETRAN model, so that an accurate benchmarked model is obtain. Once benchmarked, engineering calculations were performed to model the hydraulic losses associated with spraying through the nozzles. McGuire Unit 1 was the limiting unit, since its test flow rates were significantly lower than Unit 2.

RESULTS OF ANALYSES

The RETRAN benchmark runs yielded results which were virtually identical to the site functional test data. Train A flow was measured at 2539 gpm and Train B flow was measured at 2576 gpm. The RETRAN predictions confirm that MNS Unit 1 Train A is the most limiting auxiliary spray flow rate. Simulating the minimum flow alignment assumed in the peak containment pressure analysis, RETRAN predicted a flow of 2521 gpm for Train A and 2538 gpm for Train B. The equivalent Westinghouse simulation, predicted a flow of 1841 gpm. To incorporate some margin into the analysis, Duke assumes an auxiliary flow rate of 2400 gpm.

CONCLUSION

Previous Westinghouse predictions for the auxiliary containment spray ring flow rates are overly conservative. Updated values based on calculations, benchmarked to actual MNS site functional test data, yield higher predictions.

NRC QUESTION 3

Provide the safety evaluations for the changes in flow rates and heat transfer coefficients for the containment spray and component cooling heat exchanges. Also, describe the tests that DPC is either currently performing or plans to perform to verify the containment spray and component cooling water heat exchanger heat transfer coefficients.

DPC RESPONSE 3

The enclosed copy of the 10 CFR 50.59 evaluation of the changes to the input assumptions for the Peak Containment Pressure Transient also addresses the changes to the flow rates and heat transfer coefficients for the containment spray and component cooling heat exchangers. Please note that the parameters identified within this question as well as that identified in question 2 are just part of several input assumptions utilized in the Peak Containment Pressure Analysis. The enclosed 10 CFR 50.59 evaluation addresses all of the input assumptions of the analysis that were changed. Primarily, the impact of the changes needs to be evaluated collectively. Accordingly, the new containment peak pressure following a design basis LOCA, as calculated by LOTIC-1 is 14.07 psig. This result is below the acceptance criterion of 14.8 psig

The heat transfer coefficient for the NS heat exchanger is periodically verified by a performance test. A copy of the test procedure used in carrying out this test can be reviewed at the McGuire site. The heat transfer coefficient of the KC heat exchanger is continuously monitored. This is accomplished by continuously monitoring the pressure drop across the heat exchanger. By monitoring the pressure drop across the heat exchanger, this will assure that the fouling in the heat exchanger will be below the amount that which would cause a reduction in the heat transfer coefficient below that was assumed in the peak containment analysis.

ENCLOSURE

DUKE POWER COMPANY
MCGUIRE NUCLEAR STATION
10 CFR 50.59 EVALUATION

I. OBJECTIVE

The objective of this calculation file is to document the 10 CFR 50.59 evaluation of the changes of input assumptions for the Peak Containment Pressure Transient for Loss of Coolant Accident described in the McGuire FSAR.

II. DESCRIPTION OF ANALYSIS

A number of input assumptions for the containment code LOTIC-1 for the Peak Containment Pressure Analysis have been changed over the last few years to reflect plant modifications or changes in system and equipment behavior. The input assumptions are summarized in Reference 6 and are listed in the McGuire FSAR, Chapter 6.2.1.1.3.1, Loss of Coolant Accident.

LOTIC-1 is a Westinghouse computer program used for predictions of long term containment response following high energy pipe breaks inside the containment. The accident relevant to these input assumptions is the Design Basis LOCA. The acceptance criterion for these input assumptions is that the peak containment pressure calculated by LOTIC-1 must not exceed 14.8 psig (Ref. 2, Technical Specification Basis 3/4.6.5, Amendments No. 26 and 45).

III. DETAILS OF ANALYSIS

The input assumptions that are subject of this 50.59 evaluation are listed below. The values shown reflect the most recent peak containment pressure analysis transmitted by Westinghouse via Ref.6.

<u>Initial Ice Mass</u>

1.89×10^6 lbs

The initial ice mass was subject of several changes and sensitivity studies in the past. The previous FSAR value as of 1989 was 2.22×10^6 lbs. The current ice weight reduction is requested to facilitate ice bed maintenance. A lower initial ice weight causes the peak containment pressure to increase.

<u>Standby Nuclear Service Water Pond Temperature (SNSWP)</u>

82 °F

The original SNSWP temperature input for the containment analysis was 78 °F. It has been determined that during hot weather periods this temperature requirement could not be met due to the thermal stratification in the nuclear water service pond. The higher SNSWP temperature tends to increase the containment peak pressure.

<u>Containment Structural Heat Sink Areas</u>

The structural heat sink areas originally used in the McGuire analysis

DSW
10/29/91

and based on preliminary calculations, were significantly different from Catawba. Duke Power Civil Engineering later performed more accurate calculations which resulted in new values for structural heat sink areas that are now practically identical for both plants.

This change resulted in a slight increase in peak containment pressure, since the new structural surface areas are ~7% smaller than the original values.

Containment Spray Heat Exchanger UA (Product of Heat Transfer Coefficient and Heat Transfer Area)

1.47×10^6 Btu/hr-°F

Due to fouling of the heat exchangers, the original assumption of 2.94 $\times 10^6$ Btu/hr-°F for UA could not be met. The current value was arrived at by engineering calculations and plant data. A reduced heat transfer coefficient for spray heat exchanger caused the peak pressure to go up.

Component Cooling Water Heat Exchanger UA

1.60×10^6 Btu/hr-°F

The tubes in the KC heat exchanger exhibit increased tendency for pitting, therefore, additional tube plugging may be required in the future, rendering the original value of 5.0×10^6 Btu/hr-°F unrealistic. The current value was arrived at by Westinghouse through a sensitivity study performed with LOTIC-1. The selected heat exchanger UA resulted in a sufficient margin between the peak containment pressure and the acceptance criterion of 14.8 psig. Duke Power engineering groups accepted the new value as achievable. A lower heat transfer coefficient caused an increase in peak containment pressure.

RWST Water Temperature:

105 °F

This input assumption was originally 120°F. To gain margin to the containment acceptance value, this temperature was reduced. The current value is still slightly conservative, since the Technical Specification requirement is 100 °F. A lower RWST temperature resulted in a decrease in peak containment pressure.

Active Sump Volume

90,000 ft^3

The Westinghouse LOTIC model divides the sump into active and inactive sections. The active sump is located within the crane wall, while the inactive sump is outside. The excess water that spills into the inactive sump is no longer available for the safety injection or spray flow.

JSM
10/29/91

At McGuire the suction piping for the recirculation flow was changed and is now located outside the crane wall, making both sections of the sump active. This modification allowed the sump volume to be increased from 46,500 ft^3 to the current value. This change tends to reduce the peak containment pressure.

Auxiliary Spray Flow From the Sump

2400 gpm

An engineering calculation within Duke Power (Ref. 5) showed that the original input of 1,623 gpm obtained from Westinghouse was too conservative and that more auxiliary spray flow is available. This change resulted in a decrease in containment peak pressure providing additional margin to the 14.8 psig limit.

Nuclear Service Water Flow to the Containment Spray Heat Exchanger

3,800 gpm

The original flow of 5,000 gpm could not be met. Plant data and engineering calculations required a reduction to the present value, which resulted in a higher peak containment pressure.

Nuclear Service Water Flow to the Component Cooling Water Heat Exchanger

5,500 gpm

This flow was originally assumed at 8,000 gpm, however, plant data and engineering evaluations made it necessary to reduce to the new value. A lower flow caused an increase in the containment pressure.

Implementing all the above input assumptions, the new containment peak pressure following a Design Basis LOCA inside the containment calculated by LOTIC-1 is 14.07 psig (Ref. 6), which is below the acceptance criterion of 14.8 psig.

The 10 CFR 50.59 Guidelines include the following questions:

Probability of an Accident Previously Evaluated in the FSAR

All of the input changes described in this calculation file affect systems or components necessary to mitigate the consequences of a loss of coolant accident. None of the systems, components or functions are required during normal operation and are not actuated before the occurrence of the loss of coolant accident. Therefore, any changes to these systems or components have no impact on the probability of the occurrence of a LOCA.

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10/29/91

Consequences of an Accident Previously Evaluated in the FSAR

The consequences of a loss of coolant accident previously evaluated in the FSAR are the release of fission products from the containment due to its structural failure. Since the design pressure calculated by LOTIC-1 with the new input assumptions is below the acceptance criterion, and hence below the containment design pressure, the consequences of an accident will not be different than previously evaluated in the FSAR with the original input assumptions.

Probability of an Equipment Malfunction Previously Evaluated in the FSAR
Consequences of an Equipment Malfunction Previously Evaluated in the FSAR
Possibility of an Accident Not Evaluated in the FSAR
Possibility of an Equipment Malfunction Not Evaluated in the FSAR

The ice condenser is a passive heat sink located inside the containment. The reduction of ice mass initially loaded in the ice condenser will only have an effect on the peak containment pressure, but will in no way effect the probability and consequences of an equipment malfunction previously evaluated in the FSAR, or the possibility of an accident or an equipment malfunction not previously evaluated.

The assumption of lower heat transfer areas for structural materials located inside the containment will not result in any physical changes in the plant, therefore, there can be no change or effect on probability, possibility or consequences of equipment malfunctions or possibility of an accident not previously evaluated.

The containment spray is an active safety system with no functional requirement during normal operation. The input changes affecting this system reflect actual changes in performance observed or measured at the station, such as lower flow rates and heat transfer coefficients due to fouling or higher heat sink temperature due to higher than expected nuclear service pond temperature. All of these performance changes are within the design criteria of the components of the NS system, therefore, no physical modifications of the system have been or will be necessary.

Similar arguments apply to the component cooling water system, which provides the heat sink for the containment spray and the auxiliary spray heat exchangers.

The assumption of lower refueling water storage tank (RWST) temperature for the purpose of containment analysis does not, in any way, affect the physical status of this system. The Technical Spesification of 100 °F for the maximum RWST temperature is not being changed.

The original containment sump was redesigned by locating the two recirculation pipes outside the crane wall, and adding fine mesh screens to prevent debris from entering the pipes. The original

JSM
10/29/91

design allowed direct impingement of break flow jets in the sump area, creating air entrainment. Therefore, it can be stated that the overall design of the containment sump has been improved resulting in reduction of the probability of equipment malfunction and/or possibility of an accident or equipment malfunction not previously evaluated.

The assumption of a higher auxiliary spray flow from the sump is based on engineering calculation that showed better performance of the system than previously assumed. This change is not a result of physical modifications of the auxiliary spray system.

Reduction of Margin of Safety defined in Technical Specification Bases

The acceptance criterion defined in the McGuire Technical Specification is 14.8 psig, the actual design pressure is 15 psig. Since the new calculated peak containment pressure remains below these values, it is concluded that the fission product barrier is not affected, therefore, the margin of safety is not reduced.

Change in Technical Specifications

None of the input assumptions for LOTIC-1 discussed in this calculation file requires a change in the Technical Specifications.

IV. RESULTS

The input assumptions for LOTIC-1 peak containment pressure analyses can be changed as discussed in this calculation file, without prior NRC approval.

V. ASSUMPTIONS

None

VI. COMMENTS

None.

VII. REFERENCES

1 Duke Power Company
McGuire Nuclear Station
Final Safety Analysis Report, Volume 5
Revision 3/90

2. Duke Power Company
McGuire Nuclear Station, Units 1 and 2
Technical Specifications
Docket Nos. 50-369/370

JSM
10/29/91

3. McGuire Nuclear Station, Units 1 and 2
Docket Nos. 50-369 and 50-370
Requested Technical Specifications Changes (T.S. 3/4.6.5.1)
Containment Ice Condenser Ice Bed Ice Weight Reduction

4. McGuire Nuclear Station, Units 1 and 2
Docket Nos. 50-369 and 50-370
Proposed Technical Specifications Amendment
Increase Allowable Temperature of the Standby Nuclear Service Water Pond (SNSWP)

5. Calculation File MCC-1552.08-00-0012
ND Auxiliary Containment Spray Flow Capacity.
12/19/86

6. Westinghouse Transmittal DAP-90-512
McGuire Nuclear Station Units 1 and 2
Peak Pressure Reanalysis with Reduced Ice Weight
January 31, 1990

MCC-1552.08-00-0168
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10/29/91