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DUKE POWER

August 8, 1995

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

Subject: Catawba Nuclear Station, Units 1 and 2
Docket Nos. 50-413 and 50-414
Proposed Technical Specifications (TS) Changes
(TS 3/4.4.8 and Table 4.4-4)
Determination of Reactor Coolant System Specific Activity

Gentlemen:

Pursuant to 10CFR50.4 and 10CFR50.90, attached are license amendment requests to Appendix A, Technical Specifications, of Facility Operating Licenses NPF-35 and NPF-52 for Catawba Nuclear Station Units 1 and 2, respectively. The proposed amendments allow the reactor coolant (NC) system gross specific activity measurement method to be changed from the current degassed method to a non-degassed, or pressurized dilution, method. Data collected by Catawba indicates that current technology in isotopic analysis and sampling equipment has improved such that sample degassing is no longer required to obtain an accurate measurement of NC system specific activity.

Attachment 1 contains a background and description of the enclosed amendment request. Attachment 2 contains the required justification and safety evaluation. Pursuant to 10CFR50.91, Attachment 3 provides the analysis performed in accordance with the standards contained in 10CFR50.92 which concludes that the requested amendments do not involve a significant hazards consideration. Attachment 3 also contains an environmental impact analysis for the requested amendments. Attachment 4 contains the marked-up Technical Specification amendment pages for Catawba. Duke Power Company is forwarding a copy of this amendment request package to the appropriate South Carolina state official. Duke Power Company is requesting a thirty-day period following NRC approval of the proposed amendments to allow for implementation.

Should there be any questions concerning this amendment request or should additional information be required, please call L.J. Rudy at (803) 831-3084.

A001

Very truly yours,

W.R. McCollum
Catawba Site Vice President

LJR/s

Attachments

xc (W/Attachments):
S.D. Ebneter, Regional Administrator
Region II

R.J. Freudenberger, Senior Resident Inspector

R.E. Martin, Senior Project Manager
ONRR

Max Batavia, Chief
Bureau of Radiological Health, SC

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M&M Nuclear Consultants

INPO Records Center

W.R. McCollum, being duly sworn, states that he is Vice President of Duke Power Company; that he is authorized on the part of said Company to sign and file with the Nuclear Regulatory Commission this revision to the Catawba Nuclear Station License Nos. NPF-35 and NPF-52 and that all statements and matters set forth therein are true and correct to the best of his knowledge.

W.R. McCollum, Vice President

Subscribed and sworn to before me this 8th day of August, 1995.

Notary Public

My commission expires:

MY COMMISSION EXPIRES:
JANUARY 20, 2003

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ELL-EC05O

ATTACHMENT 1

BACKGROUND AND DESCRIPTION OF AMENDMENT REQUEST

Background

TS 3/4.4.8 governs reactor coolant system specific activity limits, sampling, and analysis. Surveillance Requirement (SR) 4.4.8 requires that NC system specific activity be determined to be within limits utilizing the sampling and analysis program of Table 4.4-4. Table 4.4-4 delineates that the gross radioactivity determination consist of measurement of NC specific activity (with the stated exceptions), which shall be the sum of the degassed beta-gamma activity and the total of all identified gaseous activities in the sample within two hours after the sample is taken and extrapolated back to when the sample was taken.

The current method of reactor coolant sampling and analysis involves collection of 1.0 liter of NC system water at 2235 psig (NC system pressure) in a stainless steel vessel. The hydrostatic pressure of the sample and the bulk of the radioactive gases are then relieved into another evacuated 1.0 liter stainless steel vessel. Next, the depressurized liquid is degassed with argon to drive the remaining gases out of the solution. Typically, 1 to 20-milliliter liquid samples and 1 to 5-milliliter gas samples are then obtained for quantification by gamma spectroscopy analysis. The results of these two isotopic analyses are summed to give the total specific activity. This method of quantifying NC system specific activity requires about one hour in the Nuclear Sampling Lab to acquire the samples. The length of sample collection time is important because the sampling takes place in a high personnel dose environment.

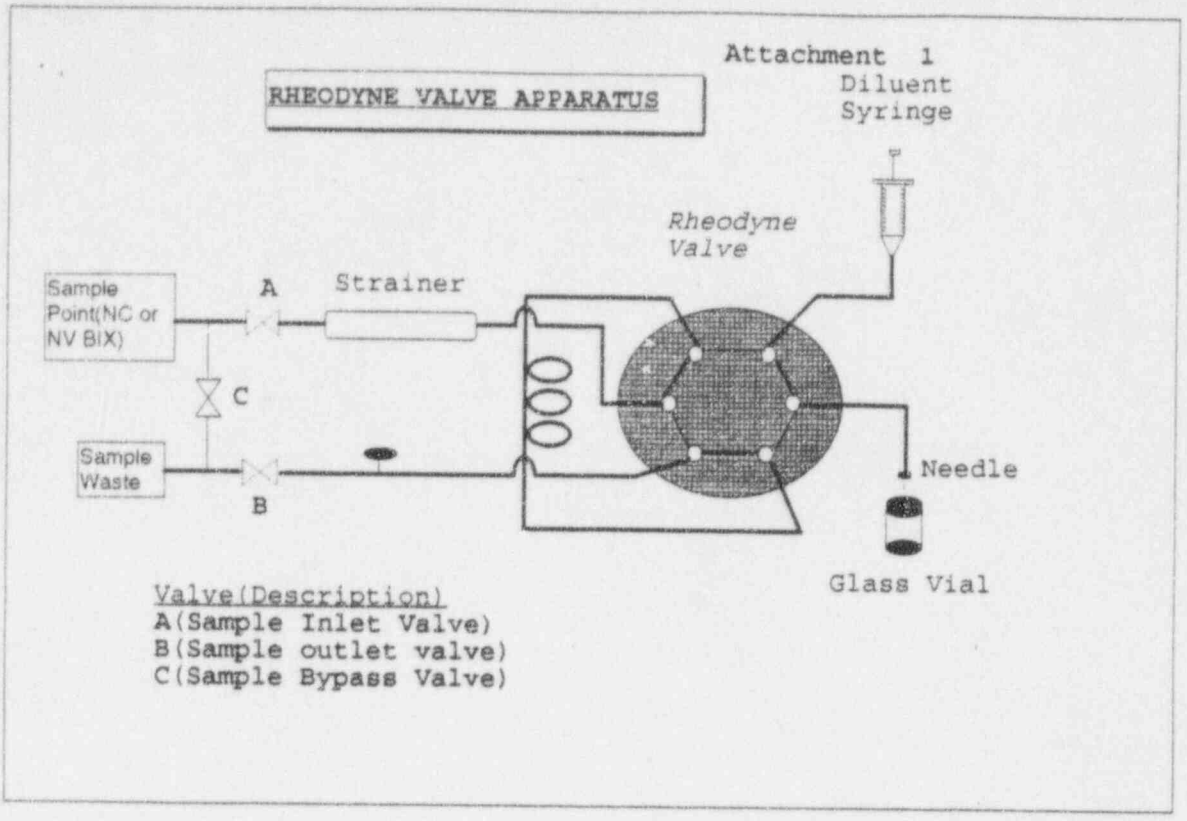
An alternative sampling method, known as the pressurized dilution method of NC sampling, has been statistically validated. This method involves the use of technology such as the Rheodyne Model 7010 six-port rotary valve for pressurized sample collection. This valve was adapted from liquid chromatography (LC), where it is widely used because of its high volumetric precision. The Model 7010 valve (see Figure 1) can be equipped with 5.0-microliter to 5.0-milliliter sample loops and has a maximum temperature and pressure rating of 150 degrees C and 5000 psi, respectively.

With the pressurized dilution method, a known volume of NC system water is trapped and then injected into a 14-milliliter gas sample vial by flushing with a known volume of dilution water. This diluted sample, which contains both gaseous and dissolved nuclides, can then be counted on a gamma spectroscopy detector and used in quantification of total specific activity. A NC sample can be obtained in fifteen minutes by the pressurized dilution method, thereby resulting in a 75% decrease in time of sampling and radiation exposure for plant Chemistry personnel. Counting instrument geometries, isotopic libraries, and programming have been upgraded to permit the use of the pressurized dilution sampling technique.

Description of Amendment Request

TS Table 4.4-4 Table Notation ** is modified to read: "... The total specific activity shall be the sum of the beta-gamma activity in the sample within 2 hours after the sample is taken and extrapolated back to when the sample was taken. ..."

Figure 1 - Rheodyne Model 7010 Six-Port Rotary Valve



No changes to the associated Bases section of the TS are required.

ATTACHMENT 2

JUSTIFICATION AND SAFETY EVALUATION

Justification and Safety Evaluation

At Catawba, NC sampling and gamma spectroscopy analysis were performed using both the degassed and pressurized dilution methods on samples from both Units 1 and 2. The specific activity of Unit 1 NC water was about four to five times lower than that of Unit 2. This represented a direct comparison of the two methods on relatively low activity (approximately .35 microcurie/milliliter) and relatively high activity (approximately 1.6 microcurie/milliliter) samples.

Nationally accepted criteria such as the National Bureau of Standards (NBS) statistical f-test and t-test were used to validate the pressurized dilution method. The statistical comparison showed results which were at least as accurate as the original degassed method. The pressurized dilution method produced results which were statistically the same for all nuclides which significantly contribute to E-bar, gross activity, dose equivalent iodine, failed fuel, and xenon dose equivalent primary-to-secondary leak indicators.

The Catawba total specific activity sampling comparison program consisted of obtaining four months of representative NC hot leg samples from Units 1 and 2. The final ten samples were used for the data comparison. Total specific activity was calculated for each NC sample collected by the degassing and pressurized dilution methods. The results were compared for relative accuracy. The collected data was subjected to the following two statistical analyses:

1) f-test per NBS Handbook (Chapter 3, page 3-22, Table 3-2) and
2) t-test per NBS Handbook (Chapter 3, page 3-22, Table 3-2).

Table 1 contains the Unit 1 and 2 total specific activity comparison data. The Unit 1 data showed an average relative error between the two methods of +2.96%. The error ranged from +21.62% (sample #10) to -17.14% (sample #1). For Unit 2, the average relative error between the two methods was -11.91%. The error ranged from -3.61% (sample #7) to -30.94% (sample #1). These errors are within the statistical guidelines of the NBS Handbook.

The total specific activity data from Table 1 indicates the presence of a negative bias for the Unit 2 data. This bias was investigated using recognized statistical techniques for data comparison. Paired data techniques for the individual isotopes were considered questionable due to a significant counting error contribution at low concentrations. A better technique was to utilize replicate samples of a homogeneous system. Since the reactor coolant system is dynamic, the criterion for sampling E-bar was used in order to obtain data points at assumed equilibrium. The data obtained was then treated as replicate data from a single source. This allowed variability comparisons to be taken into account when investigating bias. The data for both units compared favorably, with the exception of Co-58 and Xe-135m. The discrepancy in Co-58 was due to particulates settling to the bottom of the degas apparatus where the liquid sample is taken. This biased the sample high in the degas method. The discrepancy in Xe-135m could not be explained chemically, since the other inert gases showed no bias. This discrepancy may have been due to the small statistical population size (i.e., ten samples compared). Since all other isotopes did not exhibit a bias, it was concluded that both the degas apparatus and the pressurized dilution apparatus produced essentially the same results. The pressurized dilution method is therefore an acceptable alternative to the degas method.

Table 1 - Unit 1 and 2 Total Specific Activity
Comparison Data

ATTACHMENT III
(Page 3)

CATAWBA UNIT 1 NC HOTLEG
Rheodyne Verses Degassed Total Specific Activity Report

SAMPLE #	RHEODYNE (μCi/ml)	DEGASSED (μCi/ml)	% ERROR (Statistical Difference)
1	0.29	0.35	-17.14
2	0.35	0.31	12.90
3	0.29	0.29	0.00
4	0.33	0.33	0.00
5	0.37	0.32	15.63
6	0.32	0.31	3.23
7	0.33	0.3	10.00
8	0.3	0.36	-16.67
9	0.31	0.31	0.00
10	0.45	0.37	21.62
			X = +2.96%

CATAWBA UNIT 2 NC HOTLEG
Rheodyne Verses Degassed Total Specific Activity Report

SAMPLE #	RHEODYNE (μCi/ml)	DEGASSED (μCi/ml)	% ERROR (Statistical Difference)
1	1.25	1.81	-30.94
2	1.34	1.58	-15.19
3	1.35	1.78	-24.16
4	1.21	1.27	-4.72
5	1.52	1.61	-5.59
6	1.5	1.67	-10.18
7	1.6	1.66	-3.61
8	1.6	1.69	-5.32
9	1.6	1.77	-9.60
10	1.525	1.69	-9.76
			X = -11.91%

$$\%E = \frac{\text{Rheodyne } (\mu Ci/ml) - \text{Degassed } (\mu Ci/ml)}{\text{Stripped } \mu Ci/} \times 100$$

In summary, the statistical tests led to the following conclusions:

1) Both the degassed method and the pressurized dilution method produce similar results for total specific activity.

2) All isotope comparisons between the two methods showed that similar results are generated, except for two isotopes (Co-58 and Xe-135m). Higher Co-58 in the degas sample was due to particulates settling to the bottom of the sample apparatus. Lower Xe-135m in the pressurized dilution method could not be explained conclusively, but it is not a major contributor in the failed fuel analysis, nor is it a major contributor in the Xe-133 equivalence calculation to determine primary-to-secondary leakage.

Utilization of the pressurized dilution technique will result in fewer opportunities for personnel error while sampling. The degassed technique requires both gaseous and non-gaseous sample dilutions to be performed by the operator. In contrast, after the initial calibration of the installed sample loop is complete, all sample dilutions using the pressurized dilution technique are performed mechanically by the Model 7010 Rheodyne valve. The degassed technique requires 110 valve positionings per sample, compared to only 10 for the pressurized dilution technique. This reduction will greatly reduce the chance of valve mispositioning events while sampling.

Utilization of the pressurized dilution technique will result in considerable ALARA savings over the life of the plant. It has been determined that implementation of the pressurized dilution method will result in dose savings of 74.3 Rem for Unit 1 and 78.6 Rem for Unit 2 over the remaining life expectancy of the units. This is due to the fact that the pressuzized dilution method requires a smaller sample of NC liquid (1.0 milliliter for the pressurized dilution method versus 1000 milliliters for the degassed method), as well as reduced sampling time (15 minutes for the pressurized dilution method versus 1 hour for the degassed method).

In summary, approval of the requested amendments will allow Catawba to pursue new methodology for NC sampling and radiochemical analysis and to implement new technology when justified. Finally, the NRC has previously approved the use of the pressurized dilution technique to replace the degassed technique for other Duke Power Company nuclear units (reference Amendment No. 66 and Amendment No. 47 for McGuire Nuclear Station Units 1 and 2, respectively).

ATTACHMENT 3

NO SIGNIFICANT HAZARDS CONSIDERATION DETERMINATION AND ENVIRONMENTAL IMPACT ANALYSIS

No Significant Hazards Consideration Determination

As required by 10CFR50.91, this analysis is provided concerning whether the requested amendments involve significant hazards considerations, as defined by 10CFR50.92. Standards for determination that an amendment request involves no significant hazards considerations are if operation of the facility in accordance with the requested amendment would not: 1) Involve a significant increase in the probability or consequences of an accident previously evaluated; or 2) Create the possibility of a new or different kind of accident from any accident previously evaluated; or 3) Involve a significant reduction in a margin of safety.

The requested amendments allow NC samples to be analyzed using the pressurized dilution technique as opposed to the current degassed method.

Criterion 1

The requested amendments will not involve a significant increase in the probability or consequences of an accident previously evaluated. The amendments will have no effect on the probability of the occurrence of any accident. It has been demonstrated that the results obtained by the pressurized dilution technique are statistically similar to results obtained by the degassed technique. Therefore, implementation of the new method will have no effect insofar as the accuracy of the NC system specific activity determination is concerned. Therefore, there will be no effect upon any accident dose consequences.

Criterion 2

The requested amendments will not create the possibility of a new or different kind of accident from any accident previously evaluated. No accident causal mechanisms will be affected by installation of the sampling equipment required by the pressurized dilution technique. Operation of the NC system itself will not be affected by the proposed change in sampling technique. All procedure changes required for implementation of the new sampling method will be made according to the provisions of 10CFR50.59. No impact on other areas of plant operations will be generated as a result of the new sampling method.

Criterion 3

The requested amendments will not involve a significant reduction in a margin of safety. No impact on any safety limits will result from the change in sample method from the degassed technique to the pressurized dilution technique. Several benefits will result from the change, including fewer opportunities for valve mispositionings to occur, as well as reduced radiation exposure to Chemistry technicians. The proposed amendment is consistent with a similar amendment approved by the NRC for McGuire Nuclear Station (Amendment Nos. 66 and 47 for McGuire Units 1 and 2, respectively).

Based upon the preceding analyses, Duke Power Company concludes that the requested amendments do not involve a significant hazards consideration.

Environmental Impact Analysis

The proposed amendments have been reviewed against the criteria of 10CFR51.22 for environmental considerations. The proposed amendments do not involve a significant hazards consideration, nor increase the types and amounts of effluents that may be released offsite, nor increase individual or cumulative occupational radiation exposures. Therefore, the proposed amendments meet the criteria given in 10CFR51.22(c)(9) for a categorical exclusion from the requirement for an Environmental Impact Statement.

ATTACHMENT 4

PROPOSED TECHNICAL SPECIFICATION AMENDMENTS FOR CATAWBA