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May 10, 1988

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

Subject: McGuire Nuclear Station
Docket Nos. 50-369, -370
Clarification of Liquid Waste
Effluent Monitoring Requirement

Gentlemen:

By letter dated June 5, 1987, the NRC issued Amendment No. 72 to the Facility Operating License NPF-9 and Amendment No. 53 to Facility Operating License NPF-17 for McGuire Nuclear Station, Units 1 and 2. The amendments consisted of changes to Technical Specifications requested by Duke Power Company letters dated March 19, 1986 as supplemented December 3, 1986 and June 4, 1987. The change added another discharge point from the Conventional Wastewater Basin into the Catawba River. This change was accomplished by deleting an existing footnote from Technical Specification Figure 5.1-4 which authorized a one-time discharge to the Catawba River on June 20, 1986. The Technical Specification change did not decrease the existing monitoring requirements (TS 3.3.3.8 and referenced TS Table 3.3-12) which assures instantaneous radioactive release rates remain within 10CFR 20, Appendix B Limits, and that radioactive effluent monitoring instrumentation remains operable or appropriate compensatory action be taken. At that time Duke also committed to maintaining a lower limit of detection (LLD) of 0.1 pCi/L or less for Cs-137.

Subsequently during a teleconference with NRC Staff on June 8, 1987 and again on October 13, 1987 it was agreed that the NRC will evaluate the methods of implementing the dose design objectives of 10CFR Part 50, Appendix I as provided by Duke. It was also concluded that the LLD value at the discharge point should be determined based on the annual continuous release bases. Duke could take into account the dilution factors available prior to the release point outfall, and that the dilution factor for the Catawba River could not be used unless a diffuser was installed in the river at an appropriate location.

It is Duke's intention by way of the attachment to this letter to demonstrate compliance with monitoring requirements and change the previously committed LLD of 0.1 pCi/L or less for Cs-137 to 5.0E-8 microCi/ml or less for Cs-137. Should you have any questions concerning this matter, please contact S.E. LeRoy at (704)373-6233.

Very truly yours,

Hal B. Tucker

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SEL/237/jgc

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Attachment

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T.L. McConnell
M.D. McIntosh
R.O. Sharpe
N.A. Rutherford
R.L. Gill
S.A. Gewehr
P.B. Nardoci
J.B. Day
MC-801.02
(14)

## ATTACHMENT

### Clarification of Liquid Waste Effluent Monitoring Requirements at McGuire Nuclear Station

Duke Power Company will take the following measurements with the sensitivity necessary to assure that concentrations are below the levels needed for compliance with the dose design objective of 10CFR Part 50 Appendix I by:

1) Increasing the sample count time to achieve an LLD of 5.0E-8 microCi/ml for Cs-137;

2) Providing the dilution flow from the Waste Water Collection Basin (WWCB) [see attached Flow Schematic], a factor of 5.5 is credited for the calculation. This factor is based on an estimated annual average flow of 282 gpm from the Conventional Waste Water Treatment (WC) system and 1556 gpm from the WWCB (i.e., 1556 gpm divided by 282 gpm = 5.5); and,

3) Controlling the total release time to a total of 4380 hours per year from the WC system. This release time control will provide a factor of 2. (i.e., 8760 hr/yr divided by 4380 hr/yr = 2.0). The total release time can be increased, if necessary, by providing further increases in dilution flow from the WWCB, (Base = 1556 gpm), and by reducing the release rate from WC System (Base = 282 gpm).

Therefore, by using the controls stated above, an LLD value of 4.5 E-9 microCi/ml for Cs-137 results at the outfall of the discharge point; thus, this value is lower than the calculated LLD of 6.5E-9 microCi/ml required to meet the 10CFR Part 50, Appendix I dose objectives.

Based on Regulatory Guide 1.109, Revision 1, October 1977, "Calculation of Annual Doses to Man From Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10CFR Part 50, Appendix I", there are four principal exposure pathways in the aquatic environment for estimating radiation exposure to man. The following pathways and calculations are described in detail in Appendix A of the previously mentioned guide:

Note: Expressions are described in detail on pages 1.109-3 and 1.109-4 of REG GUIDE 1.109, Rev 1, Oct 1977.

a. Potable Water (Equation No. 1)

$$R_{apj} = 1100 \frac{U_{ap} M_p}{F} \sum_i Q_i D_{aipj} \exp(-\lambda_i t_p) \quad ;$$

b. Aquatic Foods (Equation No. 2)

$$R_{apj} = 1100 \frac{U_{ap} M_p}{F} \sum_i Q_i B_{ip} D_{aipj} \exp(-\lambda_i t_p) \quad ;$$

c. Shoreline Deposits (Equation No. 3)

$$R_{apj} = 110{,}000 \frac{U_{ap} M_p W}{F} \sum_i Q_i T_i D_{aipj} [\exp(-\lambda_i t_p)][1 - \exp(-\lambda_i t_b)] \quad ; \text{ and,}$$

d. Irrigated foods - The Catawba River is not used for irrigation of gardens; therefore, this pathway for exposure to man is not applicable.

For a particular radionuclide, the concentration in the water at the discharge point is:

$$Ciw = 1100(QMp/F)\exp(-\lambda_i t_p)$$

REG GUIDE 1.109
Page 1.109-12

For Cs-137:
$\lambda_i = 2.636E\text{-}6\ hr^{-1}$

For McGuire:
Mp (mixing ratio) = 1

F(discharge flow $ft^3$/sec) = 1838 gpm x min/60 sec x 0.13368 $ft^3$/gal
= 4.10 $ft^3$/sec

Other factors: $t_p$ = 12 hr (potable water)
= 24 hr (fish)
= 0 hr (shoreline deposits)

Table E-15,
REG GUIDE 1.109
Page 1.109-69

Since $\exp(-\lambda_i t_p)$ approximately equals 1.0; therefore,

$$Cw = 1100 \frac{Q}{4.10} = 268.3Q \qquad \text{(Equation No. 4)}$$

The combination of equation (1) and (2) leads to the equation below:

(NOTE: Dose from shoreline deposits is negligible)

$$R_{apj} = [1100 \frac{U_{ap} M_p}{F} \sum_i Q_i D_{aipj} \exp(-\lambda_i t_p)] + [1100 \frac{U_{ap} M_p}{F} \sum_i Q_i B_{ip} D_{aipj} \exp(-\lambda_i t_p)]$$

For Cs-137:

$$R_{apj} = [1100\ (QM_p/F)\exp(-\lambda_i t_p)][U_{ap} D_{apj} + U_{ap} D_{apj}\ B_p]$$

Therefore: $R_{apj} = Cw[U_{ap} D_{apj} + U_{ap} D_{apj}\ B_p]$ (Equation No. 5)

Where: $R_{apj}$ = total annual dose, in mRem/yr;

Cw = the concentration of radionuclide, in pCi/L;

$U_{ap}$ = 21 Kg/yr - fish;

$U_{ap}$ = 730 L/yr - drinking water, TABLE E-5, page 1.109-40;

$D_{apj}$ = 7.14E-5 mRem/pCi, TABLE E-11, page 1.109-57;

$B_p$ = 2000 pCi/kg per pCi/liter, from TABLE A-1, page 1.109-13;

$$R_{apj} = Cw\ 730\ L/yr \times 7.14E\text{-}5\ mRem/pCi + 21\ kg/yr \times 7.14E\text{-}5\ mRem/pCi \times 2000\ \frac{pCi \cdot L}{kg \cdot pCi}$$

$= 3.05\ Cw$

Therefore: $R_{apj} = 3.05\ Cw$ ; and,

$R_{apj}$ = 3 mRem/yr per unit, Appendix I Design Objectives for Dose to total body from all pathways;

Therefore, $Cw = 0.98$ pCi/L

Since $Cw = 268.3\ Q$ Equation (4), then

$$Q = \frac{0.98}{268.3}\ Ci/yr = 3.65E\text{-}3\ Ci/yr$$

The LLD for the concentration in the WC system effluent WITHOUT DILUTION should be:

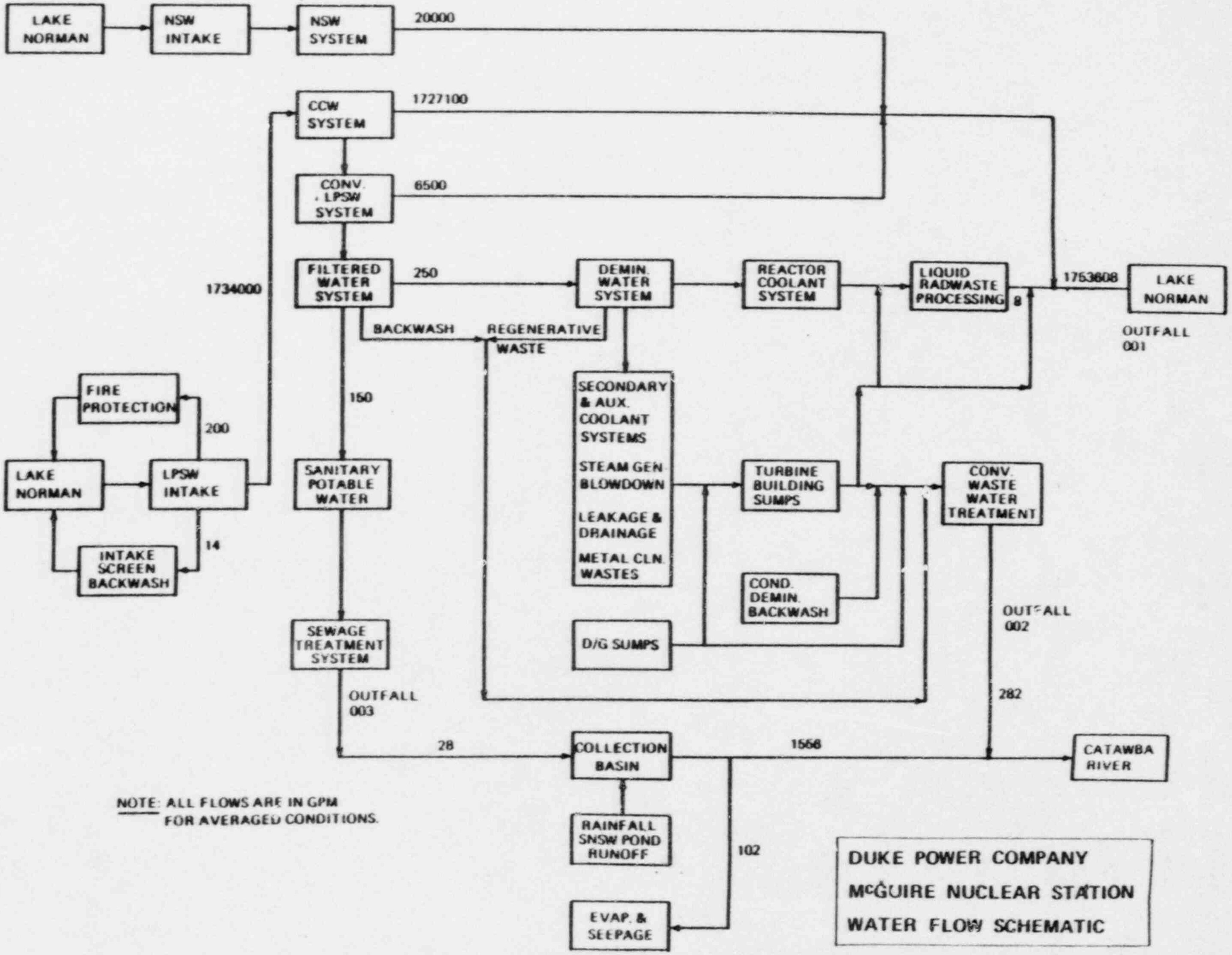
(3.65E-3 Ci/yr)(1.0E+6 microCi/Ci)(1 yr/365 d)(1 d/24 hr)(1 hr/60 min)(1 min/282 gal)(1 gal/3.7853L)(1 L/1000 mL) = 6.5E-09 microCi/ml to meet 10CFR50 criteria.

Therefore, the LLD for the WC system effluent concentration with DILUTION should be:

6.5E-09 microCi/ml x 5.5 x 2 = 7.15E - 08 microCi/ml to meet 10CFR50 criteria.

The value of 7.15E-08 microCi/ml should be considered as the minimum detectable concentration required at the discharge point into the Catawba River. Therefore, to meet 10CFR50 criteria, Duke plans to increase sample count time (see Method No. 1) to achieve an LLD of 5.0E-8 microCi/ml.

Therefore, the calculation above demonstrates that Duke will meet the dose design objective of 10CFR Part 50, Appendix I by implementing the methods discussed.


LAKE NORMAN
NSW INTAKE
NSW SYSTEM
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CCW SYSTEM
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CONV. LPSW SYSTEM
6500
FILTERED WATER SYSTEM
250
1734000
DEMIN. WATER SYSTEM
REACTOR COOLANT SYSTEM
LIQUID RADWASTE PROCESSING
8
1753808
LAKE NORMAN
OUTFALL 001
BACKWASH
REGENERATIVE WASTE
FIRE PROTECTION
200
150
LAKE NORMAN
LPSW INTAKE
14
INTAKE SCREEN BACKWASH
SANITARY POTABLE WATER
SECONDARY & AUX. COOLANT SYSTEMS
STEAM GEN BLOWDOWN
LEAKAGE & DRAINAGE
METAL CLN. WASTES
TURBINE BUILDING SUMPS
CONV. WASTE WATER TREATMENT
COND. DEMIN. BACKWASH
OUTFALL 002
D/G SUMPS
SEWAGE TREATMENT SYSTEM
OUTFALL 003
282
28
COLLECTION BASIN
1566
CATAWBA RIVER
RAINFALL SNSW POND RUNOFF
102
EVAP. & SEEPAGE
NOTE: ALL FLOWS ARE IN GPM FOR AVERAGED CONDITIONS.
DUKE POWER COMPANY
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WATER FLOW SCHEMATIC