TENNESSEE VALLEY AUTHORITY
CHATTANOOGA, TENNESSEE 37401
400 Chestnut Street Tower II

October 10, 1979

Director of Nuclear Reactor Regulation
Attention: Mr. L. S. Rubenstein, Acting Chief
Light Water Reactors Branch No. 4
Division of Project Management
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Mr. Rubenstein:

In the Matter of the Application of	)	Docket Nos. 50-327
Tennessee Valley Authority	)	50-328
		50-390
		50-391

In your August 1, 1979, letter to H. G. Parris, you requested that TVA provide a secondary water chemistry control program for the Sequoyah and Watts Bar Nuclear Plants. Enclosed are five copies of the secondary water chemistry control program for these plants. This plan reflects TVA's current understanding of the steam generator tube corrosion problem. However, the secondary water chemistry control program may be modified to reflect any future developments in the research efforts conducted by EPRI and others.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

L. M. Mills

L. M. Mills, Manager
Nuclear Regulation and Safety

Enclosure

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Tennessee Valley Authority

SECONDARY WATER CHEMISTRY PROGRAM

SEQUOYAH AND WATTS BAR NUCLEAR PLANTS

October 1979

SECONDARY WATER CHEMISTRY PROGRAM
SEQUOYAH AND WATTS BAR NUCLEAR PLANTS

Scope

The secondary water chemistry program for the Sequoyah and Watts Bar Nuclear Plants consists of the following.

1. System metal corrosion will be controlled by feeding all volatile chemicals to the secondary systems for minimizing dissolved oxygen and maintaining an alkaline pH in the feedwater to each steam generator. All volatile treatment will also be used as required for wet layup of secondary systems during periods of unit shutdown.

2. Impurity ingress into the secondary systems will be controlled by the use of condensate polishing and steam generator blowdown systems.

3. A sampling and analyses program will be established and maintained for monitoring the blowdown from each steam generator. Several concentration levels for each parameter have been established with specific unit operational action required in the event a concentration level is exceeded.

All Volatile Treatment (AVT)

1. A chemical feed system has been provided to feed both a pH control chemical and dissolved oxygen control chemical. Feed points are provided at the inlet to the condensate booster pumps and at the inlet to each steam generator. The latter feed points are provided to feed chemicals to each steam generator for wet layup chemistry control but may be used as required to maintain chemistry during power operation.

2. Laboratory analyses and continuous inline monitors located at various points in the secondary systems will be used to monitor the AVT program. While no control parameters have been established, the following analyses

of unit feedwater will be performed in order to maintain the listed specifications as close to the indicated limits as possible during power operation.

Parameter	Specification	Minimum Manual Sampling Frequency
Dissolved oxygen	5 ppb	1/72 hrs*
N_2H_4 residual	15 ppb	1/72 hrs*
pH	8.8 to 9.2	1/72 hrs*
Copper	2.0 ppb	1/week

*These parameters are also capable of being monitored by inline instrumentation.

Control of Impurity Ingress into Secondary Systems

1. The two principle modes of impurity removal from secondary systems (the condensate polishing system and the steam generator blowdown system) are capable of variable operation. The condensate polishing system may be operated at full flow from the unit hotwells, be completely bypassed, or be partially bypassed. Steam generator blowdown flow is variable. Operating conditions for each will be established as necessary to maintain steam generator blowdown chemistry during power operation and to bring the blowdown chemistry within power operation limits during startup.

2. When in service, the effluent from the condensate polishing system will also be monitored to ensure that steam generator blowdown chemistry is maintained. The primary parameters monitored are cation conductivity and differential pressure. Each parameter has the capability of being monitored by inline instrumentation.

Steam Generator Blowdown Chemistry Control

1. The steam generator blowdown chemistry should be brought within normal limits during unit startup and prior to reaching power operation, i.e., MW_t.

2. The following table specifies the steam generator blowdown chemistry parameters to be monitored, the normal operating limits, recommended action to be taken when limits are exceeded, and the frequency for laboratory analyses of each parameter.

Steam Generator Blowdown Chemistry

Parameter[1]	Specification Limits				
	Normal Operating Limit	Action Level 1	Action Level 2	Action Level 3	Manual Sampling Frequency[4]
Cation conductivity, umhos/cm	≤2.0	>2.0 ≤4.0	>4.0 <7.0	≥7.0	1/72 hrs[3]
Sodium, ppb	≤50	-	>50 <200	≥200	1/72 hrs[3]
Chloride, ppb	≤75	-	>75 <300	≥300	1/72 hrs
pH[2]	8.5-9.2	-	-	-	1/72 hrs[3]

Action Level 1. Recommended action is to identify and eliminate the problem source, set steam generator blowdown to maximum flow until specification is within limits, and to reduce power to 30% if out-of-limit condition is not corrected within 8 hours from detection of the out-of-limit condition. Full power should not be restored until the parameter is returned to within normal limits.

Action Level 2. Recommended action is immediate power reduction to 30% and steam generator blowdown set to maximum flow until specification is within normal limits. Unit brought to at least standby if out-of-limit condition is not corrected within 24 hours from detection of out-of-limit condition.

Action Level 3. Recommended action is immediate reduction in power started with the unit placed in hot standby until the out-of-limit condition is reduced to normal limits.

(1) Parameters do not include radioactivity analyses. These requirements are incorporated in each plant's technical specifications.

(2) PH is not a control parameter but is used as an indicator of potential out-of-limit condition.

(3) Cation conductivity, sodium, and pH are capable of being monitored by inline instrumentation.

(4) Laboratory analyses should be performed using procedures specified in ASTM or Standard Methods for Analysis of Water and Wastewater or by methods demonstrated to be equivalent to those listed in the above reference.

Administrative Controls

1. All data obtained from laboratory analysis of the above parameters will be recorded. This data along with the recorded printouts from the inline analytical instrumentation will be maintained in each plant's master files as prescribed by that plant's quality assurance manual.

2. The secondary water chemistry program as detailed in this document will be implemented by various plant chemical laboratory technical instructions, operating instructions, various section instruction letters, and non-technical specification surveillance instructions. These instructions will also implement the corrective actions specified by this document.

3. The power plant results or technical section supervisor is responsible for interpreting the secondary water chemistry data and recommending whether or not to continue operating the unit, reducing unit load, or placing the unit in hot standby.

4. Plant laboratory procedures incorporate instructions for laboratory personnel to provide prompt notification to their supervisor and to the shift engineer or assistant shift engineer when critical parameters are exceeded. The procedures will also include instructions for both chemical and operating personnel to attempt to identify the source of the out-of-limit condition and correct it as soon as the condition is detected and reported.

Bases

All volatile chemical treatment of secondary water systems for control of dissolved oxygen and corrosion of ferritic metals and copper alloys has been demonstrated, with proper application, to be successful in PWR plants. Chemical treatment along with proper operation of each unit's condensate polishing and steam generator blowdown systems and a comprehensive maintenance program will control the three primary sources of secondary contamination (primary to secondary steam generator tube leakage, raw water inleakage across the condenser tubes, and air inleakage into the system). A scheduled sampling and analyses program in conjunction with inline monitors will provide adequate means of detecting and correcting out-of-limit chemistry conditions. Procedures will provide instructions for the prompt notification of responsible plant personnel of out-of-limit secondary system chemistry and the steps to be taken to correct the situation. Records will be kept and maintained pertaining to secondary water chemistry to be used for evaluating past conditions in relation to possible subsequent chemical operations.

RGA:FEB
9/20/79