TOLEDO EDISON

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Docket No. 50-346

License No. NPF-3

Serial No. 874

December 22, 1982

Director of Nuclear Reactor Regulation
Attention: Mr. John F. Stolz
Operating Reactor Branch No. 4
Division of Operating Reactors
United States Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Stolz:

This is in response to your letter dated September 22, 1982 (Log No. 1089) concerning Secondary Water Chemistry Monitoring and Control. The attachment contains Toledo Edison's response to your letter for Davis-Besse Nuclear Power Station Unit No. 1.

Very truly yours,

RPC:GAB:lah
attachment

cc: DB-1 NRC Resident Inspector

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Attachment

SECONDARY WATER CHEMISTRY MONITORING PROGRAM
DAVIS-BESSE NUCLEAR POWER STATION UNIT NO. 1

I. Provide a summary of operative procedures to be used for the steam generator secondary water chemistry control and monitoring program, addressing the following:

Note: Toledo Edison received a license amendment dated October 15, 1982 concerning Secondary Water Chemistry. With the amendment was a License Condition which requires Toledo Edison to implement and maintain a program for secondary water chemistry. See below.

Add paragraph 2.C.(5) to read as follows:

Toledo Edison Company shall maintain in effect and implement a secondary water chemistry monitoring program to inhibit steam generator tube degradation. The program shall include:

(a) Identification of a sampling schedule for the critical parameters and control points for these parameters;

(b) Identification of the procedures used to quantify parameters that are critical to control points;

(c) Identification of process sampling points;

(d) Procedure for the recording and management of data;

(e) Procedures defining corrective actions for off control point chemistry conditions; and

(f) A procedure identifying the authority responsible for the interpretation of the data, and the sequence and timing of administrative events required to initiate corrective action.

1. Sampling frequency for the critical chemical and other parameters and of control points or limits for these parameters for each mode of operation: normal operation, hot startup, cold startup, hot shutdown, cold wet layup;

Response: SECONDARY WATER CONTROL POINTS AND SAMPLING FREQUENCIES

A. General

Proper feedwater conditioning, or quality, is required to maintain the operational capability of the steam generator. Good water quality minimizes fouling of the steam generator heating surfaces and subsequent loss of efficiency of the steam generator. The net result is that the frequency of "soaking" and "flushing" or chemically cleaning the steam generator is reduced.

B. Feedwater Quality for Normal Power Operations

The most representative sample point of final feedwater and the one at which all specifications must be met is the No. 6 Feedwater Heaters' Common Outlet Header. Samples of feedwater should be analyzed and must conform to NSSS minimum standards.

	Specification	Minimum Frequency
Cation Conductivity, μmho/cm, max.	0.5	Daily
Dissolved Oxygen, ppb, max.	7	Daily
Total Silica (as SiO_2), ppb, max.	20	Daily
Total Iron (as Fe), ppb, max.	10	Daily
Total Copper (as Cu), ppb	2	Monthly
pH at 77F (adjusted with ammonia)	9.2-9.6	Daily
Lead	0	Monthly
Hydrazine, ppb, min.	20	Daily

Maintaining the steam generator feedwater within the limits will control the introduction of potentially corrosive impurities into the steam generators and minimize tube degradation. This monitoring provides reasonable assurance that the chemistry conditions in the steam generators minimize the potential for tube degradation during all conditions of operation and postulated accidents, as a measure of protection of the steam generator tubing which provides part of the reactor coolant pressure boundary.

C. Condensate System

The limitations on secondary feedwater cation conductivity minimized the degradation of the steam generator tubes and the potential for steam generator tube leakage or failure due to stress corrosion. Contamination of the steam generator secondary coolant increases the potential of tube degradation and the impairment of tube integrity.

The condenser circulating water chemistry is a relatively consistent, low solids water, approximately two cycles of concentration over Lake Erie water. The main surface condenser contains tubes of Type 304 stainless steel and has a deaerating section. This fact, combined with full-flow condensate polishing, virtually nullifies any attempt to relate the chemistry of the circulating water, the demineralized makeup water, and the condensate to the steam generator feedwater quality under normal conditions. However, continuous, in-line equipment is installed at the condensate pump discharge to monitor cation conductivity, oxygen, and sodium to make possible an early detection of condenser leakage. More important to good feedwater chemistry is the operation of the condensate polishing system. Generally, the most severe contamination results from condenser inleakage of impurities that may enter the secondary side of the steam generators if breakthrough of the condensate polishing demineralizers occurs. This is a powdered resin type system. Being a powdered resin system, the potential for regeneration chemical contamination of the feedwater is eliminated. There are no resin strainers downstream of this system but the minimal quantity of resin leakage existing presents no detectable adverse effects and would not be stopped by conventional strainers anyway. Continuous monitoring of the secondary feedwater by cation conductivity is an effective means of monitoring condensate polishing demineralizer breakthrough and minimizing the introduction of contaminants to the steam generator.

D. Moisture Separator Reheater Drains

Another source of feedwater contamination is the moisture separator drains. In the original plant design, these drains are pumped forward to become feedwater at the deaerating heaters, thus bypassing the condensate polishers. In order to maintain very high steam generator feedwater quality, one-half of the moisture separator drain flow is routed to the condenser at all times for cleanup through the condensate polishers.

E. General Philosophy of Operation

The most harmful contaminants found in the secondary side are sufficiently soluble in the very low concentrations in the final feedwater that they carry over in the superheated steam, and, for the most part, do not accumulate or concentrate in the steam generators. For the very small amount of chemical contaminant "hideout" on the steam generator surfaces, we practice a procedure to remove these contaminants on each shutdown. The station procedure which contains generally all the operational chemical specifications, sample points, and sample frequencies is PP1101.04, Operational Chemical Control Limits.

OTSG Water Chemistry Specifications During Extended Operation at <15% Full Power

Analyses Required	Sample Point	Specifiation Range	Frequency of Analysis, Hrs.
Chloride, ppm	Lower tube-sheet drain line	1.0 max	Every 8
Sodium, ppm	Lower tube-sheet drain line	2.0 max	Every 8
pH at 77F	Lower tube-sheet drain line	Set By Feedwater pH	Every 8
Cation conductivity, μmho/cm	Lower Tube-sheet drain line	10.0 max	Every 8
Silica	OTSG drain line	2.0 max	Every 8

OTSG Water Chemistry Specifications During Layup

Analyses Required	Sample Point	Specifiation Range	Frequency of Analysis, Hrs.
Ammonia, ppm	OTSG recirculation line	5-20	Initially, daily until chemistry has stabilized; thereafter, weekly
Hydrazine, ppm	OTSG recirculation line	50-200	
pH at 77F	OTSG recirculation line	9.5-10.5	
Cation conductivity, μmho/cm	OTSG recirculation line	10.0 max	
Sodium, ppm	OTSG recirculation line	1.0 max.	
Chloride, ppm	OTSG recirculation line	1.0 max.	

2. Procedures used to measure the values of the critical parameters;

Response: PROCEDURES FOR QUANTIFYING CRITICAL CONTROL POINT PARAMETERS

The following Toledo Edison chemistry procedures are used to quantify the critical control point parameters for the steam generator feedwater:

CH 4078.00	pH Determination
CH 4079.00	Silica
CH 4023.00	Dissolved Oxygen (Indigo Carmine Method)
CH 4060.00	Cation Conductivity
CH 4061.00	Conductivity
CH 4072.00	Iron, Membrane Filter
CH 4071.00	Total Iron
CH 4062.00	Copper
CH 4091.00	Chloride
CH 4097.00	Hydrazine
CH 4000.00	Atomic Absorption

3. Location of process sampling points;

Response: IDENTIFICATION OF PROCESS SAMPLING POINTS

The sample point for the steam generator feedwater is at a point downstream of the highest pressure feedwater heater. At the sampling station for this point are the following continuous analyzer/recorders: sodium, hydrazine, raw conductivity, and cation conductivity. These monitors are used in addition to the grab samples to maintain a tight control on final feedwater chemistry. In addition to the final feedwater sample point, the following sample points are used to monitor and maintain strict feedwater chemistry controls throughout the cycle:

Sample Point	Monitoring Capabilities
Condensate Pump Common Discharge	Continuous sodium, oxygen, and cation conductivity analyzers/recorders
Condensate Polisher Outlet	Continuous sodium analyzer and cation conductivity analyzer/recorder
Deaerator Storage Tank Outlet	Continuous oxygen analyzer/recorder and continuous pH monitor/recorder

Steam Generator Water	Continuous raw and cation conductivity monitors/recorders
Steam Generator Steam	Continuous sodium analyzer/recorder and raw and cation conductivity monitors/recorders
Moisture Separator Drains	Continuous sodium analyzer/recorder and raw and cation conductivity monitors/recorders

4. Procedure for the recording and management of data;

Response: PROCEDURES FOR THE RECORDING AND MANAGEMENT OF DATA

Management and recording of data for the chemistry section at Davis-Besse Nuclear Power Station Unit 1 is controlled by the following Toledo Edison Procedures.

AD 1842.00	Chemistry and Health Physics
AD 1848.10	Control and disposition of records generated by the DBNPS Chemistry and Health Physics Section

5. Procedures defining corrective actions for off-control point chemistry conditions detailing time allowed at off-chemistry conditions; and

Response: PROCEDURES FOR CORRECTIVE ACTION FOR OFF CONTROL POINT CONDITIONS

Cation conductivity is a measurement that is used to monitor the general feedwater quality. It also determines the action levels in correcting feedwater chemistry upset conditions. The cation conductivity specification for normal operation is 0.5 µmho/cm maximum, but the following criteria shall be used for operating the plant during abnormal feedwater conditions:

Cation conductivity range, µmho/cm		Allowable time to correct high feedwater conductivity before shutdown is required, hrs.
Above	Below	
0.5	1.0	24
1.0	2.0	12
2.0	---	0 (initiate normal procedure for plant cooldown)

The following Toledo Edison procedures define the corrective actions required for off control point conditions.

EP 1202.23	Steam Generator Feedwater Out of Specification
EP 1202.57	Steam Generator Tube Leak
AB 1203.10	Condenser Tube Leak
AP 3034.01	Condensate Pump Discharge or Second Stage Feedwater Heater Outlet Sodium Hi
AP 3034.02	Condensate Pump Discharge or Second Stage Feedwater Heater Outlet Cation Conductivity Hi
AP 3034.03	Condensate Polishing Demineralizer Inlet Cation Conductivity Hi
AP 3034.04	Condensate Polishing Demineralizer Outlet Cation Conductivity Hi
AP 3034.05	Condensate Pump Discharge Oxygen Concentration Hi
AP 3034.06	Deaerator Storage Tank Outlet Oxygen Concentration Hi
AP 3034.07	Deaerator Storage Tank Outlet pH Hi or Lo
AP 3034.08	Feedwater Heater 1-1-6 or 1-2-6 Outlet Cation Conductivity Hi
AP 3034.09	Feedwater Heater 1-1-6 and 1-2-6 Outlets Hydrazine Hi or Lo
AP 3034.10	Steam Generator 1-1 Water Cation Conductivity Hi
AP 3034.11	Steam Generator 1-2 Water Cation Conductivity Hi
AP 3034.12	Steam Generator 1-1 Steam Sodium Hi
AP 3034.13	Steam Generator 1-1 Steam Cation Conductivity Hi
AP 3034.14	Steam Generator 1-2 Steam Sodium Hi
AP 3034.15	Steam Generator 1-2 Steam Cation Conductivity Hi
AP 3041.01	Condensate Demineralizer 1-1 Differential Pressure Hi
AP 3041.02	Condendate Demineralizer 1-2 Differential Pressure Hi
AP 3041.03	Condensate Demineralizer 1-3 Differential Pressure Hi
AP 3041.04	Condensate Demineralizer 1-4 Differential Pressure Hi
AP 3041.05	Air Failure (Condensate Demineralizer)

AP 3041.06	Condensate Demineralizer 1-1 Outlet Conductivity Hi
AP 3041.07	Condensate Demineralizer 1-2 Outlet Conductivity Hi
AP 3041.08	Condensate Demineralizer 1-3 Outlet Conductivity Hi
AP 3041.09	Condensate Demineralizer 1-4 Outlet Conductivity Hi
AP 3041.10	Power Failure (Condensate Demineralizer)
AP 3041.11	Condensate Demineralizer 1-1 Flow High/Low
AP 3041.12	Condensate Demineralizer 1-2 Flow High/Low
AP 3041.13	Condensate Demineralizer 1-3 Flow High/Low
AP 3041.14	Condensate Demineralizer 1-4 Flow High/Low
AP 3041.15	Low Level Precoat Tank

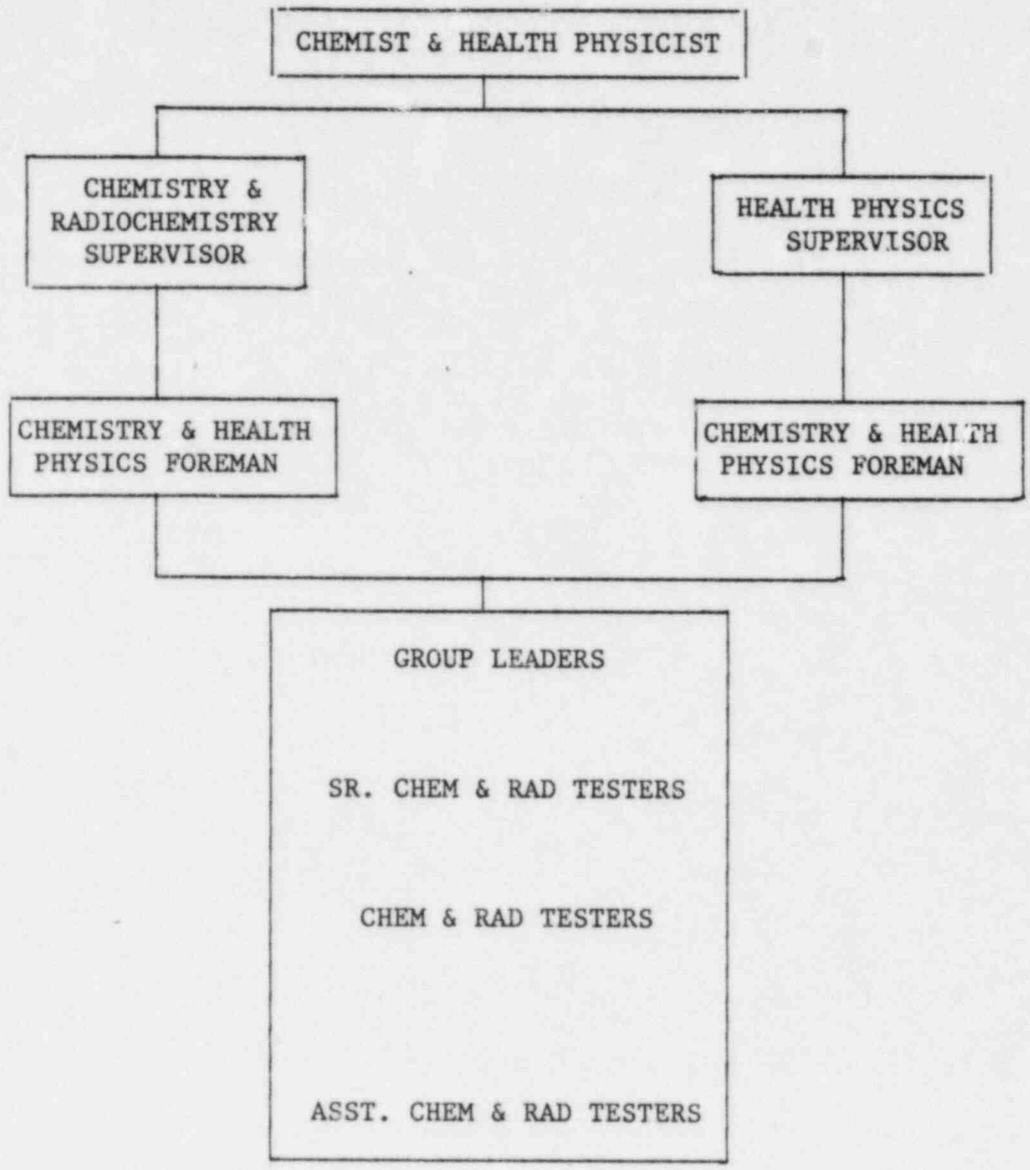
6. The procedures identifying (a) the authority responsible for the interpretation of the data and (b) the sequence and timing of administrative events required to initiate corrective action.

Response: ADMINISTRATIVE CONTROLS

The attached organizational chart shows the division of responsibility within the Chemistry and Health Physics Section at Davis-Besse Nuclear Power Station Unit No. 1. The following procedures detail the administrative actions required for initiation of corrective action for off-control point chemistry conditions.

AD 1842.00	Chemistry and Health Physics

Also, see procedures lised in Part 5 above.



DAVIS-BESSE NUCLEAR POWER STATION, UNIT No. 1
CHEMISTRY & HEALTH PHYSICS
ORGANIZATION CHART

November 8, 1982

II. Verify that the steam generator secondary water chemistry control program incorporates technical recommendations of the NSSS. Any significant deviations from NSSS recommendations should be noted and justified technically.

Response: The specifications are virtually identical to those recommended by Babcock & Wilcox the NSSS vendor.

III. In addition to the secondary water chemistry monitoring and control program, we require monitoring of the steam condensate at the effluent of the condensate pump. The monitoring of the condensate is for the purpose of detecting condenser leakage. Veriry that the steam condensate at the effluent of the condensate pump is monitored.

Response: A continuous, in-line equipment is installed at the condensate pump discharge to monitor cation conductivity, oxygen, and sodium to make an early detection of condenser leakage. A grab sample of this same point is also analyzed daily.

IV. If demineralizers are used, explain how you prevent resin breakthrough into the steam generator.

Response: There are no resin strainers downstream of this system but the minimal quantity of resin leakage existing presents no detectable adverse effects and would not be stopped by conventional strainers anyway. Continuous monitoring of the secondary feedwater by cation conductivity is an effective means of monitoring condensate polishing demineralizer breakthrough and minimizing the introduction of contaminants to the steam generator.

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