Wisconsin Electric POWER COMPANY
231 WEST MICHIGAN, MILWAUKEE, WISCONSIN 53201

March 8, 1975

Mr. Edson G. Case, Deputy Director
Directorate of Licensing
U.S. NUCLEAR REGULATORY COMMISSION
Washington, D.C. 20555

Dear Mr. Case:

DOCKET NO. 50-266
LICENSEE EVENT REPORT NO. 50-266/75-4
"B" STEAM GENERATOR TUBE FAILURE
POINT BEACH NUCLEAR PLANT

This letter is to report the details of an abnormal occurrence at the Point Beach Nuclear Plant, Unit No. 1, Facility Operating License No. DPR-24, as defined by Sections 15.1.a.C and 15.1.a.F of the Technical Specifications. This written ten-day report is filed in accordance with Section 15.6.6.A.2 of the Technical Specifications and follows a telephoned notification of the event to Mr. Dwane Boyd, Region III, Directorate of Regulatory Operations, on February 27, 1975, per Section 15.6.A.1 of the Point Beach Nuclear Plant Technical Specifications. The telephone call was followed up with a brief written report (see Appendix "C"). The event description, as described in Appendix "C", was then issued as a press release to the public at 1100 hours February 27, 1975.

It is our intention to file the total report of this event in two parts. This first report, described as the "incident report", details the immediate events as they occurred following the failure of a Unit 1 "B" steam generator tube up until the time when the unit was placed in the fully cooled shutdown condition. This report includes a preliminary analysis of the event based upon the facts available at this time.

The second report, entitled the "recovery report", will be filed as expeditiously as practicable following the return to service of the unit, and will describe the inspection

50-266
incident

2650

and repair of the steam generator, complete any analysis of the event as may be required, and describe any modifications or actions planned or taken to reduce the possibility of a repetition of the tube failure or to improve plant response in the event future failure occurs.

On February 26, 1975, at 2300 hours, Unit 1 at Point Beach was operating at full power, 485 MWe net. No operational problems of note existed at this time. A routine daily primary coolant water inventory check, completed at 2200 hours, indicated a total leakage in the reactor coolant and chemical and volume control systems of 0.086 gallons per minute, a very acceptable figure.

Commencing at 11:12 p.m., the following chronological list of events took place:

Time	Event
2312	Unit 1 air ejector discharge gas monitor R15 pegged high; then dropped low.
2313	Since on the previous shift the "A" charging pump had been isolated due to seal leakage and the auxiliary building stack monitor (R14) indicated an increase, the initial investigation was directed towards a possible leak in the auxiliary building.
	Unit 1 charging pump speed control high limit alarm came in. The Control Operator checked the running "B" charging pump controller position and then observed pressurizer level slowly dropping.
2314	The "C" charging pump was started by the Control Operator.
2314-2331	During this period, pressurizer level was falling slowly and the Control Operator was manually increasing charging pump speed accordingly. All radiation monitors were checked for assistance in locating the leak. A continuing rise on R14 still appeared to indicate a leak in the auxiliary building. Pressurizer level dropped approximately 6%.
2317	Auxiliary building exhaust stack monitor R14 alarmed.
2320	The Operator manually secured reactor coolant system letdown. Two Supervisors went to the primary auxiliary building to assist in locating the suspected leak.
2331	"A" charging pump was unisolated and placed in service.

2331-2336 The Control Operator increased the third charging pump speed to maximum. The volume control tank commenced a gradual reduction in level.

2336 An Operating Supervisor detected, after a detailed examination, a small perturbation in the "B" steam generator feed flow. The leak rate at this time was estimated to be 125 gallons per minute.

2337 The Duty and Call Superintendent was informed of plant conditions.

2338 A portable monitor, utilized to check activity at the air ejector discharge in-line filter located approximately two feet from R15, showed a 1 R/hr field and a similar check at "B" blowdown sample cooler showed 50 mr/hr.

2340 The conclusion was made by the operating staff on duty that the leak was primary-to-secondary into the "B" steam generator. Blowdown on both steam generators was secured remotely at the control board by the Control Operator.

2342 Telephone calls were made to the Power Systems Supervisor, the Operations Superintendent, and the Health Physicist. The unit was placed on a ramp from 500 MWe to 150 MWe at a rate of 5%/minute.

2344 Steam generator blowdown sample monitor, R19, alarmed and closed sample line isolation valves as the Supervisor was manipulating the sample line valves.

2359 The reactor was tripped manually by the operator at 25% power level. No activation of atmospheric dump or safety valves was required.

February 27, 1975

0000 Closed "B" main steam stop valve.

The Operations Superintendent arrived on site.

Auxiliary Operators were dispatched to take radiation surveys of the turbine building.

0002 "B" main feed pump, a condensate pump, and heater drain pumps were secured.

0003 Commenced reducing primary system pressure and started cooldown using "A" steam generator condenser steam dump.

0006 Blocked safety injection at 1790 psig.

0007 Sampling program commenced by Health Physics (see attached Appendix "A").

0010 Secured all feed to "B" steam generator.

Operations Superintendent informed the Manager-Nuclear Power Division by telephone of plant conditions.

0012 Commenced taking charging pump suction directly from the refueling water storage tank.

0013 Ran "A" and "B" safety injection pumps briefly and periodically as required during cooldown to maintain adequate pressurizer level.

0018 Isolated safety injection accumulators at 1240 psig primary system pressure.

Secured "B" reactor coolant pump.

0025 Secured "A" charging pump.

0030 Wind direction checked as steady at 10 mph from west.

0031 Secured "C" charging pump.

0049 Restarted "C" charging pump.

0050 Restarted "B" reactor coolant pump to assist cooling of "B" steam generator.

0052 Restarted "A" charging pump.

0100 Summary of Conditions: Reactor coolant system pressure was 1000 psig at 430° F; "A" steam generator pressure was 300 psig, and "B" steam generator pressure was 920 psig.

Operators changed the valve lineup of the air ejector drains to direct its condensate to the retention pond rather than to the atmospheric blowoff tank and the service water system.

0101 "A" main feed pump secured.

0113 Auxiliary building exhaust stack monitor R14 reset.

0114 R14 alarmed again.

0116 R14 reset.

0122-
0142 "B" steam generator main steam stop three inch bypass valve opened to bleed steam to condenser and prevent any possibility of residual heat in steam generator metal from causing further rise in steam generator pressure and activation of safety valves.

0135 Secured "B" charging pump.

0205 Air ejector discharge monitor, R15, unsaturated.

0217 Commenced residual heat removal operation.

0301 Restarted "B" charging pump.

0450 R15 monitor reset.

0515 "B" main steam line spring-loaded pipe hangers blocked to prevent possible pipe or structural damage in the unlikely event of the steam generator filling to the main steam stop valve.

0600 NRC Resident Inspector informed of the incident by the Manager-Nuclear Power Division.

0615 Executive Vice President informed of the incident by the Manager-Nuclear Power Division.

0635 Reactor coolant system at better than minimum cold shutdown condition; primary system pressure at 320 psig; primary system temperature at 182° F; 1235 ppm boron.

The "immediate action" with respect to safe equipment shutdown required by this event is considered to have been completed at this time.

0830 Available data telephone to Milwaukee headquarters office.

0900 Executive officers of Wisconsin Electric met to review incident. News media requested to meet with Company officials.

1100 News conference held and all available information provided to public.

As indicated in the chronology, a sampling program was commenced at 1207 hours, February 27, as per Appendix "A". Additionally, a collection of environmental data was conducted on February 28, 1975, as per the attached Appendix "B".

An on-site investigation of the event was conducted by the Resident NRC Inspector, Mr. D. Boyd, on February 27, 1975, and continued February 28, 1975, with the assistance of Mr. M. Schumacher, a health physics specialist, also of Region III.

Two Manager's Supervisory Staff Meetings were held on February 27, 1975 to review events and determine further immediate courses of action. A further meeting was held on March 3, 1975, when all operating personnel involved in the initial stages of the event met to review the event and present a critique on any particular problems encountered during the course of the incident.

The group examined the decision made to ramp the unit down at 5% per minute followed by a manual trip at 25% power, rather than tripping it from 100% power.

Two factors influenced this decision:

1. A reactor trip from 100% power would invariably activate the atmospheric steam dump valves off the main steam line. Ramping prevented this and thus kept releases to as low as practicable.

2. Primary-to-secondary leakage had been closely estimated at 125 gallons per minute and the charging pumps had demonstrated their ability to maintain pressurizer level with this leakage present. By ramping down at an acceptable and controllable rate, safety injection was avoided and no activation of safeguards equipment was required.

The group also reviewed the very early stage of the incident at which time various plant in-line radiation monitors appear, at this point in the investigation, not to have provided their complete accident design functions during the event; the subject monitors being (1) R15, the air ejector monitor, (2) R14, the auxiliary building exhaust stack monitor, and (3) R19, the steam generator blowdown sample monitor.

Operating personnel pointed out that the initial indications suggested a possible leak in the primary auxiliary building, i.e., the R14 monitor reading was rising, the R15 "spike" had not endured and the instrument indicated low; R19 did not indicate a radioactive discharge via the steam generator blowdown lines. Seal leakage at the "A" charging pump, which is located in the auxiliary building, had caused this pump to be manually isolated earlier in the shift and this added the possibility that the leakage had become extended in some manner.

Finding no primary auxiliary building chemical and volume control system leaks, the component cooling system levels normal, and receiving no containment sump "A" alarms; operating supervision shifted their suspicion to primary-to-secondary leakage. By portable instrument monitoring, it was established at about 1138 hours that the air ejector filter at R15 had a contact reading of about 1 R/hr and the "B" blowdown sample cooler had a contact reading of 50 mr/hr. These two local readings thus proved the remote readings in the control room to be erroneous. At 1140 hours the Duty Shift Supervisor concluded that a primary-to-secondary

leak existed in the "B" steam generator and directed that a complete shutdown of the unit begin.

Follow-up investigations of the performance of the monitors in question have determined the following:

1. The charcoal filter near R15 (air ejector discharge monitor) absorbed and held up xenon, thus creating a very strong source. "Shine" effect from the filter spiked R15 momentarily causing an alarm, and then R15 went downscale when the monitor saturated. This response was not expected for this monitor equipment. One continuous recorder trace and one multi-point recorder were recording at the time. The saturation of this monitor clouded the evidence that primary-to-secondary leakage had occurred.

2. The R14 monitor (primary auxiliary building discharge stack) began a trend upward shortly after 2312 hours, and was interpreted to indicate a leak in the primary auxiliary building such as in the chemical and volume control system. However, it has been concluded that R14 response was mostly due to "shine" from two other sources rather than the primary auxiliary building radioactivity.

   The R14 monitor is located at approximately the 50-foot level in the east side of the auxiliary building exhaust stack. It appears probable that the first upward movement of this monitor was caused by "shine" from the "B" steam generator main steam line which is located approximately 30 to 35 feet away or the main steam safety valve header only 20 feet away. The elevator structure would provide little shielding effect. (The response of the R11 containment particulate monitor located in a small room below the steam line is probably attributable to the same source also.)

   The response of R14 could be expected to be further affected when the radioactive air ejector gases began to enter the stack some 20 feet above the R14 probe, since the air ejector discharge pipe passes within approximately 12 feet of the probe.

3. R19, the blowdown monitor (combined reading of "A" and B steam generator blowdown) located outside the sampling room would not be expected to alarm for some time following the R15 alarm because of primary-to-secondary liquid mixing, and blowdown and pipe and tubing transport time. However, this alarm and valve trip function appears not to have responded fast enough and had not responded before manual shutoff was effected on the steam generator blowdown at 2340 hours. The Supervisor who investigated the monitor equipment between 2340 and 2344 hours believes there was little or no flow through the "B" steam

generator meter. He manipulated the flow adjusting valves which caused flow increase and which apparently caused automatic closure of the sample line valve. The R19 monitor also appears to have saturated after an upward spike. The multi-point recorder and printout does not show enough detail for accurate establishment of response.

A test of this monitor will be made for high radioactivity response and saturation, although based upon the overall existing circuit design, isolation should be effected before saturation occurs.

The review by the Supervisory Staff indicates that the R19 monitoring should be improved since three parallel paths exist in the sample blowdown stream, and the use or adjusting of one can affect the response time and flow in another. Further, the control of the radiation monitoring aspect is presently not clearly defined as being either under the Chemistry and Health Physics Group or the Operations Group jurisdiction.

(After the meeting, the Manager convened a task group of the Radiochemical Engineer, a Shift Supervisor, the Operations Superintendent, and himself to investigate the blowdown piping arrangement and monitoring configuration. The task group concluded the piping arrangement should be improved, and the Operations Superintendent was requested to prepare a modification request. At the time of the task group inspection, Unit 2 blowdowns were properly flowing to the radiation monitor.)

The above-noted monitor experiences will be further investigated and modification requests generated to improve functioning in the accident mode without reducing normal operating mode sensitivity.

All other process and built-in instrumentation and control such as level, pressure, flow, and other radiation monitors performed as would be expected.

This initial and preliminary review also generated a number of suggestions regarding procedural changes. They are as follows:

1. A step will be added to the requisite procedure to stipulate that main steam line blocks be installed, if possible, following a tube failure event. In this incident, operating personnel took this prudent action without a written procedural step.

2. A step should be added to the requisite procedure to advise the operator to arrange for split condensate storage tank operation if, in the course of normal operation, this is not already being done. Here again, the experienced operating staff took this action without a written procedural step and, thus, prevented cross-contamination of the secondary equipment of the unaffected unit.

3. A note should be added to the requisite procedure to advise the operator to avoid using the steam-driven auxiliary feedwater pump as the pump is a potential source of unmonitored radioactivity release via the exhausting steam. In this incident, the "steamer" was used and the steam supply from the "A" steam generator had radioactivity on a gross level at about 10^{-6} µCi/ml. This activity will form part of the total unscheduled discharge made as a result of this event.

4. As the existing emergency procedures describing the action required to be taken in the event of a steam generator tube break conservatively allow for considerably greater leakage, safety injection, activation of safeguards equipment, and initiation of the site emergency plan, the less dramatic events actually experienced suggest a review may be required of the procedure as presently written.

During and following this event, considerable effort has been expended in determining the quantity and activity levels of radioactive liquids, gases, and particulate released to and contained by plant systems or released to atmosphere. This effort continues, but is expected to take several days more to complete. In the interim, the following gross and conservative calculations have been made:

RELEASE VIA AIR EJECTOR DRAIN TO CIRCULATING WATER

Isotope	MPC	Diluted Concentration	% MPC	Total, Ci
Xe-133	3×10^{-6}	1.93×10^{-8}	0.6	1.30×10^{-3}
Xe-133m	3×10^{-6}	4.45×10^{-10}	< 0.1	3.00×10^{-5}
Xe-135	3×10^{-6}	8.46×10^{-9}	0.3	5.70×10^{-4}
Kr-85m	*	5.88×10^{-10}	---	3.96×10^{-5}
Kr-87	*	8.73×10^{-11}	---	5.88×10^{-6}
Kr-88	3×10^{-6}	6.68×10^{-10}	< 0.1	4.50×10^{-5}
I-131	3×10^{-7}	4.03×10^{-11}	< 0.1	2.72×10^{-6}

RELEASE VIA AIR EJECTOR DRAIN
TO CIRCULATING WATER
(continued)

Isotope	MPC	Diluted Concentration	% MPC	Total, Ci
I-132	8×10^{-6}	7.44×10^{-11}	< 0.1	5.01×10^{-6}
I-133	1×10^{-6}	1.07×10^{-10}	< 0.1	7.23×10^{-6}
I-135	4×10^{-6}	9.33×10^{-11}	< 0.1	6.28×10^{-6}
Cs-138	*	8.68×10^{-9}	---	5.85×10^{-4}
Rb-88	*	2.29×10^{-7}	---	1.54×10^{-2}
		Total Air Ejector Drain		1.79×10^{-2} Ci

*Half-lives are less than two hours. 10 CFR 20 does not give MPC for isotopes dissolved in water.

BLOWDOWN RELEASE TO LAKE MICHIGAN (MAXIMUM)

Isotope	MPC	Diluted Concentration	% MPC	Total, Ci
Xe-133	3×10^{-6}	2.23×10^{-8}	0.7	4.14×10^{-4}
Xe-135	3×10^{-6}	8.20×10^{-8}	2.9	1.52×10^{-3}
I-131	3×10^{-7}	4.86×10^{-8}	16.2	9.00×10^{-4}
I-133	1×10^{-6}	2.23×10^{-7}	22.3	4.14×10^{-3}
I-132	8×10^{-6}	8.43×10^{-8}	1.1	1.56×10^{-3}
I-135	4×10^{-6}	2.18×10^{-7}	5.4	4.04×10^{-3}
Tritium	3×10^{-3}	2.39×10^{-8}	< 0.1	4.43×10^{-4}
		Total Blowdown		1.30×10^{-2} Ci
		Total Liquid Release		3.09×10^{-2} Ci

The above calculations are based upon maximum discharge concentration released to Lake Michigan. Final calculations will take credit for dilution effect of steam generator volume. These values assume maximum blowdown concentration at start of incident and continuing until blowdown was secured.

Airborne gaseous release pathways are as follows:

1. Air ejector release to atmosphere via auxiliary building vent.

2. Steam generator blowdown tank vent release to atmosphere via auxiliary building vent.

3. Secondary steam leaks release to atmosphere via turbine building roof vents.

4. Atmospheric blowoff tank vent release to atmosphere via vent to turbine building roof.

5. Condensate storage tank "A" vent release to atmosphere via turbine building roof vents.

For simplicity, the conservative assumption was made that all noble gas releases occurred by complete degassing during the period from the start of the incident until the "B" main steam stop valve closed, and during the period of release of the "B" steam generator steam space to reduce pressure.

AIRBORNE RELEASES - CURIES

Airborne releases occurring from the start of the incident until closing of the main steam stop valve (48 minutes) were as follows:

Isotope	Air Ejector Release	Blowdown Tank Vent Release	Total Release	Xe-133 Equivalent
Ar-41	1.39	.05	1.44	10.8
Kr-85m	12.9	.47	13.4	40.2
Kr-87	8.56	.31	8.87	133
Kr-88	17.1	.62	17.8	267
Xe-133	190	6.88	197	197
Xe-133m	2.35	.09	2.44	2.44
Xe-135	65.2	2.36	67.5	202
Xe-135m	9.60	.35	9.95	99.5
Xe-138	14.3	.52	14.8	148
I-131	8.92×10^{-6}	1.47×10^{-5}	2.38×10^{-5}	7.14×10^{-4}
I-132	4.42×10^{-5}	7.35×10^{-5}	1.19×10^{-4}	1.19×10^{-3}
I-133	4.38×10^{-5}	7.29×10^{-5}	1.18×10^{-4}	5.06×10^{-3}
I-134	1.03×10^{-4}	1.70×10^{-4}	2.75×10^{-4}	8.25×10^{-4}
I-135	7.33×10^{-5}	1.21×10^{-4}	1.96×10^{-4}	5.88×10^{-3}
			Total	1100 Ci

Average Xe-133 Equivalent Release Rate = 0.38 Ci/sec for the 48-minute period until "B" main steam stop valve closed.

Airborne releases resulting from release of the "B" steam generator steam space to the condenser after the "B" main steam line isolation (20 minutes) were as follows:

AIRBORNE RELEASES - CURIES

Isotope	Total Release	Xe-133 Equivalent Release
Ar-41	2.26	17.0
Kr-85m	21.1	63.3
Kr-87	14.0	210
Kr-88	28.2	423
Xe-133	309	309
Xe-133m	3.83	3.83
Xe-135	106	318
Xe-135m	18.4	184
Xe-138	23.3	233
I-131	3.21×10^{-6}	9.63×10^{-5}
I-132	1.58×10^{-5}	1.58×10^{-4}
I-133	1.58×10^{-5}	6.78×10^{-4}
I-134	3.48×10^{-5}	1.04×10^{-4}
I-135	2.79×10^{-5}	8.37×10^{-4}
	Total	1761 Ci

Average Xe-133 Equivalent Release Rate during the 20-minute period of venting the "B" steam generator = 1.47 Ci/sec.

Airborne releases resulting from cooldown of the unit (370 minutes) until 0635 on 2-27-75 were as follows:

AIRBORNE RELEASES - MICROCURIES

Isotope	Air Ejection Discharge	Gland Seal Exhaust	Steam-Driven Auxiliary Feed Pump	Total	Xe-133 Equivalent
I-131	.03	1.51	2.53	4.07	1.22×10^{-4}
I-132	.14	7.52	12.7	20.4	2.04×10^{-4}
I-133	.18	7.43	15.6	23.2	9.95×10^{-4}
I-134	ND	17.4	ND	17.4	5.22×10^{-5}
I-135	.23	12.4	20.4	33.0	9.90×10^{-4}
				Total	2.36×10^{-3}

Average Xe-133 Equivalent release rate during the 370-minute period = 1.06×10^{-7} Ci/sec.

These initial calculations appear to indicate that from the time of the commencement of the incident until the "B" main steam stop valve was closed, and later, during the depressurizing of the "B" steam generator to the condenser via the 3" main steam stop valve bypass valve, the maximum permitted 15-minute discharge of 2.0 Ci/second (Xe-133 equivalent) was not exceeded at any time.

Considerable calculational work remains to be completed in this area. However, it is our belief at this time that refinement of the above data will result in lower figures than this initial conservative approach presently indicates.

Very truly yours,

Sol Burstein

Executive Vice President

Sol Burstein

Copy to Mr. J. G. Keppler, Regional Director - Region III

APPENDIX "A"

CHEMISTRY AND HEALTH PHYSICS SAMPLES TAKEN IMMEDIATELY FOLLOWING THE INCIDENT

NOTE: ALL SAMPLING WAS PERFORMED ON FEBRUARY 27, 1975

Time	Sample	
0007	"B" steam generator blowdown)	SAMPLES TAKEN BY OPERATIONS GROUP
0008	"A" steam generator blowdown)	
0015	"B" steam generator blowdown)	
0016	"A" steam generator blowdown)	
0030	"B" steam generator blowdown)	
0033	"A" steam generator blowdown)	
0104	Site boundary control center (air particulate, iodine and gas)	
0115	Turbine building 46' level (air particulate, iodine)	
0123	Turbine building 26' level (air particulate, iodine, gas)	
0127	South gatehouse (air particulate, iodine, gas)	
0155	Condensate pump discharge (liquid)	
0159	Health Physics station (air particulate, iodine)	
0221	Turbine building 46' level - control room (air particulate, iodine, gas)	
0230	Steam generator blowdown filter outlet (liquid)	
0242	Pumphouse (air particulate, iodine)	
0300	Neutralizing tank (liquid)	
0302	Turbine building 26' level (air particulate)	
0500	Unit 1 facade sump	

APPENDIX "B"

CHEMISTRY AND HEALTH PHYSICS ENVIRONMENTAL SAMPLING PROGRAM

February 27, 1975, P.M.

The environmental air particulate sample was briefly removed from the meteorological tower, located to the south of the plant site on the afternoon of February 27, 1975. The sample was counted on the Point Beach counter and it indicated less than minimum detectable activity. The sample was then returned to the meteorological tower location for recollecting on February 28, 1975, along with the samples listed below:

February 28, 1975, A.M.

1. The stray radiation chambers were removed from the meteorological tower, southwest boundary, west boundary, and north boundary exclusion area sample sites.

   The samples were counted and showed no significant exposure.

2. Lake Michigan water samples were taken from the south of the plant site at the meteorological tower and north of the plant site at the Two Creeks County Park.

3. Snow samples were taken from the south, west and north site boundaries.

4. Environmental air particulate samples were removed from the meteorological tower, southwest boundary, west boundary, and north boundary exclusion area sample sites.

5. Environmental TLD's were removed from the meteorological tower, southwest boundary, west boundary and north boundary exclusion area sample sites.

Item Nos. 2 through 5 have been sent to Eberline Instrument Corporation, Midwest Facility, in West Chicago, Illinois for processing.