UNITED STATES DEPARTMENT OF JUSTICE

WASHINGTON, D.C. 20530

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March 13, 1981

Mr. James Cummings
Director
Office of Inspector and Auditor
Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Cummings:

I am writing in regard to the ongoing investigation of possible criminal activity at the Three Mile Island Nuclear power station. As you of course recall, your office referred this case to the Criminal Division in April 1980, after conducting your own investigations into certain allegations by former Control Room Operator Harold Hartman. When you referred the case, you sent to us transcripts of several statements made by Mr. Hartman, as well as summaries of interviews with several other CRO's. In addition, of course, you provided us with a variety of test records, logs, and other material essential to understanding the case.

Attorneys from this Section, in cooperation with the United States Attorney for the Middle District of Pennsylvania, began a grand jury investigation during the second week of May 1980. The investigation is continuing. At the time we went before the grand jury, we were led to believe that the NRC had provided us with all the statements pertaining to this matter which had been given to NRC investigators by Metropolitan Edison employees. Many of the decisions about how the investigation should proceed were based on the assumption that we were cognizant of all relevant statements in the possession of the NRC.

Attachment 17

It is with considerable surprise, and not a little dismay, therefore, that we now find the NRC took eighteen statements from Met Ed employees of which we were not informed until a few weeks ago. In early February 1981, Mr. Frank Bowman, an attorney with this Section, called Mr. John Sinclair to verify certain facts which were to be included in an affidavit to be presented to the U. S. District Court in Harrisburg, Pennsylvania. One of these facts was the number of Met Ed employees who had been interviewed by the NRC regarding the Hartman allegations. After doing some checking (apparently including a call to Mr. R. Keith Christopher, an investigator in Region I), Mr. Sinclair reported that in addition to the statements already in our possession, NRC investigators had conducted fourteen "screening type interviews" with TMI CRO's and shift foremen, plus four in-depth taped interviews with Mr. Jim Floyd, Mr. Kenneth Hoyt, Mr. Bernie Smith, and Mr. Brian Mehler, all supervisory personnel at TMI. All eighteen men are potential witnesses or targets of the grand jury investigation. Mr. Sinclair quickly provided us transcripts of the four taped interviews and copies of notes on the results of the fourteen "screening type interviews." However, the fact remains that these potentially crucial statements did not reach us until ten months after the start of grand jury proceedings.

It is too early to tell whether our lack of awareness of the additional eighteen statements will have any adverse effect on the outcome of the Three Mile Island investigation. Certainly, had we proceeded to trial and not supplied the defendants with pretrial statements of government witnesses which would have been (unbeknownst to the Department of Justice) in the Government's possession, we would have risked reversal of any conviction. Regardless of the result in this particular case, however, we cannot stress too strongly that omissions of this kind are extremely grave and every effort should be made to avoid a similar future incident. If the Criminal Division is to do a competent and professional job of representing the Nuclear Regulatory Commission in those criminal matters you refer to us, we must be in possession of all relevant information in the NRC's control.

Very truly yours,

LAWRENCE LIPPE, Chief
General Litigation and
Legal Advice Section
Criminal Division

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

Denton
Eisenhut
Rehm
Murley

NOV 7 1983

MEMORANDUM FOR: William J. Dircks
Executive Director for Operations

FROM: Richard C. DeYoung, Director
Office of Inspection and Enforcement

SUBJECT: EXAMINATION OF REACTOR COOLANT SYSTEM LEAK RATE TESTING AT RANCHO SECO AND DAVIS-BESSE

Your memorandum of September 20, 1983 directed the Office of Inspection and Enforcement to review the reactor coolant system (RCS) leak rate test procedures and calculational methods in use in 1978 at two B&W plants. Any significant deficiencies were to be identified and compared to the previously identified deficiencies in the TMI procedures and calculational methods.

Rancho Seco and Davis-Besse were selected at random for the review. Records and procedures relating to primary coolant leak rate tests for a one-month period of stable operation in 1978 were examined. The objectives were to establish whether these plants could adequately determine the leak rates to within the applicable limits and whether the problems previously identified at TMI were unique to TMI or were common to other B&W plants. Independent calculations were performed with the NRC-developed leak rate computer program to assess measured leakage and evaluate methods.

The details of our evaluation are presented in Enclosure 1. Our conclusions, based on this evaluation are that the deficiencies identified in the Davis-Besse and Rancho Seco plants are relatively minor and resulted in only small errors in the calculation of RCS leak rate. There were no inadequacies in the Rancho Seco and Davis-Besse procedures sufficient to provide a motivation for operator falsification of the leak rate test records, as apparently was the case at TMI. No evidence of any falsification of records was identified at either Rancho Seco or Davis-Besse.

Your memorandum also requested that IE provide a summary of the RCS measurement program initiated by IE after the accident at TMI-2. This is provided in Enclosure 2. The results of the trial use of the program by the regional inspectors have not disclosed any indications of falsification of the test results by licensees. However, these inspections were not specifically structured to uncover falsification of data. A number of minor errors and inaccuracies of the type identified at Rancho Seco and Davis-Besse have been identified. In one case,

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because of rounding of input data, the calculations were not sufficiently accurate to provide reliable information on unidentified leakage. Deficiencies at operating plants uncovered during the trial use period have been corrected.

RC DeYoung

Richard C. DeYoung, Director
Office of Inspection and Enforcement

Enclosures: As stated

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Enclosure 1

EXAMINATION OF REACTOR COOLANT SYSTEM LEAK RATE TESTING AT RANCHO SECO AND DAVIS-BESSE

The performance of the primary coolant leak rate tests at Rancho Seco and Davis-Besse during the period shortly prior to the TMI accident was examined. The objective of the examination was to determine if the leak rate test problems previously identified at TMI were unique to TMI or if they were common to other B&W plants. The two plants were chosen at random from among the B&W plants in operation prior to 1979. The reactor coolant system (RCS) leak rate test procedures and calculational methods used during that period were reviewed to find out if they could adequately determine the leak rates to within the applicable limits. The surveillance test records during a one-month period of stable power operation in 1978 were selected for review for each plant. Those deficiencies that were identified were compared to deficiencies previously identified at TMI. The licensee calculations were reviewed. Independent calculations were performed with the NRC-developed leak rate computer program. These results agreed closely with the licensee's calculations.

1. Purpose and Description of Leak Rate Test Procedure

The reactor coolant system inventory balance procedure is designed to measure the RCS leakage. It is a surveillance procedure that is required by the Technical Specifications of essentially all nuclear power plants. The applicable limits for PWR plants are typically zero for throughwall leakage in vessels or piping, 10 gpm for identified leakage from seals and valves, and 1 gpm for unidentified leakage. The required frequency of testing is at least once every 72 hours. Since the unidentified leakage can be converted to identified leakage at any time by locating and quantifying its source, the 1 gpm limit can be considered to be the allowable tolerance limit for the entire surveillance test procedure. This limit is used in judging the significance of the combined errors and inaccuracies of the procedures evaluated below. The procedure involves determining an RCS water inventory at the beginning and at the end of a test interval. The net change in the inventory is the end of a test interval. The net change in the inventory is then used to determine the gross leak rate. The inventory should account for water mass changes due to level changes in the pressurizer and makeup tank (volume control tank). It should account for density changes in the RCS and pressurizer (both water and steam space) from changes in temperature and pressure. It should also account for any RCS water addition or removal made during the test interval. The identified leakage is determined by measuring the level changes in RCS leakage collection tanks such as the pressurizer relief tank (also called the quench tank or reactor coolant drain tank). Any other RCS allowable leakage that can be quantified is included in the identified leakage. The unidentified leakage is then determined by subtracting identified from gross leakage.

2. Omissions and Errors in the TMI Procedure

The TMI leak rate test computer program which was used before the accident for all of the leak rate calculations had at least six significant errors. Some were large enough to practically ensure that an unacceptable unidentified leak rate would be calculated even if there were no actual unidentified leakage. These are summarized in Tables 1 and 2 and detailed in the following paragraphs.

a. Omissions at TMI

The TMI procedure neglected the effect of pressure changes on the reactor coolant system as well as temperature changes in the pressurizer. These two items have opposing effects, tending to cancel each other. The resulting error is only 4 lb/psi and has little effect at most plants. However, because of a feedwater control problem, TMI was experiencing large pressure variations during much of the time. These averaged about 20 psi, resulting in an error of 80 lb per test. TMI used a reactor coolant weight of 5.84 lb/gal in calculating its leak rates, resulting in an average error (from neglecting pressure) of about 0.2-gpm per test. As is discussed below, this was not very significant compared with other errors in the TMI procedure.

b. Errors in Calculations at TMI

Inconsistent densities were used to convert mass of water to gallons of leakage. The gross leakage from the RCS was determined by summing the mass changes (calculated in pounds) in the various primary spaces and multiplying by a gallons-per-pound factor, based on the water density at RCS temperatures (5.86 lb/gal at 582°F). The identified leakage, however, was derived from the leakage collection tank level change converted to gallons by use of a table in the computer. The calibration for this level measurement was based on cold water density (8.29 lb/gal at 70°F). Since the unidentified leakage is defined as the difference between gross and identified leakage, this inconsistency leads to an erroneous increase in the unidentified leak rate of about 40% of the identified leak rate. Before March 16, 1979 (when hand-calculated corrections for this item were begun) the identified leak rate was averaging 3 gpm. This resulted in the calculation of an unidentified leak rate which was too large be 1 2 gpm.

There was a similar failure to correct the volume of water added by the operators to the RCS for expansion to reactor density. This omission results in an erroneous decrease in the unidentified leak rate of the same magnitude. During March 1979, 15 water additions, averaging 250 gallons each, were made during leak rate tests, resulting in an error of 1.7 gpm. The majority of these additions were made after March 16, 1979, when the hand-calculated corrections for the first item were begun. However, no corrections for the density of the water additions were made.

The tables in the program used to convert temperature to density terminate at 582°F. When the RCS temperature exceeds this value, the density corresponding to 582°F is selected. Twenty-two of the tests reviewed had temperatures above 582°F and resulting errors averaging 0.2 gpm.

An incorrect RCS volume was used in the calculation of the mass change in the RCS. The computer used a value of 10,673 ft^3 whereas the SAR gave a value of 10,346 ft^3. For the average temperature variation of 0.2°F, this caused an error of 0.013 gpm.

The table in the computer memory used to convert reactor coolant drain tank (RCDT) levels to gallons of water differed from the equivalent table used by the operators in the control room. As an example, for an RCDT level of 76 in., the table in the computer memory gave a value of 6,605 gallons, whereas, the value used in the hand calculation was 6,411 gallons. The average drain tank change was 2 in. causing an error of 0.14 gpm.

3. Evaluation of Davis-Besse

The evaluation of Davis-Besse included a review of the procedures in existence during 1979, an evaluation of the leak rate calculations performed by the licensee during that period of time, and the performance of independent calculations using the NRC computer program.

a. Davis-Besse Procedures

The Davis-Besse procedures were reviewed to determine to what extent they accounted for those items necessary to make an accurate water inventory determination. The results are summarized in Table 1. The procedures accounted for level changes in the pressurizer and makeup tank. It also accounted for density changes in both the RCS and the pressurizer due to temperature variation. Adding or removing water during the test was prohibited. As discussed in the following paragraphs, three items needed for accurate leak rate determinations were omitted from the Davis-Besse procedure. None of these proved to be very significant under the usual conditions of the test.

The Davis-Besse procedure omitted the correction for the effect of pressure on the RCS causing an error of about 10 lb/psi. However, the average pressure variation recorded on the surveillance test sheets was only 0.3 psi. Also, Davis-Besse used a relatively long test interval averaging two hours. The resulting error on the average test was a negligible 0.003 gpm.

The Davis-Besse procedure also neglected the mass change in the pressurizer steam space which occurs with pressurizer level change. Steam has a significant density of 6 lb/ft^3 at operating pressure. The

steam volume changes by 3.17 ft^3 per inch of level change. The average level change was 1.4 in. resulting in an error of about 27 lb or 0.03 gpm for a two-hour test.

Davis-Besse did not use the pressurizer relief tank (PRT) level changes in calculating its identified leakage. The main component of Davis-Besse's identified leakage is pump seal leakoff, which was not collected in the PRT but went to the sump (where it mixed with non-reactor-coolant water). This identified leakage was measured manually at each reactor shutdown and used unchanged in the leak rate calculation until the next shutdown. This is conservative with respect to the unidentified leak rate, since the seal leakoff tends to increase, but it does introduce some error in the calculation. The average increase in the seal leakoff measurement, following a shutdown, was 0.15 gpm. Assuming that the seal leakoff increased linearly, the average error caused by this practice would have been 0.075 gpm.

b. Davis-Besse Leak Rate Calculations

The calculations used with the Davis-Besse procedure were reviewed to determine if correct values and methodology were used. The results are shown in Table 2. The calculations at Davis-Besse were normally done by a computer after the test parameters had been entered manually by the operators. The exact version of the computer program used at Davis-Besse in 1978 could not be obtained. However, manual calculation sheets were provided by the procedure. Also, the computer printout of the test results provided water mass quantities for each of the items included in the inventory, so it could be shown that the computer provided exactly the same results as the manual calculation.

The Davis-Besse procedure calculated all inventory quantities in pounds and summed the results before making the conversion to gallons, so there was no problem in comparing the different quantities. The ASME steam table values were used to derive the density of pressurizer water. The makeup tank and the pressurizer level changes were correctly accounted for. Appropriate values were used in converting net mass changes to leak rates. No significant inaccuracies were found in the Davis-Besse calculations.

c. Calculation of Davis-Besse Leak Rates Using the NRC Program

A one-month period of stable power operation at Davis-Besse was selected and copies were made of the surveillance test records for the entire month. The surveillance test input values were used to run leak rate test calculations using the NRC Computer Program (described in NUREG-0986). These calculations were made for the entire month. The results are shown in Table 3. These results are compared with the results calculated by the Davis-Besse procedure in Table 4. These two sets of results agree quite well. In only 2 cases out of the 29 results calculated did the results differ by more than 0.2 gpm. The average difference in the two sets of results was about 0.1 gpm.

4. Evaluation of Rancho Seco

Like the evaluation of Davis-Besse, the Rancho Seco evaluation included a review of the licensee's procedures and calculations during 1978 and independent calculations using the NRC Computer Program.

a. Rancho Seco Procedures

Rancho Seco actually used two procedures, a complete test done weekly and an abbreviated test done daily. The daily procedure required that the more comprehensive test be run immediately if the daily test produced an unacceptable result. As shown in Table 1, both of these procedures accounted for level changes in the pressurizer and makeup tank. In both cases adding or removing water during the test was prohibited. The weekly test accounted for density changes in both the RCS and the pressurizer because of temperature variation. However, neither of the procedures included corrections for RCS pressure. None of the items omitted in these procedures had a very significant effect on leak rate test results. Each is reviewed briefly in the following sections.

(1) Rancho Seco Comprehensive Test

The only omission in this test was the lack of a pressure correction for the reactor coolant system density. The effect of compression on the water mass content of the reactor coolant system is slightly less than 10 lb/psi for the 10578 ft^3 RCS at operating pressure. The average pressure variation recorded on the surveillance tests reviewed (discussed below) was about 3 psi, resulting in an error of 29 lb. This caused an error of about 0.06 gpm in the average one-hour test result.

(2) Rancho Seco Daily Test Procedure

The abbreviated Rancho Seco test omits pressurizer temperature as well as pressure corrections. The lack of pressure correction causes the same 29-lb error in RCS water inventory. However, any pressure rise is caused by an increase in pressurizer temperature, which is accompanied by a pressurizer water expansion that results in a loss of 6 lb/psi. This is 18 lb for the average 3-psi pressure rise. The result is that the omission of a pressure correction only has a 0.02 gpm effect on the average test when pressurizer temperature is also neglected.

The daily test also omitted the effect of temperature on the RCS density. This causes a larger error of 808 lb/°F. The average temperature change recorded on the daily tests was 0.2°F causing an error of 162 lb and 0.3 gpm on a one-hour test.

b. Rancho Seco Leak Rate Calculations

The calculations used with the Rancho Seco procedures were also reviewed. The results are shown in Table 2. The calculations at Rancho Seco were all done manually. The comprehensive procedure calculated all inventory quantities in pounds and summed the results before making the conversion to gallons. The simplified procedure did carry the various quantities in gallons, but appropriate corrections were made to the high temperature RCS quantities to account for the reduced density. The ASME steam table values were used to derive the density of pressurizer water. In both of the procedures the makeup tank and the pressurizer level changes were correctly accounted for. Appropriate values were used in converting the net mass changes to leak rates. Two small inaccuracies were identified in the Rancho Seco tests.

One of the deficiencies identified was the use of a constant value of 666.7 lb/°F to correct for RCS temperature changes. The calculation using the specific volume equations for compressed water from the ASME steam tables gives a value of 808 lb/°F. The resulting error of 141 lb/°F combined with the average temperature variation of 0.2°F resulted in an average deviation of 28 lb or 0.06 gpm per test.

The other deficiency was the use of a 33.3 gal/in. value to account for changes in the PRT level in the Rancho Seco daily test. The value used with the comprehensive test, as well as the currently accepted value is 33.8 gal/in. The 0.5-gallon error combined with the average PRT level change of 2.6 in. resulted in an estimated error of 0.02 gpm.

c. Calculation of Rancho Seco Leak Rates Using the NRC Program

The surveillance test input data for a one-month period of stable power operation at Rancho Seco was also used to run leak rate test calculations using the NRC Computer Program. The results are shown in Table 5 for the daily tests and Table 6 for the weekly tests. These results are compared with the results calculated by the Rancho Seco procedure in Tables 7 and 8. The two sets of results for the weekly test differ by an average of only 0.01 gpm. The two sets for the daily test also agree quite well in most cases. However, in 5 cases out of the 31 daily results calculated, the results differed by more than 0.3 gpm. These were all cases in which there was a relatively large temperature change recorded between the beginning and end of the test. The inaccuracy was due to the omission of an RCS temperature correction by this procedure. The reviewer was able to include the temperatures in the NRC calculations because these were included on the test sheets "for information only." In two cases the temperature variation was about 1°F., resulting in an unidentified leak rate which exceeded the one gpm limit. Since the temperatures were not normally used in the calculation, it is possible that the operators may not always have recorded them with sufficient accuracy for this purpose. However, the two sets for the daily test still agree to within an average of about 0.2 gpm.

5. Conclusions

The Rancho Seco and Davis-Besse RCS leak rate test procedures and calculational methods used in 1978 were sufficiently comprehensive and accurate to determine the leak rates to within the applicable limits. The omissions and inaccuracies in the Rancho Seco weekly test and Davis-Besse test resulted in estimated average errors of less than 0.1 gpm. The estimated average error in the Rancho Seco daily test was about 0.3 gpm. These estimates were confirmed by the results of the NRC computer calculations which used the same input data as the licensees used. The errors identified in these procedures are at least on an order of magnitude less than the errors previously identified in the TMI procedures. There were no inadequacies in the Rancho Seco and Davis-Besse procedures sufficient to provide a motivation for the operator to falsify the leak rate test records, as apparently was the case at TMI. No evidence of any falsification of records was identified at either Rancho Seco or Davis-Besse.

Enclosure 2

PROGRAM FOR INDEPENDENT MEASUREMENT OF RCS LEAK RATES BY NRC INSPECTORS

Following the IE investigation of the alleged leak rate test falsification at TMI in March 1980, a program was written to calculate reactor coolant system (RCS) inventory balances using the Hewlett Packard 41C programmable calculator. The adequacy of this program was verified by conducting leak rate test calculations at the Farley and Calvert Cliffs stations in July and August 1980. On the basis of this work, it was concluded that the expected errors for the licensee's calculations were 1.9 gpm for TMI 2, 2.3 gpm for Farley 1, and 0.1 gpm for Calvert Cliffs 1 and 2. The Resident Inspector stated that the licensee subsequently took corrective action for Farley 1.

In March 1981 a Temporary Inspection module (TI2512/48) was issued for the independent calculation and verification of RCS leak rates by NRC inspectors using the Hewlett Packard 41C program. All PWRs in Region III were found to have gross leak rates of less than 1 gpm and there was acceptable agreement between the licensee's and the inspector's calculations. The program was also applied to the PWRs in Region V and no adverse results were reported.

In 1982 an expanded program was written for the Osborne portable computer in order to expand the capabilities of the calculations, facilitate data entry, and simplify storage of the plant-specific parameters. Osborne computers were procured for both IE and the regional offices in early 1983. Regional inspectors were trained in the use of this program in April 1983. This program was subsequently documented in NUREG-0986 and is currently available for the NRC independent measurements program.

A permanent inspection module for the IE manual has been written, providing for regular (an annual frequency has been proposed) NRC verification of the adequacy of the licensees' RCS leak rate test procedures. This module is presently being processed by the Division of Quality Assurance, Safeguards and Inspection Programs.

At this time, there has been no documented feedback on the use of this program by the Regional Inspectors.

TABLE 1
CHANGES ACCOUNTED FOR BY PROCEDURES

	IMI		Davis-Besse		Rancho Seco (Weekly)		Rancho Seco (Daily)	
·ameter	Included	Avg. Error (gpm)	Included	Avg.Error (gpm)	Included	Avg. Error (gpm)	Included	Avg. Error (gpm)
; density - temperature	yes	--	yes	--	yes	--	no	0.30
; density - pressure*	no	0.60	no	0.003	no	0.06	no	0.06
:ssurizer water density*	no	-0.40	yes	--	yes	--	no	-0.04
:ssurizer steam volume	yes	--	no	0.03	yes	--	yes	--
:ssurizer level	yes	--	yes	--	yes	--	yes	--
‹eup tank level	yes	--	yes	--	yes	--	yes	--
lief tank level	yes	--	no	0.075	yes	--	yes	--
ter addition or loss	yes	--	prohibited	--	prohibited	--	prohibited	--

hese two items tend to cancel each other because RCS pressure increase is caused by a
ressurizer temperature rise resulting in reduced pressurizer density.

TABLE 2
CORRECTNESS OF VALUES USED IN LEAK RATE CALCULATIONS

	IMI		Davis-Besse		Rancho Seco (Weekly)		Rancho Seco (Daily)	
ameter	Correct	Avg. Error (gpm)	Correct	Avg.Error (gpm)	Correct	Avg. Error (gpm)	Correct	Avg.Error (gpm)
volume	no	0.013	yes	--	yes	--	yes	--
density	no	0.14*	yes	--	no	0.06	no	0.06
ssurizer water density	yes	--	yes	--	yes	--	no	-0.04
ssurizer steam density	yes	--	yes	--	yes	--	yes	--
ssurizer volume vs level	yes	--	yes	--	yes	--	yes	--
eup tank mass vs level	yes	--	yes	--	yes	--	yes	--
eup tank density	yes	--	yes	--	yes	--	yes	--
ief tank mass vs level drain tank)	no	0.14	yes	--	yes	--	no	0.02
ief tank density	no	1.2	yes	--	yes	--	yes	--
sity of water added r lost	no	1.7	N/A	prohibited	N/A	prohibited	N/A	prohibited
version of mass to allons	yes	5.86**	yes	8.25**	yes	8.33**	yes	8.33**

bove 582°F.

.b/gal.

TABLE 3

REACTOR COOLANT SYSTEM LEAK RATES
Davis Besse Unit 1

DATE JR(Hr)	RCS PRESS (psig) START END	AVG TEMP (F) START END	PZR LEVEL (in) START END	MUT LEVEL (in) START END	PRT LEVEL (in)	LEAK RATES (- - - gpm - - -) GROSS	IDENT	UNIDENT
8/30/78	2215	582.2	203.5	68.66	0			
1	2210	582.1	201.1	68.3	0	0.55	0.29	0.26
8/31/78	2210	581.6	206.3	73.8	0			
1	2208	581.6	206.1	72.21	0	0.88	0.37	0.51
9/1/78	2211	581.7	210.7	70.83	0			
1.05	2207	581.7	211	68.59	0	1.09	0.37	0.72
9/2/78	2207	581.4	208.8	68.26	0			
3.28	2213	581.6	210.3	63.71	0	0.71	0.37	0.34
9/3/78	2215	582.1	212.2	74.65	0			
4.433	2211	582.1	211.7	68.79	0	0.72	0.37	0.35
9/4/78	2215	581.7	210.8	71.84	0			
1.666	2215	581.7	211.8	69.09	0	0.66	0.37	0.29
9/5/78	2208	581.4	207.6	72.74	0			
2.967	2211	581.5	209.6	68.19	0	0.71	0.37	0.34
9/6/78	2239	581.9	211.6	72.68	0			
4.45	2218	582	210.3	66.62	0	0.84	0.37	0.47
9/7/78	2215	581.6	206.5	70.62	0			
1.4	2211	581.6	209.5	68.68	0	0.31	0.37	-0.06
9/8/78	2219	582	211.3	65.34	0			
1.233	2210	581.5	208.8	63.66	0	0.54	0.37	0.17
9/9/78	2219	581.7	206.2	61.69	0			
1.617	2218	582	209.8	59.36	0	0.60	0.37	0.23
9/12/78	2216	580.9	201.6	70.9	0			
1.367	2219	581.1	202.6	68.56	0	0.96	0.37	0.59
9/13/78	2215	581.1	202	78.17	0			
1.9	2211	580.8	202.1	74.4	0	0.79	0.37	0.42
9/14/78	2219	580.9	203.4	78.25	0			
1	2211	580.7	201.4	77.26	0	0.67	0.37	0.30
9/15/78	2210	580.7	208.7	69.45	0			
1	2216	581.3	211.1	68.03	0	1.15	0.37	0.78
9/16/78	2213	581.2	210.9	69.41	0			

REACTOR COOLANT SYSTEM LEAK RATES
Davis Besse Unit 1

DATE / HR(Hr)	RCS PRESS (psig) START / END	AVG TEMP (F) START / END	PZR LEVEL (in) START / END	MUT LEVEL (in) START / END	PRT LEVEL (in)	LEAK RATES (- - - gpm - - -) GROSS	IDENT	UNIDENT
9/17/78	2211	581.1	209.4	59.21	0			
1	2213	581.2	209.3	57.88	0	0.86	0.37	0.49
9/18/78	2218	581.4	211.9	61.44	0			
1.067	2215	581.6	214.3	58.54	0	1.28	0.37	0.91
9/18/78	2219	581.3	211.3	74.87	0			
1.033	2210	581.3	210.9	72.93	0	1.12	0.37	0.75
9/19/78	2211	581.7	216.4	70.27	0			
1.017	2225	581.5	215.9	69.02	0	0.35	0.37	-0.02
9/20/78	2216	581.2	211.4	67	0			
4	2221	581.6	213.7	60.79	0	0.84	0.37	0.47
9/20/78	2218	581	211.6	65.02	0			
2.017	2216	581.2	210.1	63.07	0	0.81	0.37	0.44
9/21/78	2211	581.4	209.6	71.73	0			
3.733	2215	581.9	213.5	64.91	0	0.95	0.37	0.58
9/22/78	2218	581.3	210	66.77	0			
4	2219	581.9	212.2	58.83	0	1.16	0.37	0.79
9/23/78	2215	581.6	210.8	65.66	0			
2	2215	581.9	211.9	61.77	0	1.14	0.37	0.77
9/24/78	2210	581.5	211.2	79.7	0			
4	2216	581.6	211	71.23	0	1.14	0.37	0.77
9/25/78	2219	581.9	212.4	80.73	0			
1.367	2219	581.7	213.1	78.25	0	0.62	0.37	0.25
9/26/78	2211	581.3	211.3	66.05	0			
4	2219	581.6	211.8	59.64	0	0.91	0.37	0.54
9/29/78	2208	532.7	154	76.1	0			
4	2208	532.6	154	68	0	1.03	0.52	0.51

TABLE 4

COMPARISON OF UNIDENTIFIED LEAK RATE TEST RESULTS
CALCULATED BY NRC COMPUTER AND BY DAVIS-BESSE

Date	Duration (Hr)	Leak Rate (gpm) NRC	Leak Rate (gpm) Davis-Besse
8/30/78	1	0.26	0.30
8/31/78	1	0.51	0.515
9/1/78	1.05	0.72	0.126
9/2/78	3.28	0.34	0.359
9/3/78	4.433	0.35	0.33
9/4/78	1.866	0.29	0.26
9/5/78	2.967	0.34	0.32
9/6/78	4.45	0.47	0.37
9/7/78	1.4	-0.06	0.17
9/8/78	1.233	0.17	0.0
9/9/78	1.617	0.23	0.12
9/12/78	1.367	0.59	0.60
9/13/78	1.9	0.42	0.37
9/14/78	1	0.30	0.191
9/15/78	1	0.78	0.85
9/16/78	1	0.60	0.71
9/17/78	1	0.49	0.32
9/18/78	1.067	0.91	0.755
9/18/78	1.033	0.75	0.566
9/19/78	1.017	0.28	0.39
9/20/78	4	0.47	0.472
9/20/78	2.017	0.44	0.437
9/21/78	3.733	0.58	0.55
9/22/78	4	0.79	0.77
9/23/78	2	0.77	0.75
9/24/78	4	0.77	0.80
9/25/78	1.367	0.25	0.13
9/26/78	4	0.54	0.454
9/29/78	4	0.51	0.497

TABLE 5

REACTOR COOLANT SYSTEM LEAK RATES
Rancho Seco Unit 1 (Daily Test)

DATE HR(Hr)	RCS PRESS (psig) START END	AVG TEMP (F) START END	PZR LEVEL (in) START END	MUT LEVEL (in) START END	PRT LEVEL (in)	LEAK RATES (- - - gpm - - -) GROSS	IDENT	UNIDENT
8/1/78	2186	582.1	180	80.9	39.9			
1	2187	582.1	180.9	77.8	42.3	1.40	1.34	0.05
8/2/78	2205	582	180	77.9	24.2			
1.05	2208	582	180	73.4	26.9	2.17	1.44	0.73
8/3/78	2184	582	180	83	49.4			
1.467	2184	582	180	76.4	54	2.30	1.76	0.55
8/4/78	2207	582	182.2	79.7	40.5			
1	2205	581.6	182.7	74.7	43.8	1.82	1.85	-0.03
8/5/78	2187	582.2	180.7	69.9	33.9			
1.033	2187	582.2	180.6	66.1	36.8	1.90	1.57	0.33
8/6/78	2196	581.2	182	72.1	42.4			
1	2201	581.2	182	69.3	45.3	1.40	1.62	-0.22
8/7/78	2207	581.7	180.8	79.3	48.4			
1	2204	582.7	181	75.2	51.7	3.71	1.85	1.86
8/8/78	2178	582.3	178.7	77.2	53.1			
1	2181	582.4	179.8	72.8	56.1	2.17	1.68	0.49
8/9/78	2187	581.8	180.2	78.8	35.8			
1	2187	581.8	180.5	75.2	38.6	1.78	1.57	0.22
8/10/78	2221	582	182	86.1	24.5			
1	2205	582.9	182.4	82.6	26.4	3.29	1.06	2.22
8/11/78	2201	582.7	180.9	79.5	55.2			
1	2181	582.6	179.2	76	57.5	2.12	1.29	0.83
8/12/78	2208	583.3	181.2	90.6	47.5			
1	2205	583.3	181.4	86.9	50.2	1.88	1.51	0.37

TABLE 5 (Continued)

REACTOR COOLANT SYSTEM LEAK RATES
Rancho Seco Unit 1 (Daily Test)

ATE R(Hr)	RCS PRESS (psig) START END	AVG TEMP (F) START END	PZR LEVEL (in) START END	MUT LEVEL (in) START END	PRT LEVEL (in)	LEAK RATES (- - - gpm - - -) GROSS	IDENT	UNIDENT
/13/78	2181	583.3	181	86	26.8			
1	2202	583.2	181.4	82.1	29.1	1.59	1.29	0.30
/14/78	2181	582.4	180.4	80.9	29.7			
1.017	2181	582.6	180.3	78.6	32.3	1.50	1.43	0.07
/15/78	2207	583.1	181.6	81.1	49.4			
1	2201	583.1	181.2	78	51.8	1.71	1.34	0.37
/16/78	2207	582.5	179.2	73.9	32.1			
1	2207	582.7	179	71.4	34.3	1.65	1.23	0.41
/17/78	2207	583.1	181.8	77.9	27.6			
1	2208	583.1	182.1	74.9	30	1.47	1.34	0.12
/18/78	2180	582.7	181.5	77.4	36.9			
1	2180	582.6	180.6	74.5	39.4	1.50	1.40	0.10
/19/78	2202	583.1	182.7	77.4	41			
1	2202	582.9	182.7	73.4	43.5	1.72	1.40	0.32
/20/78	2181	582.5	181.5	80.8	43.5			
1	2181	582.7	180.8	77.6	46.5	2.11	1.68	0.43
/21/78	2202	583.2	183	80.6	39			
1	2205	583.1	182.8	76.7	41.5	1.85	1.40	0.45
/22/78	2207	582.4	182.2	74.3	38.4			
1	2181	582.3	181.1	70.5	40.8	2.19	1.34	0.85
/23/78	2201	582.1	182.6	80.8	30.4			
1	2199	582.1	182.1	77.8	32.9	1.65	1.40	0.25

REACTOR COOLANT SYSTEM LEAK RATES
Rancho Seco Unit 1 (Daily Test)

DATE JR(Hr)	RCS PRESS (psig) START END	AVG TEMP (F) START END	PZR LEVEL (in) START END	MUT LEVEL (in) START END	PRT LEVEL (in)	LEAK RATES (- - - gpm - - -) GROSS	IDENT	UNIDENT
8/24/78	2167	581.8	182.1	82.8	31			
1	2169	582	182.4	80.1	33.5	1.64	1.40	0.24
8/25/78	2178	582.4	180.4	76.4	31			
1	2180	582.4	179.1	74.5	33	1.22	1.12	0.10
8/26/78	2178	582.2	182	84	32.7			
1.333	2178	582.2	181.6	80.3	35.5	1.48	1.18	0.30
8/27/78	2195	582.7	182.1	71.1	37.9			
1	2199	582.6	182.7	67.4	40.2	1.58	1.29	0.29
8/28/78	2193	582.4	182.3	73.5	27			
1	2192	582.4	182.2	70.3	29.5	1.67	1.40	0.27
8/29/78	2204	582.1	183.3	80.3	33.7			
1	2205	582.1	183.9	77	36.2	1.56	1.40	0.16
8/30/78	2199	582.3	183	75.1	48.1			
1	2199	582.2	183.3	72	50.5	1.37	1.34	0.02
8/31/78	2199	581.9	183.2	80.8	34.2			
1	2201	581.6	183.5	76.8	36.4	1.49	1.23	0.26

TABLE 6

REACTOR COOLANT SYSTEM LEAK RATES
Rancho Seco Unit 1 (Weekly Test)

DATE / HOUR (Hr)	RCS PRESS (psig) START / END	AVG TEMP (F) START / END	PZR LEVEL (in) START / END	MUT LEVEL (in) START / END	PRT LEVEL (in)	LEAK RATES (- - - gpm - - -) GROSS	IDENT	UNIDENT
8/9/78	2199	582.3	180.5	77.7	26.5			
1.017	2204	582.1	181.3	73.9	29.3	1.40	1.54*	-0.14*
8/18/78	2198	582.8	181	84.1	31.8			
1	2192	582.6	181.4	80.3	34	1.59	1.23*	0.35*
8/23/78	2207	582.6	183.4	75.8	47.5			
1	2207	582.1	182.9	71.7	49.9	1.38	1.34*	0.04*
8/31/78	2183	582	182.9	82.9	45.1			
1	2181	582.1	182.1	79.5	47.5	2.08	1.34*	0.73*

* Does not include 0.5 gpm correction for evaporative losses. This value was identified during hot functional testing and routinely added to the identified leakage calculated in the weekly procedure.

TABLE 7

COMPARISON OF UNIDENTIFIED LEAK RATE TEST RESULTS
CALCULATED BY NRC COMPUTER AND BY THE RANCHO SECO DAILY PROCEDURE

Date	Duration (Hr)	Leak Rate (gpm) NRC	Leak Rate (gpm) Rancho Seco	Date	Duration (Hr)	Leak Rate (gpm) NRC	Leak Rate (gpm) Rancho Seco
8/1/78	1	0.05	0.03	8/17/78	1	0.12	0.12
8/2/78	1.05	0.73	0.77	8/18/78	1	0.10	0.36
8/3/78	1.467	0.55	0.56	8/19/78	1	0.32	0.64
8/4/78	1	-0.03	0.60	8/20/78	1	0.43	0.61
8/5/78	1.033	0.33	0.34	8/21/78	1	0.45	0.49
8/6/78	1	-0.22	-0.14	8/22/78	1	0.85	0.87
8/7/78	1	1.86	0.21	8/23/78	1	0.25	0.26
8/8/78	1	0.49	0.32	8/24/78	1	0.24	0.08
8/9/78	1	0.22	0.21	8/25/78	1	0.10	0.17
8/10/78	1	2.22	0.64	8/26/78	1.333	0.30	0.34
8/11/78	1	0.83	0.90	8/27/78	1	0.29	0.49
8/12/78	1	0.37	0.34	8/28/78	1	0.27	0.27
8/13/78	1	0.30	0.62	8/29/78	1	0.16	0.15
8/14/78	1.017	0.07	0.23	8/30/78	1	0.02	0.18
8/15/78	1	0.37	0.34	8/31/78	1	0.26	0.35
8/16/78	1	0.41	0.16				

TABLE 8

COMPARISON OF UNIDENTIFIED LEAK RATE TEST RESULTS
CALCULATED BY NRC COMPUTER AND BY THE RANCHO SECO WEEKLY PROCEDURE

Date Duration(Hr)	Leak Rate (GPM) NRC	 Rancho Seco
8/9/78 1.017	-.64	-.65
8/18/78 1	-.15	-.20
8/23/78 1	-.46	-.46
8/31/78 1	.23	.24