SCE&G
A SCANA Company

South Carolina Electric & Gas Company
P.O. Box 88
Jenkinsville, SC 29065
(803) 345-4040

O. S. Bradham
Vice President
Nuclear Operations

10CFR50.36

February 28, 1990

90 MAR 6 A12:26

Mr. S. D. Ebneter
Regional Administrator
U. S. Nuclear Regulatory Commission
Region II, Suite 2900
101 Marietta Street, N. W.
Atlanta, Georgia 30323

Subject: Virgil C. Summer Nuclear Station
Docket No. 50/395
Operating License No. NPF-12
Annual Operating Report

Dear Mr. Ebneter:

Attached is the 1989 Annual Operating Report for the South Carolina Electric & Gas Company Virgil C. Summer Nuclear Station Unit No. 1. This report is being submitted in accordance with Technical Specifications 6.9.1.4, 6.9.1.5, and Regulatory Guide 1.16.

If there are any questions, please call at your convenience.

Very truly yours,

O. S. Bradham

ARR/OSB:lcd
Attachment

c: D. A. Nauman/O. W. Dixon, Jr./T. C. Nichols, Jr.
E. C. Roberts
R. V. Tanner
General Managers
J. J. Hayes, Jr.
L. A. Blue
W. R. Baehr
C. A. Price
R. B. Clary
J. R. Proper
K. E. Nodland
J. C. Snelson
R. L. Prevatte
J. B. Knotts, Jr.
NPCF
NSRC
RTS (ANN 2800)
File (818.02-10)

111
IE01

1989

ANNUAL OPERATING REPORT

VIRGIL C. SUMMER NUCLEAR STATION

PREFACE

The 1989 Annual Operating Report for the Virgil C. Summer Nuclear Station is hereby submitted in accordance with Technical Specifications 6.9.1.4, 6.9.1.5, and Regulatory Guide 1.16 under Docket Number 50/395 and Facility Operating License NPF-12.

TABLE OF CONTENTS

1.0 INTRODUCTION

The Virgil C. Summer Nuclear Station (VCSNS) utilizes a pressurized water reactor rated at 2775 MWt. The unit produces a maximum dependable capacity of 885 MWe net of electrical power. The plant is located approximately 26 miles northwest of Columbia, South Carolina.

2.0 HIGHLIGHTS

For the reporting period of January 1 through December 31, 1989 the plant operated at a capacity factor of 69.8% (using maximum dependable capacity) and a unit availability of 80.8%. The reactor was critical for a total of 7,276.2 hours, the generator remained on-line for a total of 7076.8 hours, and the total gross electrical energy generated for 1989 was 5,714,880 MWh.

3.0 SCHEDULED OR FORCED POWER REDUCTION SUMMARIES

During the 1989 report period, the plant experienced two scheduled and fifteen forced power reductions of greater than 20% of design power which exceeded four hours in duration. Included in these power reductions are five (three automatic and two manual) outages initiated by reactor trips.

1. At the beginning of January 1989, the plant was at approximately 50% power and was continuing with power ascension from the fourth refueling outage. On January 4, 1989, at 1035 hours, power was decreased from 75% to 40% because the secondary water chemistry was out of specification. Cation conductivity exceeded 7.0 umho/cm in all three steam generators. This condition was caused by resin intrusion from the condensate polishing system via a broken check valve in the hold pump discharge line. The check valve was repaired and the plant remained at reduced power during secondary side cleanup using the condensate polishing system and maximum blowdown. All secondary water chemistry action levels were cleared at 2100 hours on January 5. The forced power reduction was 34.4 hours in duration. Power ascension was resumed and 100% power for Cycle 5 was achieved on January 11, 1989.

2. At 1610 hours on January 29, 1989, a problem was experienced with the "A" Reactor Coolant Pump lower oil reservoir level. Reactor power was reduced to approximately 40% to allow entry into the Reactor Building. It was determined that the oil level was slightly high and approximately 1.5 gallons of oil was drained from the 25 gallon reservoir. The change in level was attributed to increasing ambient temperature and possible overfill of the reservoir during the fourth refueling outage. As part of the corrective action for this occurrence, a procedure for adding/draining oil was issued and the high/low alarm settings were modified. At 2130 hours, power was increased. The forced reduction in power lasted 5.3 hours.

3. On February 14, 1989, at 2312 hours, a manual plant shutdown was initiated to clean up secondary water chemistry after an inadvertent resin release. On February 15 at 0200 hours, the plant was taken off-line. The cause of the resin intrusion was a system misalignment (Valve XVD-6186 was inadvertently left open after maintenance) in the Nuclear Blowdown Demineralizer System which allowed the main condenser vacuum to be aligned to the Blowdown Demineralizer. This allowed the resin to bypass filters and be injected into the condenser.

   A decision was made to attempt system cleanup in hot standby using the Steam Generator Blowdown System. When it appeared that chemistry was returning to normal limits on February 19, the reactor was taken critical at 1145 and the generator was placed on-line at 1605 hours. The duration of the forced shutdown was 110.1 hours. The plant operated at reduced power levels (less than 50%) to continue secondary chemistry cleanup until March 10. (See item 4 for corrective actions and reports made for this event.)

4. On March 10, 1989, at 1005 hours, a controlled manual shutdown was initiated. The generator was taken off line at 1125 hours to allow for secondary water chemistry cleanup which could not be accomplished at power.

   Corrective actions included a modification to place strainers in the inlet headers to the demineralizers. Also, procedural changes were made to the locked valve tracking program and the tagout program. In addition, a task force was formed to identify similar configurations susceptible to resin intrusion. Equipment cleanup included replacing filters, steam generator sludge lancing and secondary system flushing.

   Information on this event was provided in SCE&G's April 5, 1989, response to NRC Inspection Report 89-03 and in a March 22 meeting with the NRC (reference the March 28, 1989, letter to the Document Control Desk). On March 29 at 2255 hours, the reactor was taken critical. The generator was placed on-line at 1732 hours on March 30, 1989. The duration of the forced shutdown was 486.1 hours.

5. On March 30, 1989, at 1819 hours, the turbine tripped on indicated high moisture separator/reheater (MSR) level. Initial investigation indicated that the trip was generated by an MSR high level signal but no MSR high level alarms had annunciated. As a result of conflicting indications and plant data, the trip was attributed to erroneously generated signals. The suspect MSR level switches were recalibrated and the unit was placed on-line at 1047 hours on March 31, 1989. The duration of the forced shutdown was 16.5 hours. This event is covered in LER 89-06 which reported a similar occurrence (April 1, 1989).

6. With the plant operating at 30% power for continued chemistry cleanup, another turbine trip on high MSR level occurred at 0445 hours on April 1. At 0519 hours, a reactor trip occurred due to lo-lo steam generator level.

   The cause of this event was various secondary equipment malfunctions. Detailed investigation revealed that the turbine trip was caused by actual high MSR level resulting from a malfunction of the MSR drain tank level controller and switch. The resultant lo-lo steam generator level reactor trip was caused by a Feedwater Isolation Valve (FWIV) signal. The FWIV signal resulted from an indicated but not actual low feedwater flow signal generated by a faulty flow transmitter coincident with low feedwater temperature. Corrective action included repair/replacement/recalibration of improperly functioning MSR components and the feedwater flow transmitter. In addition, verification of adequate preventive maintenance for these components was made. Also, a plant procedure was revised to require initiation of detailed investigations of secondary plant trips. The reactor was taken critical at 0415 hours on April 4, 1989, and the plant was placed on-line at 1600 hours. The duration of the forced outage was 82.7 hours and the event was reported in LER 89-06. Plant power was slowly increased to 100% (achieved April 11 at 1940 hours) to allow for continued chemistry cleanup.

7. At 0252 hours on May 28, 1989, a manual reactor trip was initiated following the failure of Pressurizer Safety Valve XVS-8010-C. The valve became unseated causing a rapid depressurization of the Reactor Coolant System. The manual trip was initiated at approximately 2000 psig and the safety valve reseated prior to reaching the Safety Injection setpoint of 1850 psig. The Reactor Coolant System pressure was stabilized at approximately 2000 psig.

   The reason for the misoperation of XVS-8010-C was that the expected margin (10%) between normal operating pressure and the pressurizer safety valve relief setpoint pressure was reduced to zero. It was determined that the most prevalent factor in this margin reduction was a loop seal discharge. This discharge resulted in a reduced valve setpoint because of the steam medium imposed on the valve. SCE&G is currently planning to eliminate the loop seal capability for the pressurizer safety valves.

   Short term corrective action for this event involved replacing the "B" and "C" safety valves. The "B" valve was replaced as a precaution due to previous minor leakage past the seat. The setpoints on all 3 valves were verified prior to restart. Also, temperature detectors were temporarily installed on the Pressurizer Safety Valves to facilitate valve body temperature monitoring. A special instruction for Operations personnel was issued to provide instruction on temperature monitoring requirements and when a plant shutdown should be initiated. In addition, a current/pressure convertor was adjusted for a

condenser steam dump valve which failed to operate during the transient.

On June 11, 1989, at 0049 hours, criticality was established and the plant was placed on-line at 0957 hours. The duration of the forced shutdown was 343.1 hours and was reported in LER 89-011 (and Revision 1).

8. On July 11, 1989, at 1435 hours, a turbine trip/reactor trip occurred while operating at 100% power. Technicians working inside the "Generator Stator Cooling Water" cabinet inadvertently shorted the power leads on the temperature converter causing the AC power fuse to blow. This gave a false indication of loss of generator stator cooling water which caused a turbine trip and resultant reactor trip. A turbine runback relay in the circuitry which would have limited turbine runback failed to operate. In addition, three other generating stations tripped while attempting to compensate for the loss of reactive generation (VARs) on the grid due to the VCSNS trip.

   With the exception of the failed turbine runback relay, the plant responded as expected. As a result of the loss of four generating stations and subsequent degraded voltage condition, both Emergency Diesel Generators started and supplied their respective Engineering Safety Feature busses. To minimize the probability of recurrence, interim controls were established including limiting VCSNS reactive output. Also, generator backup relay settings on other plants were increased to prevent inadvertent/unnecessary loss of the plants. A modification to install voltage regulators on the 115/7.2 KV Emergency Auxiliary Transformer is in progress.

   The defective turbine runback relay was replaced and on July 12, 1989, at 0555 hours, the reactor was taken critical. On July 13, 1989, at 0537 hours, the generator was placed on-line. The forced shutdown lasted 39 hours and was reported in LER 89-12. A presentation to the NRC was made on this topic on August 1, 1989.

9. At 1000 hours on August 25, 1989, the "A" Pressurizer Safety Valve (XVS-8010-A) body inlet temperature increased to greater than 450°F and a plant shutdown was initiated. During the load reduction, the pressurizer safety valve opened at a system pressure of approximately 2260 psig. The Reactor Coolant System rapidly depressurized and the reactor was manually tripped at 1004 hours. The valve reseated prior to reaching the Safety Injection setpoint of 1850 psig.

   The cause of this event was similar to the May 28 "C" Pressurizer Safety Valve failure. The "A" valve had been leaking and as the loop seal temperature increased, the leakage rapidly increased leading to a loss of the loop seal. This caused a dramatic reduction in the valve setpoint. The affected valve was replaced. A modification is planned to change out all three of the pressurizer safety valves' internals for steam application

and to remove the loop seal capability. On September 1, 1989, at 0635 hours, the reactor was taken critical and the plant was on-line at 1530 hours. The duration of this forced shutdown was 173.4 hours and was reported in LER 89-015 (and Revisions 1 and 2).

10. On September 7, 1989, with the plant at 100% power, a power reduction was commenced at 1740 hours to repair condenser tube leaks. During the repair activity, a faulty test circuit on the "A" Main Steam Isolation Valve (MSIV) was discovered. At 0410 hours on September 8, a controlled shutdown was commenced as required by Technical Specification 3.7.1.5 (MSIV "A" was declared inoperable at 0001 hours on September 8). It was determined that movement in a four inch feedwater forward flush line crushed a conduit which caused a short circuit in the "A" MSIV test circuit wiring. The movement of the forward flush line was caused by a pressure spike/wave generated in the line when water flashed to steam and then (water) reentered the line.

    Corrective action consisted of repairing the conduit and test circuit wiring. The forward flush line was inspected and restored to design condition. Also, the method of operating the non-safety flush line is being modified to minimize the probability of future transients. On September 15, 1989, at 1457 hours, the reactor was taken critical. After holding at lower power to clean up secondary chemistry, the plant was placed on-line at 2149 hours on September 17. The duration of the forced outage was 239.9 hours. This event was reported in LER 89-16.

11. On September 19, 1989, at 0249 hours, the turbine tripped from approximately 36% power due to a loss of condenser vacuum. Operations personnel were in the process of transferring circulating water to the condenser from the outer to inner loop as part of tube integrity testing. A missing light bulb associated with the circulating water isolation valve indicator resulted in a false indication/personnel misinterpretation of the associated valve position and led to the loss of circulating water to the condenser.

    As part of the corrective action for this event, all buildings were walked down to ensure indicating lights and lens covers were installed where appropriate. Also, the procedure in use during the system evolution was revised to require verification of system status using pump running amps. The generator was placed back on-line at 0705 hours on September 19, 1989. The forced shutdown lasted 4.3 hours.

12. On September 22, 1989, at 0320 hours, reactor power was reduced to 70% due to a loss of system loads resulting from hurricane damage to the SCE&G grid. At 2120 hours on the same day, the plant returned to full power. The duration of the load reduction was 18 hours.

13. On October 13, 1989, at 2200 hours, a power reduction began to allow for locating and repairing condenser leaks. Power was reduced to 30% by October 14 at 0100 hours. Following condenser repairs, condensate system oxygen levels required power to be maintained at 30%. This forced power reduction lasted 160.4 hours until October 20 at 1422 hours.

14. On October 20, 1989, at 1422 hours, the main generator was taken off-line to repair the Alterex slip ring and brushes. Reactor power was maintained at 30% using the steam dump valves. At 1705 hours, the repairs were completed and the generator was placed back on-line. The duration of this scheduled outage was 2.7 hours.

15. Continuing secondary chemistry problems on October 20 indicated additional condenser leaks were present and the plant was shutdown to plug tubes and repair any other leaks. The generator was taken off-line at 1759 hours. On October 26 at 1133 hours, criticality was established and the generator was placed on-line at 2156 hours. The duration of this forced shutdown was 147.9 hours. Long term actions to improve condenser reliability/upgrade the condenser are being evaluated.

16. On December 2, 1989, at 2202 hours, Operations personnel started a load reduction to 90% power for monthly turbine control valve testing. Due to a turbine control system failure, the turbine commenced a rapid power decrease during the evolution. The turbine was manually tripped at 2216 hours. At 2222 hours, a reactor trip occurred on "C" steam generator lo-lo level.

    The cause of this event was a relay contact failure in the turbine Electro Hydraulic Control (EHC) load reference circuitry. The circuit board with the defective component was replaced. Also, a failure of the exciter field breaker to actuate promptly during the event was attributed to lack of lubrication. Preventive Maintenance (PM) was performed on the breaker and PM frequency was increased.

    The circuitry of the EHC card was analyzed and it was discovered that diodes were not installed to prevent high inductive voltages. On December 3 at 2108 hours, criticality was established and at 0121 hours on December 4, 1989, the generator was placed on-line. The duration of the forced shutdown was 27.1 hours and was reported in LER 89-020. A modification to install diodes in the circuitry was scheduled for December 29, 1989.

17. On December 29, 1989, at 1009 hours, the generator was taken off-line to perform the aforementioned modification to the EHC circuitry. The generator was placed back on-line at 0459 hours on December 30. The duration of the scheduled outage was 18.8 hours.

4.0 EXPOSURES

Attachment I provides a table which lists the number of station, utility, and other personnel (including contract personnel) receiving exposures greater than 100 Mrem/Year, and their associated man-rem exposure according to work and job functions.

5.0 FAILED FUEL

The specific activity of the primary coolant remained within the limits (1.0 microcurie per gram Dose Equivalent I-131) of Technical Specification 3.4.8, "Specific Activity," except on four occasions where the limit was slightly exceeded following a reactor power reduction or trip. In all four cases, the reactor was operating at approximately 100% power with a constant letdown flow of 100 gpm for the 48 hours prior to the event. Attachment II provides a graph for each event showing reactor power and activity levels for I-131, I-133 and I-134 as a function of time.

On May 28, 1989, at 0530 hours, Dose Equivalent I-131 exceeded Technical Specification limits following a manual reactor trip. The results of isotopic analyses for samples taken prior, during, and after the occurrence were:

May 26 at 0120 hours - 1.40E-2 uCi/gm
May 28 at 0530 hours - 1.14 uCi/gm
May 28 at 0925 hours - 8.38E-1 uCi/gm

Based on sampling results, the duration of the occurrence was 3.9 hours.

On July 11, 1989, at 1530 hours, Dose Equivalent I-131 exceeded Technical Specification limits following an automatic reactor trip. The results of isotopic analyses for samples taken prior, during, and after the occurrence were:

July 11 at 0050 hours - 2.22E-2 uci/gm
July 11 at 1530 hours - 1.07 uCi/gm
July 11 at 1830 hours - 8.39E-1 uCi/gm

Based on sampling results, the duration of the occurrence was 3 hours.

On December 3, 1989, at 0145 hours, Dose Equivalent I-131 exceeded Technical Specification limits following an automatic reactor trip. The results of isotopic analyses for samples taken prior, during, and after the occurrence were:

December 2 at 0300 hours - 3.06E-2 uCi/gm
December 3 at 0145 hours - 1.04 uCi/gm
December 3 at 1340 hours - 2.60E-1 uCi/gm

Based on sampling results, the duration of the occurrence was 11.9 hours. (Note that LER 89-19 reports the failure to obtain the second December 3 sample in the required time frame.)

On December 29, 1989, at 1118 hours, Dose Equivalent I-131 exceeded Technical Specification limits following a power reduction. The results of isotopic analyses for samples taken prior, during and after the occurrence were:

December 26 at 0045 hours - 3.37E-2 uCi/gm
December 29 at 1118 hours - 1.06 uCi/gm
December 29 at 1240 hours - 1.14 uCi/gm
December 29 at 1540 hours - 8.50E-1 uCi/gm

Based on sampling results, the duration of the occurrence was 4.4 hours.

SOUTH CAROLINA ELECTRIC & GAS COMPANY
V. C. SUMMER NUCLEAR STATION
1989 MAN-REM REPORT

FOR PERSONNEL EXPOSURE GREATER THAN 100 MREM

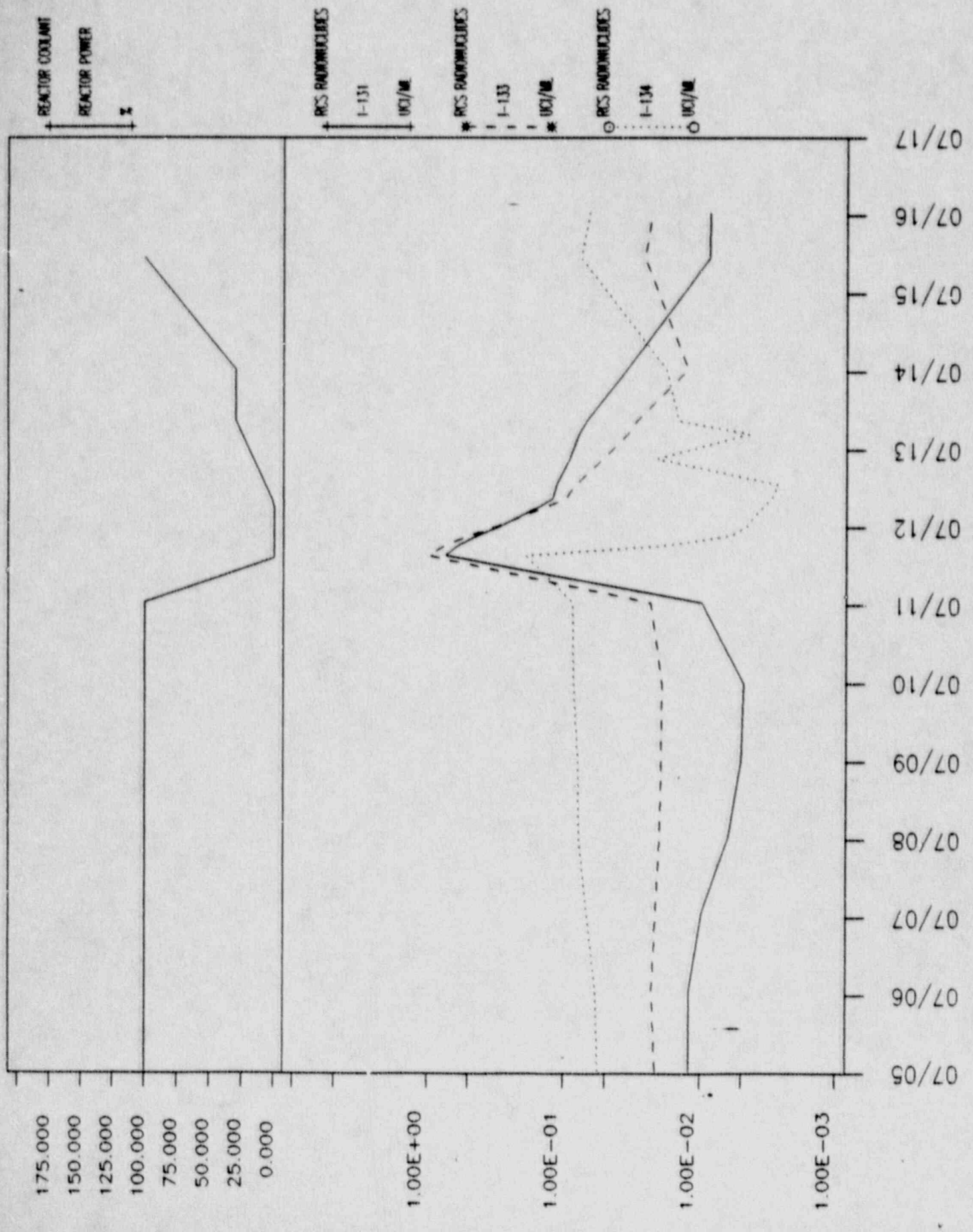
WORK AND JOB FUNCTION	NUMBER OF PERSONNEL > 100 M REM			TOTAL MAN-REM		
	STATION	UTILITY	CONTRACT	STATION	UTILITY	CONTRACT
Reactor Operations & Surveillance						
Maintenance Personnel	0	0	2	0.744	0.000	0.470
Operating Personnel	14	0	4	3.691	0.095	1.785
Health Physics Personnel	7	0	11	1.894	0.000	3.072
Supervisory Personnel	0	0	0	0.295	0.005	0.083
Engineering Personnel	0	0	0	0.305	0.000	0.190
Routine Maintenance						
Maintenance Personnel	6	0	4	3.175	0.000	1.688
Operating Personnel	0	0	4	0.442	0.015	1.626
Health Physics Personnel	0	0	1	0.385	0.000	0.490
Supervisory Personnel	0	0	0	0.157	0.000	0.030
Engineering Personnel	0	0	1	0.256	0.000	0.110
Inservice Inspection						
Maintenance Personnel	0	0	3	0.000	0.000	1.205
Operating Personnel	3	0	0	0.910	0.000	0.125
Health Physics Personnel	0	0	0	0.125	0.000	0.135
Supervisory Personnel	0	0	0	0.005	0.000	0.000
Engineering Personnel	0	0	0	0.000	0.000	0.120
Special Maintenance						
Maintenance Personnel	30	0	47	9.741	0.000	13.983
Operating Personnel	8	0	6	2.344	0.020	1.690
Health Physics Personnel	7	0	9	2.225	0.000	3.037
Supervisory Personnel	2	0	0	1.023	0.000	0.000
Engineering Personnel	1	0	0	0.310	0.000	0.060
Waste Processing						
Maintenance Personnel	0	0	0	0.044	0.000	0.000
Operating Personnel	0	0	5	0.015	0.000	1.083
Health Physics Personnel	1	0	2	0.215	0.000	0.460
Supervisory Personnel	0	0	0	0.005	0.000	0.000
Engineering Personnel	0	0	0	0.000	0.000	0.000
Refueling						
Maintenance Personnel	0	0	0	0.000	0.000	0.000
Operating Personnel	0	0	0	0.000	0.000	0.000
Health Physics Personnel	0	0	0	0.000	0.000	0.000
Supervisory Personnel	0	0	0	0.000	0.000	0.000
Engineering Personnel	0	0	0	0.000	0.000	0.000
TOTALS						
Maintenance Personnel	36	0	56	13.704	0.000	17.346
Operating Personnel	25	0	19	7.402	0.130	6.309
Health Physics Personnel	15	0	23	4.844	0.000	7.194
Supervisory Personnel	2	0	0	1.485	0.005	0.113
Engineering Personnel	1	0	1	0.871	0.000	0.480
GRAND TOTAL	79	0	99	28.306	0.135	31.442

The above Whole Body dose assignments are based on Pocket Dosimeter estimates.

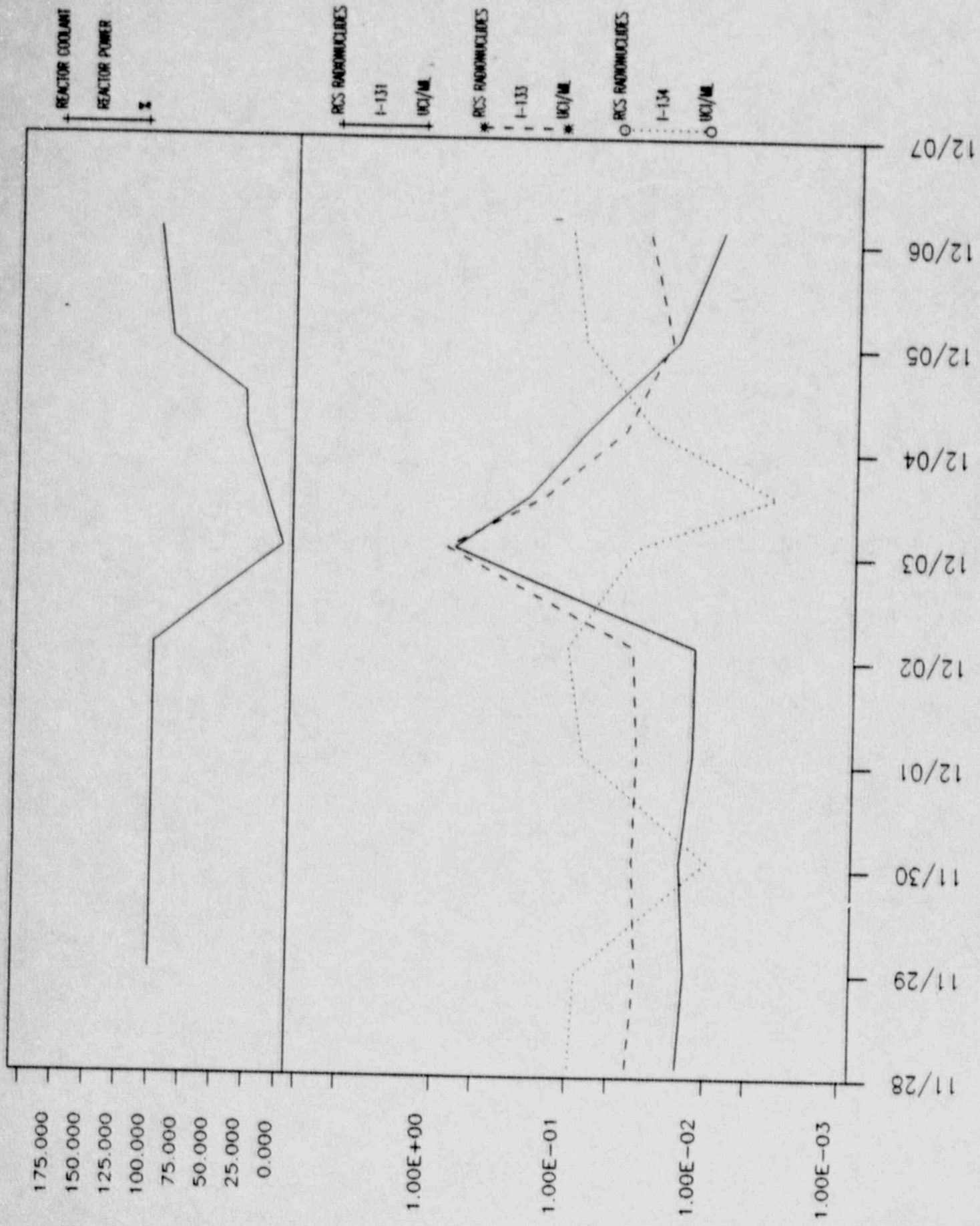
Attachment 11
February 28, 1990
Page 1 of 4

May 28, 1989 Event

July 11, 1989 Event



December 3, 1989 Event



December 29, 1989 Event