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Writer's Direct Dial "jumpe"

April 15, 1980 TLL 174

Office of Inspection and Enforcement Attn: B. H. Grier, Director Region I U. S. Nuclear Regulatory Commission 631 Park Avenue King of Prussia, Pa. 19406

Dear Sir:

Three Mile Island Nuclear Station, Unit II (TMI-2)
Operating License No. DPR-73
Docket No. 50-320
TMI-II Quarterly Report No. 3

Enclosed please find the sixth followup report, the third quarterly report, which describes recovery related progress since the March 28, 1979 incident occurring at TMI-II. This report documents current progress information for the period January 1 thru March 31, 1980, and is submitted in accordance with section 6.9.1.10 of the TMI-II Recovery Technical Specifications. Also included in this report is the Radiation Safety Program Report as described in section 6.9.1.6 of the TMI-II Recovery Technical Specifications.

Sincerely,

/a/ G. K. Hovey
G. K. Hovey
Director, TMI-II

GKH: LWH: hah

Enclosure: TMI-II Recovery Quarterly Progress

Report for the period January 1, 1980

thru March 31, 1980.

cc: Director of Nuclear Reactor Regulation

Light Water Reactors Branch No. 4 U. S. Nuclear Regulatory Commission Washington, D.C. 20555

J. T. Collins, Program Manager
TMI Program Office
U. S. Nuclear Regulatory Commission
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THREE MILE ISLAND UNIT 2
RECOVERY QUARTERLY PROGRESS
REPORT FOR THE PERIOD
ENDING MARCH 31, 1980

THREE MILE ISLAND UNIT 2 RECOVERY REPORT



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THREE MILE ISLAND UNIT 2
RECOVERY QUARTERLY PROGRESS
REPORT FOR THE PERIOD
ENDING MARCH 31, 1980

APPROVED BY:

Director
TMI Unit 2

Prepared for the U.S. Nuclear Regulatory Commission, Director Region 1 Office, King of Prussia, Penna. in accordance with paragraph 6.9.1.10 of TMI Unit 2 Technical Specification.

Submitted to NRC Region 1 in April 1980.

METROPOLITAN EDISON COMPANY/
GENERAL PUBLIC UTILITIES
THREE MILE ISLAND
P.O. BOX 480
MIDDLETOWN, PA 17057

TABLE OF CONTENTS

Section					Page
1	INTR	ODUCT	TION and	SUPPHARY	1-1
	1.0	Gene	ral		1-1
	2.0	Sum	ary of (Objectives	1-1
	3.0	Sum	ary of (Current Progress	1-2
2	RECO	VERY	REPORTS	and TECHNICAL SERVICES	2-1
	1.0	Scop	e		2-1
	2.0	Curr	ent Act	ivities	2-1
3	RECO	VERY	ENGINEE	RING	3-1
	1.0	Subc	ask A P	roject Engineering	3-1
		1.1	Scope.	• • • • • • • • • • • • • • • • • • • •	3-1
			1.1.1	TMI-2 Low Level Liquid Waste Processing System	3-1
			1.1.2	Submerged Demineralizer System	3-1
			1.1,3	Ground Water Mointoring	3-1
			1.1.4	Processed Water Storage Items	3-2
			1.1.5	Mini Decay Heat Removal System (MDHRS)	3-2
			1.1.6	Equipment Decontamination Facility	3-2
			1.1.7	Evaporator/Solidification Facility	3-3
			1.1.8	Processed Water Storage & Recycl System (PWST)	
			1.1.9	Laumdery Facilities	3-3
			1.1.10	EPICOR II Liner Solidification Facility	3–3
			1.1.11	Solid Waste Staging Facility	3-3
			1.1.12	Interim Waste Staging Building	3-3
			1.1.13	Containment Recovery Service Building	3-3

ECTION		
3 continued)	1.1.14	Personnel Access Facility/Command
		Center3-4
	1.1.15	Administration Building3-4
1.2	Curren	Activities3-4
	1.2.1	TMI-2 Low Level Liquid Waste
		Processing System Status3-4
	1.2.2	Submerged Demineralizer System
		Status3-5
	1.2.3	Ground Water Honitoring Status3-6
	1.2.4	Processed Water Storage Tanka
		Status3-6
	1.2.5	Mini Decay Heat Removal System
		Status3-7
	1.2.6	Equipment Decontamination Facility
		Status3-8
	1.2.7	Evaporator/Solidification Facility
		Status3-8
	1.2.8	Processed Water Storage & Recycle
		System (PWST) Status3-8
		Laundry Facilities3-8
	1.2.10	EPICOR II Liner Solidification
		Facility Status3-8
	1.2.11	Solid Waste Staging Facility
		Status3-9
	1.2.12	Interim Waste Staging Building
		Status3-9
	1.2.13	Containment Recovery Service
	1 2 1/	Building Status3-9
		Personnel Access Facility3-9
	1.2.15	Administration Building Status3-10
2.0 Su	btask. I	Support Engineering3-10
2.1 S	cope	3-10
	2.1.1	Pressurizer (RCS) Sample Tie-In to
		Unit II Temporary Sample Sink3-10

SECTION		
3		
(continued)	2.1.2	Opening DH-V1/DH-V171 Valves3-10
	2.1.3	Reactor Building Water Level3-10
	2.1.4	Reactor Coolant System Chemistry3-10
	2.1.5	Reactor Coolant System3-10
	2.1.6	Reactor Coolant System Boron
		Concentration3-10
	2.1.7	Solidification3-11
	2.1.8	Decreasing Reactor Coolant System
		Pressure to 100 PSIG3-11
2.2.	Current Ac	tivities3-11
	2.2.1 Pre	asurizer (RCS) Sample Tie-In to Unit
	II	Temporary Sample Sink Status3-11
	2.2.2 Ope	ming DR/V1/DH-V171 Valves Status3-11
	2.2.3 Rea	ctor Building Water Level3-11
	2.2.4 Res	ctor Coolant System (RCS) Chemistry
	Sta	tus3-12
	2.2.5 Rea	ctor Coolant System Status3-12
	2.2.6 Rea	ctor Coolant System Boron Concentra-
	tio	n Status3-13
	2.2.7 Sol	idification Status
	2.2.8 Dec	reasing Reactor Coolant System
		ssure to 100 PSIG Status3-14
3.0	Subtask C T	echnical Planning3-14
	3.1 Scope	3-14
	3.2 Current	Activities3-14
4.0		Surns & Roe Engineering3-15
	4.1 Scope	3-15
	4.2 Current	Activities3-15
5.0		- The Effects of Gamma Radiation on Ion
	Exchange Re	esins and activated charcoal3-18
	5.1 Stateme	ent of the Problem3-18
	5.2 Irradia	ation Capsule Construction and Irradiator
	110	

SE	CT	CON

3	
continued)	5.3 Capsule Pressure as a Function of Gamma
	Dose3-27
	5.4 Gas Composition as a Function of Gamma dose3-31
6.0	Appendix B Calculation of Dose to buried Adsorbent
	Material3-38
4 OPE	RATIONS AND MAINTENANCE4-1
1.0	Subtask A Plant Engineering4-1
	1.1 Scope4-1
	1.1.1 Reactor Building Purge4-1
	1.1.2 In-Place Recovery System and Pre-
	Accident Plant Systems4-1
	1.1.3 Plant Fire Protection4-1
	1.1.4 Recovery System4-1
	1.1.5 Plant Chemistry and Radiochemistry4-1
	1.1.6 Start-up and Test4-2
	1.2 Current Activities4-2
	1.2.1 Reactor Building Purge Status4-2
	1.2.2 In-Place Recovery System and Pre-
	Accident Plant Systems Status4-2
	1.2.3 Plant Fire Protection Status4-3
	1.2.4 Recovery Systems Status4-3
	1.2.5 Plant Chemistry and Radiochemistry
	Status4-4
	1.2.6 Start-up and Test Status4-4
2.0	Subtask B Process Support4-4
	2.1 Scope4-4
	2.2 Current Activities4-5
	2.2.1 Fuel Pool Waste Storage Systems
	Status4-5
	2.2.2 Liquid Radioactive Waste Processing
	System titled "EPICOR II" Status4-7
	2.2.3 Staging Facilities for Dewatered Resins
	and Evaporator Bottoms status4-10

-	-	~		-	
S	Ŀ	5	ш	U	N

4

(continued)	2.2.4 Nuclear Sampling System Status4-12
	2.2.5 Solid Waste Status4-14
3.0	Subtask C Decontamination4-15
	3.1 Scope4-15
	3.1.1 Decontamination of Auxiliary and
	Fuel Handling Building4-15
	3.2 Current Activities4-15
	3.2.1 Decontamination Status4-15
4.0	Subtask D Plant Haintenance4-16
	4.1 Scope4-16
	4.2 Current Activities4-16
	4.2.1 Auxiliary Building Ventilation
	System Statua4-16
	4.2.2 Equipment Layup Status4-17
	4.2.3 Nuclear Service River Water Pump
	Status4-17
	4.2.4 Waste Gas Compressor Status4-17
	4.2.5 New Project Instrumentation
	Status4-17
	4.2.6 Preventative Maintenance Status4-18
5 RAD	TOLOGICAL CONTROLS5-1
1.0	Scope5-1
	1.1 Radiological Technical Support Group5-1
	1.2 Radiological Field Operations Group5-1
	1.3 Radiological Training Group5-1
	1.4 Dosimetry Group5-2
	1.5 Radiological Support Services Group5-2
2.0	Current Activities5-2
	2.1 Initial Reactor Building Re-Entry
	Program5-2
	2.2 Radiological Control Procedure Revision5-2
	2.3 Dosimetry Program5-2
	2.4 Training Programs5-3

-	20	-	20	
S	LU	т	IC	M

5		
continued)	2.5 ALARA Program5-	3
	2.6 Instrumentation5-	3
	2.7 Radiation Protection Plan5-	3
3.0	Appendix A - Management Plan for TMI-2	
	Radiological Control Program5-	4
	3.1 Introduction5-	4
	3.2 Specific Plan Objectives5-	4
	3.2.1 Establish management's commitment to	
	achieving a High Quality Radiological	
	Control Program at TMI-25.	4
	3.2.2 Formalize the organizational	
	structure for the TMI Unit 2	
	Radiological Control Program5-	6
	3.2.3 Increase the Technical depth of the	
	Radiation Safety Program5-	8
	3.2.4 Upgrade the Radiological Control	
	Technician and Radiological worker	
	Training Programs5-	9
	3.2.5 Improve Response to and Resolution of	
	Audit Findings5-	12
	3.2.6 Revise and implement procedures which	
	will ensure strict, verbatim compliance,	
	and revise the procedure review	
	practices to expedite implementation of	
	Radiological Control Procedures5-	15
	3.2.7 Improve the External Personnel	
	Dosimetry Program5-	-17
	3.2.8 Improve the Internal Dosimetry	
	Program5-	-20
	3.2.9 Upgrade the Radiation Protection	
	Instrumentation Program5	-20

	TABLE OF CONTENTS (CONTINUED)
SECTION .	
5	
(continued)	3.2.10 Improve TMT ≥ Radioactive
	Material Shapping and Labeling
	procedure5-24
	3.2.11 Improve Decontamination procedures
	for equipment and tools5-25
	3.2.12 Implement a program which emphasizes
	the reduction of personnel exposures
	to "as low as reasonably achievable"5-26
	3.2.13 Improve personnel understanding of
	responsibilities and expectations in
	achieving a sound Radiological
	Program5-27
4.0	Appendix B - Management Plan Schedule5-29
	4.1 Purpose and Summary5-29
5.0	Appendix C - Matrix Relating NUS and NRC Audit
	Findings with Management Plan5-31
	5.1 Purpose and Summary5-31
6.0	Appendix D - Current Progress Related to the
	Management Plan5-34
	6.1 Purpose and Summary5-34
	6.2 Corrective Action Status for Commitments
	due on April 1, 19805-34
	6.3 Corrective Action Status for Commitments
	due during the second quarter 19805-37
	6.4 Additional Activity in Progress5-37
6 SPE	CIAL PROJECTS6-1
1.0	Scope6-1
2.0	Current Activities6-2
	2.1 Hydrogen Control System Support6-2
	2.2 Reactor Building Entry Support6-3

2.3 Reactor Building Personnel Airlock

Radiation Survey.....

C	2	~	Р1	20	181
ಾ	E.	u	ч	[0	А

6

(contin	ued) 2.4 Radiation Instrument and wearing apparel Studies6-3
7	ENVIRONMENTAL MONITORING
	1.0 Scope7-1
	2.0 Current Activities
	2.1 Environmental Impact Statements7-1
	2.1.1 System Reviews7-1
	2.2 Environmental Monitoring Programs7-2
	2.3 Summary of Accomplishments7-3
8	PROJECT OPERATIONS8-1
	1.1 Scope8-1
	2.0 Current Activities8-1
9	QUALITY ASSURANCE9-1
	1.0 Scope9-1
	2.0 Current Activities9-1
	2.1 Program Development9-1
	2.2 Design and Procurement9-2
	2.3 Site QC Inspection9-2
	2.4 Monitoring Site Activities9-3
	2.5 Audits9-3
10	TRAINING10-1
	1.0 Subtask A Operator Training10-1
	1.1 Scope10-1
	1.1.1 Auxiliary Operator Training10-1
	1.1.2 Licensed Reactor Operator Training10-1
	1.1.3 Senior Reactor Operator Training10-2
	1.1.4 RO/SRO Requalification Training10-3
	1.2 Current Activities10-4
	1.2.1 Auxiliary Operator Training
	Accomplishments10-4
	1.2.2 Licensed Reactor Operator Training
	Accomplishments10-4

	TABLE OF CONTENTS (continued)
SECTION	
10	
(continued)	1.2.3 Senior Reactor Operator Training
	Accomplishments10-4
	1.2.4 RO/SRO Requalification Training
	Accomplishments10-4
2.0	Subtask B Maintenance Training10-
	2.1 Scope10-5
	2.2 Current Activities10-
3.0	Subtask C Health Physics Technician Training10-
	3.1 Scope10-
	3.2 Current Activities10-0
4.0	Subtask D General Employee Training10-
	4.1 Scope10-
	4.2 Current Activities10-0
5.0	Subtask E Radwaste Management Training10-
	5.1 Scope10-3
	5.1.1 Radwaste Administration Training10-
	5.1.2 Radwaste Reduction Training10-
	5.2 Current Activities10-
	5.2.1 Radwaste Administration Training
	Accomplishments10-
	5.2.2 Radwaste Reduction Training
	Accomplishments10-
6.0	Subtask F Special Training10-
	6.1 Scope10-
	6.1.1 Reactor Building Re-Entry Team
	Training10-
	6.1.2 Reactor Building Purge System
	Training

6.1.4 Supervisory Indoctrination in

6.1.3 Emergency Plan Training.....10-9

Controlled Substance Training......10-9

SECTIO	
10	
(continu	ued) 6.2 Current Activities10-9
	6.2.1 Reactor Building Re-Entry Team
	Training Accomplishments10-9
	6.2.2 Reactor Building Purge System
	Training Accomplishmenta10-9
	6.2.3 Emergency Plan Training
	Accompliahments10-9
	6.2.4 Supervisory Indoctrination in
	Controlled Substance Training
	Accomplishments10-9
	7.0 Subtask G Chemistry Technician Training10-1
	7.1 Current Activities10-1
11	SECURITY11-1
	1.0 Scope11-1
	2.0 Current Activitiea11-1
	2.1 Organization11-1
	2.2 Security System11-1
	2.3 Security Procedures11-2
	2.4 Badging System11-2
	APPENDIX - 1 Annotated Sequence of Events

DISTRIBUTION LIST

LIST OF FIGURES

Figure	Page
3-1	Section through Resin Pressure Capsule3-21
3-2	Detail A and Detail B Enlarged3-22
3-3	Gas Chromatograph Capsule3-23
3-4	Gas Chromatograph Sample Assembly3-24
3-5	Bill of Materials3-25
3-6	Co-60 Irradiator3-26
3-7	Anion Resin - Pressure versus Dose3-28
3-8	Cation Resin - Pressure versus Dose3-29
3-9	Charcoal - Pressure versus Dose3-30
3-10	Methane Production - Volume versus Dose3-33
3-11	Ethane Production - Volume versus Dose3-34
3-12	Propane Production - Volume versus Dose3-35
3-13	Butane Production - Volume versus Dose3-36
3-14	H ₂ Production - Volume versus Dose3-37
5-1	Management Plan Schedule5-30

LIST OF TABLES

Table		Page
5-1	NUS Audit Findings	5-32
5-2	NRC Special Panel Findings	5-33
6-1	Whole Body Dose Rates	6-4
6-2	Beta Skin Dose Rates	6-5

SECTION 1 INTRODUCTION AND SUMMARY

1.0 GENERAL

This is the third quarterly progress report which documents salient recovery related work performed at the Three Mile Island Unit 2 nuclear facility (TMI-2) during the first quarter of calendar year 1980. Individual section summaries are included within this section under Summary of Current Progress; the more detailed treatise of each of these section summaries is presented within the body of this report.

2.0 SUMMARY OF OBJECTIVES

The TMI-2 quarterly recovery reports shall include available information concerning the cause of the March 28, 1979 incident, probable consequences of the incident, planned (short term and preliminary long term) corrective action and description of continuing activities related to the incident. Quarterly progress reports shall continuc until a final report is issued, as previously committed in Metropolitan Edison Company letter GQL 0490 dated April 11, 1979. These reports shall include similar information as described above, as well as interim analysis results and evaluations which have become available. The final report shall also include a summary of Technical Specification Violations which occurred during and after the transient, a summary of the cause(s) of the incident, a sequence of events which occurred during the transient, and corrective actions (both short term and long term) which were taken as a result of the March 28, 1979 incident. Quarterly progress reports shall be prepared and submitted in lieu of REPORTABLE OCCURRENCE REPORTS, MONTHLY OPERATING REPORTS and SPECIAL REPORTS identified in the TMI-2 Technical Specification.

3.0 SUMMARY OF CURRENT PROGRESS

Recovery Engineering - Significant engineering efforts were expended in the design and construction of various liquid and solid radwaste handling systems. Detailed engineering and fabrication of components for the Submerged Demineralizer System (SDS) has continued, and preliminary results of analytical tests performed on actual Reactor Coolant System samples verified the design of that system. A Technical Evaluation Report for the SDS was drafted and reviewed in preparation for submittal to the NRC.

Hydrostatic testing, flushing and preoperational testing commenced during this quarter on the Mini Decay Heat Removal System. Development of design criteria, engineering design drawings and procurement of equipment for the jointly finded GPU/DOE Equipment Decontamination Facility continued.

Other work performed in the Recovery Engineering Department included continued surveillance and analysis of reactor conditions, containment building water level, evaluation of reactor cooling requirements and other analytical work in support of plant operations. Engineering work also continued in the evaluation and development of methods to solidify EPICOR II resins, in accordance with NRC requirements.

Operations and Maintenance - Plant Engineering section provided engineering support to the Reactor Building Purge effort, the Standby Pressure Control System Program, the Emergency Diesel Generator Maintenance program, the Waste Gas Compressor program, the Reactor Building and Steam Generator water level measurements, the Pire Protection program, the Submerged Demineralizer System program, and the Plant Chemistry and Radiochemistry programs. The Process Support group continued supporting the Fuel Pool Waste Storage System, EPICOR II system, the staging facilities for dewatered resins and evaporator bottoms and the Nuclear Sampling System efforts. The decontamination work effort within the Auxiliary and Fuel Handling Buildings continued. Plant maintenance continued on a scheduled and non-scheduled basis.

Radiological Controls - A comprehensive Management Plan for TMI-2
Radiological Control Program has been implemented. The Radiological
Control Department was reorganized into five separate groups reporting
to a manager that reports directly to a Senior Vice President. The
Radiological Assessment Group was formed to independently monitor
progress towards implementing and adhering to a strong Radiological
Control Program. This group has the authority to stop work involving
violations of sound radiological work practice. A comprehensive
Radiation Protection Plan for TMI-2 was submitted to the NRC for
approval. Radiological Control Department formalized training
programs were implemented.

Special Projects - Design input and modifications to the hydrogen control system required to support TMI-2 reactor building purge has been completed. Expected dose rates have been calculated for personnel entering the reactor building and are hereinafter presented. Training of initial entry crew and testing of equipment for initial reactor building was completed. Entry into and radiation surveys were accomplished within the reactor building personnel airlock. Experiments were conducted to determine response characteristics of various gamma and beta/gamma survey instruments and diffusion rates through select wearing apparel subjected to a krypton environment.

Environmental Monitoring - Activities during this quarter centered around upgrading and improving the existing environmental radiation monitoring program. Upgraded detection systems included: infield placement of a new environmental TLD system acquisition of on-site TLD readout detection monitors, and air sampling equipment that will provide for grab sampling, one week continuous, and cryogenic analysis. In addition to improvements in instrumentation, numbers of sampling sites were increased to provide expanded coverage in the environment.

During this quarter, input and comments were provided on the design systems for recovery. Inputs were directed at ensuring compliance with plant operations, technical specifications, and regulatory statutes for purposes of protecting the health and safety of the general public. Project Operations - The baseline engineering package for an interim waste staging facility has been completed and is currently under review. General arrangement drawings and a material handling study for the TMI-2 reactor building recovery service building have been completed and are currently under review. A supplement to the July 1979 reactor building decontamination report has been issued for review. In addition, an overall radwaste management study, a study on alternate methods for the disposal of tritiated water and preliminary evaluation of radwaste volume reduction techniques has been completed. A contract for the new TMI-2 administration building was awarded on February 27, 1980. Preliminary construction for this facility has been initiated. The ground water monitoring well system surrounding TMI-2 has been completed and is undergoing pre-operational testing.

Quality Assurance - The scope of the Quality Assurance Program for TMI-2 has been expanded to include all items and activities identified by engineering as important to safety. The new important to safety concept will encompass not only the items previsouly designated as safety related but also activities, systems, structures and components which may affect the capability of the unit to adequately protect the health and safety of the public. A separate Quality Assurance Plan is currently in progress which describes the program to be implemented during recovery. During this period the Quality Assurance staff has been reorganized to implement the requirements of the new plan.

Training - During this period, Auxiliary Operator, Reactor Operator (RO), and Senior Reactor Operator (SRO), and RO/SRO requalification training programs were continued. Maintenance training, Health Physics training, radwaste administration training, general employee training, emergency plan training, supervisory indoctrination into controlled substance training, reactor building re-entry team and purge system training and special training programs were continued.

<u>Security</u> - A computerized access control system was established for entrance into protected/vital areas. Security procedures have been completed and are currently in the review and approval cycle. A new badging system has been established and is being implemented.

Appendix - 1 - This report provides an Annotated Sequence of Events on the March 28, 1979, accident at Three Mile Island Unit 2 and is the result of a detailed analysis of reactimeter data, plant computer data, plant recorder charts, plant logs and operator interviews. The Report includes a chronology of plant events, the reference source of each entry in the chronology, and the information available to the operator regarding each event in the sequence. The "Information Available to the Operator" entries, addresses the type of information available, the form in which the information was presented, and the timeliness of the presentation of the information to the operator, relative to the time of occurrence of the event.

This report should be considered the final analysis on the Sequence of Events during the TMI-2 accident. Investigation and data analysis are still ongoing and continue to provide new insights. As this new information and/or understanding is developed, amendments or revisions to this document will be submitted as necessary.

SECTION 2 RECOVERY REPORTS AND TECHNICAL SERVICES

1.0 SCOPE

The objectives of this task are to ensure timely reporting of current TMI-2 recovery activities to the U.S. Nuclear Regulatory Commission, Region 1 Office. Technical Services include the coordination, compilation, illustration, review, approval, reproduction and distribution of the TMI-2 quarterly and final recovery progress reports.

Overall report direction and day-to-day administration will be provided under this task. Plana and controls will be established and maintained; periodic reviews will be held with principal contributors and the Commission; related correspondence and reports will be coordinated and day-to-day technical and administrative liason with cognizant recovery team personnel will be provided.

2.0 CURRENT ACTIVITIES

During this period a Technical Services Group was established to process TMI-2 recovery related reports and thereby alleviate this function from the Licensing Group. A more comprehensive reporting format was established. The third quarterly TMI-2 recovery progress report was completed. Project administration and day-to-day liason with cognizant contributors continued.

SECTION 3 RECOVERY ENGINEERING

1.0 SUBTASK A. PROJECT ENGINEERING

1.1 SCOPE

1.1.1 TMI-2 LOW LEVEL LIQUID WASTE PROCESSING SYSTEM

The low level liquid waste processing system for TMI-2 shall consist of the EPICOR I system, which is presently used for both TMI-1 and TMI-2, and will be relocated for exclusive use of TMI-2, to support recovery work.

This task requires the engineering, design and construction of foundations and weather protector for the EPICOR I system equipment, and the routing of system influent and effluent piping within existing plant structures and the yard north of the EPICOR II facility. It is intended that the system be employed to process liquids collected within the TMI-2 Containment Drain Tanks, prior to transfer of these liquids for disposal via the TMI-2 Evaporator Condensate Test Tanks.

1.1.2 SUBMERGED DEMINERALIZER SYSTEM

The Submerged Demineralizer System (SDS) is designed to be installed within the TMI-2 "B" spent fuel pool. The system utilizes the natural shielding capabilities of water to minimize personnel exposure while processing the water contained in the Reactor Building sump (RBS).

Approximately 700,000 gallons of water will be pumped from the RBS via pump WGP-1 through two (2) in-liner filters, to the tank farm. From the tank farm, the water is pumped through a trein of three (3) zeolite beds which are designed to remove the majority of cesium 134 and 137, and strontium 89 and 90; the water is then pumped through a cation train and finally through a mixed bed polishing unit, where other trace elements are removed, and then to Honitor Tanks. The system has sampling capabilities and the program includes a full chemistry support program including a geli system and counting facilities. Current plans are to have the system operated by Chem Nuclear personnel under the

direction of Met-Ed Operations.

1.1.3 GROUND WATER MONITORING

Develop the capability to monitor the ground water around the TMI-2 Reactor Containment Building.

1.1.4 PROCESSED WATER STORAGE TANKS

Provide two (2), 500,000 gallon capacity tanks, with associated ring foundations for storage of processed water from EPICOR II, SDS systems and future processing systems.

1.1.5 MINI DECAY HEAT REMOVAL SYSTEM (MDHRS)

The Mini Decay Heat Removal System consists of two (2), electric motor driven centrifugal pumps, two (2), shell and tube heat exchangers, piping, valves, and controls required to remove heat from the TMI-2 core. The system is located at the south end of the fuel handling building, at elevation 280'6" (MSL).

Shielding and air flow control and filtration equipment have been provided for system operation, to minimize personnel exposure to a level as low as reasonably achievable.

In addition to decay heat removal service, the system is also capable of providing intertie to the Submerged Demineralization System (reference section 1.1.2) for demineralized cleanup of the reactor coolant system.

1.1.6 EQUIPMENT DECONTAMINATION FACILITY

This jointly funded GPU/DOE project will consist of a facility which will demonstrate advanced equipment decontamination processes, capable of reducing occupational radiation exposures to workers in nuclear power plants. The decontamination equipment will be located in a fully detached, one story building of about 3000 square feet. Electropolish, freon spray, and vibratory media decontamination techniques will be employed.

1.1.7 EVAPORATOR/SOLIDIFICATION FACILITY

The Evaporator/Solidification Facility shall provide for the collection, treatment, storage and disposal of liquid radioactive wastes, generated during the decontamination of TMI-2.

1.1.8 PROCESSED WATER STORAGE & RECYCLE SYSTEM (PWST)

Provide pumps, piping, valves, controls, etc., for the PWST and interconnection with EPICOR II & SDS systems.

1.1,9 LAUNDRY FACILITIES

The scope of this task is to provide the means of laundering large quantities of protective clothing to be used during the recovery. Specific requirements and alternatives are being studied by Bechtel Power Corporation.

1.1.10 EPICOR II LINER SOLIDIFICATION FACILITY

The EPICOR II Liner Solidification Facility shall provide for the treatment, solidification and disposal of spent resins from EPICOR II water processing system.

1.1.11 SOLID WASTE STAGING FACILITY

The staging facility is a structure designed to store radioactive wastes (solidified or dewatered resins) until they can be shipped for burial. The structure will consist of six (6), modules. Each module consists of sixty (60), 84 inch diameter cells, embedded in concrete and capped with 3 feet thick concrete plugs. Each cell has a drain line to a sump which will serve three modules. The sump is designed to collect any leakage from lines installed in the cells, and meets the seismic requirements of USNRC Regulatory Guide 1.143.

1.1.12 INTERIM WASTE STAGING BUILDING

Provide an interim facility, to serve as a central point for staging solid or compacted waste, prior to transportation for disposal.

1.1.13 CONTAINMENT RECOVERY SERVICE BUILDING

This 25,000 square feet, one story building will be built directly adjacent to the TMI-2 containment and accomplish the following:

- Provide contamination control and airborne particulate control envelope at the containment equipment hatch.
- 2. Provide for efficient personnel access to containment.
- 3. Allow passage of large pieces of equipment and bulk radwaste.
- 4. Provide a waste staging and temporary storage area.
- Provide a decontamination area for equipment removed from containment.
- 6. Provide space to handle containment service systems.
- 7. Allow for maintaining a hot tool crib in vicinity of containment.

1.1.14 PERSONNEL ACCESS FACILITY/COMMAND CENTER

This two story building will be located directly adjacent to the containment recovery service building, to provide about 12,000 square feet of space and accomplish the following:

- Provide efficient personnel access to the containment during all phases of containment decontamination and restoration.
- Provide for personnel radiation monitoring and personnel decontamination.
- Provide the necessary administrative spaces for processing radiation work permits, personnel briefing, and maintenance of records.
- 4. The Command Center, an integral part of the Personnel Access Facility, will provide a readout location for remotely monitored instruments, and a central location to direct the containment decontamination and recovery.

1.1.15 ADMINISTRATION BUILDING

Provide a two story building to house 350 to 400 staff personnel, document control center and others as required.

1.2 CURRENT ACTIVITIES

1.2.1 TMI-2 LOW LEVEL LIQUID WASTE PROCESSING SYSTEM STATUS

During the period of January through March, 1980, the following work has been accomplished:

- A design criteria document has been issued to relocate EPICOR I from TMI-1 to TMI-2.
- Bechtel Power Corporation has been assigned tasks of providing services, an enclosure structure, two (2), 10,000 gallon monitor tanks and pipe routing inside existing structures and the plant yard area, for system influent and effluent piping.
- 3. A letter to USNRC has been issued to notify the agency of the intent to move the system.

1,2,2 SUBMERGED DEMINERALIZER SYSTEM STATUS

During the period of January through March, 1980, the following activities have transpired:

- Completion of design and engineering effort by AGNS has progressed to the point where 95% of the drawings have been released for construction.
- The Cask Support Platform has been delivered to the site, with additional hardware currently 25% to 75% complete in the APCO fabrication shops. All major pieces of hardware are currently on order.
- 3. Interface, with plant operation groups and plant engineering personnel, has proceeded to the point where draft copies of operating procedures and chemistry/Health Physics procedures are being jointly reviewed. Plans are being formulated at this time to develop a cohesive training program for both the Chem-Nuclear and Met-Ed operators.
- 4. The first installation procedure (the cask support platform)
 has been completed and has been signed off by the PORC committee.

- 5. A schedule for the completion of operating, maintenance, and chemistry/Health Physics procedures has been developed.
- 6. An estimate of the required man hours and cost to install the system has been developed by Catalytic.
- 7. Project Engineering meetings, to identify and solve problems and to inform interested parties of on-going progress, were begun in January and currently are being conducted each Tuesday and Thursday. Minutes are published at each meeting and distributed to interested persons as a means of documenting progress.
- 8. Additional column testing was begun at Oak Ridge National Labs, utilizing the three (3), 1 liter samples of water which were taken from the reactor sump in October, 1979. To date, the water has been centrifuged and passed through a simulated SDS column set-up, and preliminary indication from Osk Ridge indicates acceptable performance, at least in the ability to remove cesium and strontium.
- 9. Filter loading and filter dewatering tests have been conducted at AGNS with satisfactory results.
- 10. The study, to determine the effects of gamma radiation on ion exchange resins and activated charcoal, has been completed by R.C. McFarland, Neely Nuclear Research Center, Department of Nuclear Engineering, Georgia Institute of Technology in February 1980, and is presented in Appendix A.
- 11. Work has been proceeding on the development of a solidification module to solidify the 10 cubic feet vessels. Currently a draft copy of a design criteria document is being reviewed. An assembly drawing has been prepared based on this document.
- 12. The Technical Evaluation Report for the SDS has been written and is in the final stages of preparation for presentation to the USNRC.

1.2.3 GROUND WATER MONITORING STATUS

Installation of eight (8), wells has been completed. The drillers demobilized on March 13, 1980. Preliminary sampling procedure has been reviewed. Pump tests to develop hydrogeological information commenced.

1.2.4 PROCESSED WATER STORAGE TANKS

- 1. Tanks PW-Tl and T2: Order placed with Pittsburgh Des-Moines on February, 1980.
- 2. Foundations PW-T1 and T2. Excavations complete, PW-T2, tank, concrete poured March 24, 1980.

1,2,5 MINI DECAY HEAT REMOVAL SYSTEM STATUS

During this period of January through March 1980, the following work has been accomplished:

- Design changes have been issued to incorporate a demineralized water flush for MDHRS pump mechanical seals and seal water cyclone separater.
- Design changes have been issued to incorporate piping and valves that will allow future inter-tie of the MDHRS and the Submerged Demineralizer System.
- 3. System hydrostatic testing, flushing, and preoperational testing commenced on March 8, 1980, and remains in process.
- 4. Final MDHRS operating dose, to equipment and instrumentation in proximity to the MDHRS piping and components, has been evaluated. No equipment movement is deemed to be necessary, within the following exceptions:
 - a. A pressure indicator, employed for the Standby Pressure Control System, bas been relocated to an area outside the shielding volume.
 - b. Relocation of accelerometer equipment, used to detect earth/slsb movement during a seismic event, will be accomplished to minimize operator exposures during equipment maintenance.

- 5. An assessment of boron concentrations within the reactor core due to MDNRS startup and operation, commenced in mid-March, 1980, and remains in process.
- 6. USNRC comments concerning information, a part of the MDRR system design criteria document, and the system description, were received, evaluated and disposition defined for incorporation into the above mentioned documents.
- 7. Revision 7, to the System design Criteria Document was issued. Final MDRRS, ALARA dose estimate were accomplished.
- 8. The PORC has initiated review and approval of the SOP for opening valves DHV-1 or DHV-171, the MDHRS operating procedure and maintenance requests for hydrostatic testing between DHV-3 and DHV-1 and 171.
- Plant Engineering has begun, and is in the process of developing alarm response procedures and emergency procedures in support of system operation.

1,2,6 EQUIPMENT DECONTAMINATION FACILITY STATUS

- 1. Development of general arrangement of equipment.
- 2. Procurement of equipment.
- Engineering design of systems.
- 4. Determination of building type and design.
- Development of design criteria.

1.2.7 EVAPORATOR/SOLIDIFICATION FACILITY STATUS

- Engineering in process.
- 2. Intermediate issues of layouts and flow diagrams reviewed.
- 3. Technical Evaluation Report preparation in progress.
- 4. Solidification system selected.

1,2,8 PROCESSED WATER STORAGE & RECYCLE SYSTEM (PWST) STATUS

P & ID for review and comments, ongoing.

1.2.9 LAUNDRY FACILITIES STATUS

A letter from Hr. R.F. Wilson, Director of TMI-II Recovery, dated March 4, 1980, authorized Bechtel Power Corporation to proceed in performing the studies necessary to define anti-contamination clothing, and laundry requirements during the TMI-II containment recovery.

1,2,10 EPICOR II LINE SOLIDIFICATION FACILITY STATUS

- Studies completed for inliner and exliner solidification concepts, TDR's prepared for each.
- Proposals for inliner and exliner concepts reviewed and evaluated.
- 3. Test program being developed with Hittman Nuclear Development Corporation, to ensure that EPICOR II resins can be solidified (inliner) with cement. Testa will use both lab samples (500 ml) and drum samples (300r 55 gallons).

1.2.11 SOLID WASTE STAGING FACILITY STATUS

Module A:

Coating applications completed. Electrical and Piping work completed. Gaskets installed. Liners stored in 27 cells of A module.

Module B:

Construction commenced.

Base Mat poured with drain lines installed to sump.

Forms and wall steel for perimeter walls 60% complete.

Module C&D:

Bid packages in house for review and comment.

1.2.12 INTERIM WASTE STAGING BUILDING STATUS

Design criteria being developed.

1.2.13 CONTAINMENT RECOVERY SERVICE BUILDING STATUS

- 1. Development of general arrangement.
- 2. Preparation of design criteria.

3. Engineering design in progress.

1.2.14 PERSONNEL ACCESS FACILITY/COMMAND CENTER STATUS

- 1. Development of general arrangement.
- 2. Preparation of design criteria.
- 3. Engineering design in progress.

1.2.15 ADMINISTRATION BUILDING STATUS

- A contractor has been selected for the entire construction engineering and construction effort, based on a competitive fixed price bidding.
- Construction commenced (site cleaning and preparation for foundations).
- 3. Engineering is proceeding on building services.

2.0 SUBTASK B. SUPPORT ENGINEERING

2.1 SCOPE

2.1.1 PRESSURIZER (RCS) SAMPLE TIE-IN TO UNIT II TEMPORARY SAMPLE SINK

To verify the accuracy of the Reactor Coolant pump seal cavity pressure instrument.

2.1.2 OPENING DH-V1/DH-V-1/1 VALVES

To evaluate and write a procedure on the impact of operations with DH-Vl or DH-V171 and DHV2 being open.

2.1.3 REACTOR BUILDING WATER LEVEL

To monitor the water level in the Reactor Building on a continuous basis to determine if any gross changes of water inflow have occurred.

2.1.4 REACTOR COOLANT SYSTEM CHEMISTRY

To maintain continuous surveillance of the reactor coolant system chemistry parameters.

2.1.5 REACTOR COOLANT SYSTEM

To present a status of the reactor coolant system during the quarter.

2.1.6 REACTOR COOLANT SYSTEM BORON CONCENTRATION

To ensure boron concentration in the reactor coolant system remains above 3000 ppm.

2.1.7 SOLIDIFICATION

To present a status of the efforts expended to resolve problems of resin solidification.

2,1,8 DECREASING REACTOR COOLANT SYSTEM PRESSURE TO 100 PSIG

To provide guidance and support for lowering the reactor coolant system pressure.

2.2 CURRENT ACTIVITIES

2.2.1 PRESSURIZER (RCS) SAMPLE TIE-IN TO UNIT II TEMPORARY SAMPLE SINK STATUS

A memo was issued listing necessary action, responsible parties and time periods involved. A test was arranged to verify the accuracy of the reactor coolant pump, and seal cavity pressure instrument, which was to have been the means of Reactor Coolant System pressure indication. (The instrument failed on January 26, 1980). The results of the teat were satisfactory but proved to be irrelevant.

Engineering support was provided for a construction procedure and operational procedure. The tie-in was completed on February 21, 1980.

2.2.2 OPENING DH-V1/DH-V1/1 VALVES STATUS

A procedure was drafted for this operation and forwarded to PORC. PORC comments on the first review are incorporated and the procedure resubsitted.

A work order was initiated to have the operator for DH-V1/DH-V171 rewired for step or staccato operation.

An evaluation of the impact of operations with DH-V1/DH-V171 and DH-V2 being open has been performed. DH-V1 or DH-V171 must be opened to operate the Mini Decay Heat Removal System.

2,2,3 REACTOR BUILDING WATER LEVEL STATUS

A direct measurement system using a manometer through penetration 401 was assembled and is being used to establish an accurate water level reading method with respect to penetration.

Statistical methods are being used to establish inflow rates for comparison with inflow leakage.

2.2.4 REACTOR COOLANT SYSTEM (RCS) CHEMISTRY STATUS

During this quarter, results of the sample analysis were recorded and graphed in order to provide long term trends. The graphs included values of boron, oxygen, hydrogen, nitrogen, chlorides, sodium, total gas, pH, tritium, strontium, and cesium.

Input was provided to answer question regarding:

- 1. The need for an alternate RCS buffer solution for pH control.
- 2. Increased RCS boron concentrations.
- 3. Erratic dissolved gas concentrations.

A review of alternate RCS pH control mechanisms (other than NaOH), was conducted due to processing problems encountered with ion exchange of high sodium fluids.

The reasons for a continually increasing RCS boron concentration were determined through a review of boric acid addition procedures, boron analysis accuracy, and control room log books.

Erratic dissolved gas concentrations were viewed in light of using the two different RCS pressure control systems and the possibility of sample air contamination.

A complete record of "Daily Plant System Sheets" and graphs of hourly values of critical RCS temperature have been, and continue to be, maintained.

2.2.5 REACTOR COOLANT SYSTEM STATUS

At noon on February 11, 1980, a compression type fitting connected to the discharge piping of Make-up pump 1B, failed. The resultant leakage of seactor coolant forced the reactor operator to secure reactor coolant makeup (seal injection) and let down. Loss of approximately 11 gpm make-up and let-down flows had a two-fold effect on the natural circulation cooling of the reactor core.

Approximately 200,000 BTU/hr., of direct cooling is provided by this flow, and the net migration of seal injection from the "B" loop reactor coolant pumps, over to the low point of an "A" loop cold leg, normally adds stability to natural circulation.

To compensate for the loss of MU/let-down flow, the reactor coolant temperature increased slightly (the largest temperature increase was 4° - 6°F) and more heat was rejected through the "A" steam generator to condenser. This latter change took the form of complex cyclic flows in the "A" loop, characterized by a regular set of temperature patterns in an 18 hour period. A decision to reactivate the seal injection mode was made in late February. On the third of March the 1B make-up pump was started and approximately 13 gpm of balanced reactor coolant pump seal injection and let down flow was re-instituted. A return to the reactor coolant patterns, observed prior to securing the pump in February, occurred. On March 20, seal injection and let down were once again secured. An identical pattern, seen on February 11th and 12th was repeated.

2,2,6 REACTOR COOLANT SYSTEM BORON CONCENTRATION STATUS

In accordance with the Technical Specifications, the Reactor Coolant System boron concentration must remain above 3000 ppm.

When the Mini Decay Heat System is started, a quantity of water with boron concentration of 2250 ppm will be injected into the Reactor Vessel. The question arose as to whether or not this would dilute the boron concentration below 3000 ppm in the Reactor Vessel.

Recovery Engineering analyzed the problem by calculating contentration changes over-time. The hydraulic dynamics of the entire system are complex; Recovery Engineering defined the specific design of the fluid system involved as a starting point for more advanced analysis that are currently being performed by GPU/Parsippany.

2.2.7 SOLIDIFICATION STATUS

In accordance with the directives of the USNRC, all waste generated during the TMI-II clean up will be solidified.

An extensive literature search on the current state of the art of radioactive waste solidification involving both spent organic ion exchange resins, and concentrated evaporator bottoms, did not produce satisfactory results. Information tended to indicate that most of the work done was unique and to a specific system. Results from various sources tended to conflict with one another and were incomplete.

A trip was undertaken to the Brookhaven National Laboratory in March allowing extensive discussions. We discovered that the answers to most of our questions do not yet exist in a satisfactory form. For example:

- 1. How to successfully solidify resins, etc.?
- 2. What are the failure mechanisms and corrective actions?
- 3. What methods are to be employed?
- 4. What quality assurance will be used?

A subsequent decision was made to proceed with demonstrator experiments as necessary to determine whether or not we can successfully and expediently use cement as the solidification agent for organic ion exchange resins, particularly those used in EPICOR system.

2.2.8 DECREASING REACTOR COOLANT SYSTEM PRESSURE TO 100 PSIG STATUS

Operational guidance was provided to Plant Operations for lowering RCS pressure. This involved listing prerequisite procedural outlines and alternatives to pressure reduction.

Continuing support is being provided for drafting a procedure. The procedure is completed and is being reviewed by the USNRC.

3.0 SLBTASK C. TECHNICAL PLANNING

3.1 SCOPE

To provide technical planning and support.

3.2 CURRENT ACTIVITIES

- Reviewed the Phase I study and requested clarification of the recommendations regarding containment water level and return water chemistry.
- 2. Reviewed the Phase II study, made comments and coordinated GPU comments.
- Continued the development of detail Flow Charts for Technical Planning.
- 4. Completed studies on tritiated water and submitted a near term plan to the USNRC.
- Published TDR #137 "Water Quality" specifications for discharge of TMI-II waste water:

A. EPICOR II Solidification:

- (1) Published TDR #122 EPICOR II Resin Solidification

 Conceptual Design for Ex-liner Solidification. Wrote

 TDR #146 EPICOR II Resin Solidification Conceptual

 Design for In-liner Solidification. Originated the

 Bechtel person-rem assessment. Solicited proposals

 for solidification demonstration.
- (2) Closed out the feasibility of separating the evaporator solidification system from the evaporator facility as being non-feasible.
- (3) Commenced a study of the total solidification projections.

B. Waste Management:

(1) Continued development of computer software to support solid waste management. Received Bechtel draft Waste Hanagement study and initiated a Structural Waste Hanagement Planning Document. (2) Provided advice to DOE-TIO on waste management activities that are of generic value and may be of industry-wide interest.

4.0 SUBTASK D. BURNS & ROE ENGINEERING

4.1 SCOPE

To provide continuing support for all aspects of Recovery Engineering.

4.2 CURRENT ACTIVITIES

- Prepared engineering change packages for the EPICOR II system to:
 - A. Improve system venting.
 - B. Allow for additional storage of processed water.
 - C. Add instrumentation for improved system control.
 - D. Improve access for system operation.
- 2. Continued engineering support for plant maintenance.
- Prepared the following engineering change packages for the Mini-Decay Heat Removal System:
 - A. Installation of radiation, television, and pump vibration monitoring instrumentation.
 - B. Installation of pump oil supply tubing.
 - C. Performed the finalizing of the system description.
 - D. Supported studies concerning radiation level effects when the system is in operation.
- Prepared engineering change packages to provide fire protection for recovery facilities. Performed initial engineering for a TMI-2 fire door alarm system.
- 5. Provided electrical engineering support for disconnecting the BOP diesel generators.
- 6. Performed engineering to develop the electrical power and distribution for the Submerged Demineralization System.

7. Provided general engineering and administrative support for recovery and plant engineering, by providing TMI-2 design information and engineering interface support to other organizations.

5,0 APPENDIX A - THE EFFECTS OF GAMMA RADIATION ON ION EXCHANGE RESINS AND ACTIVATED CHARCOAL

5.1 STATEMENT OF THE PROBLEM

Solid absorbents and ion exchange materials, used in the decontamination of high level liquid radioactive waste, will receive large radiation doses from the radioactive material which they remove from the waste stream. Radiation damage to the adsorbent material is responsible for the observed effects of loss of exchange capacity and chemical decomposition of the base material.

Since the actual decontamination process is relatively rapid, the loss of exchange capacity due to radiation damage is a minor consideration in the decontamination of liquid rad waste. On the other hand, chemical decomposition of the base material can be a major concern when the highly radioactive adsorbent materials are buried in sealed containers. The possibility that radiation decomposition of adsorbent materials could produce gases, in sufficient quantity to cause over pressurization of burial containers, led to this investigation. Specifically, the goals of this project were to determine the pressure buildup and gas composition as a function of gamma dose in burial canisters of the type being considered for use at Three Mile Island. The purpose of the first part of this investigation was to measure the pressure versus gamma radiation dose, in separate simulated burial containers holding organic cation resin, organic anion resin, and activated charcoal.

The first task in this investigation was to estimate the radiation dose to an absorbent material loaded with TMI high level radioactive waste and sealed in a burial container. The calculation of the estimated radiation dose is given in Appendix B. Once the magnitude of the total dose was determined, the gamma irradiator design was finalized. The details of the Co-60 irradiator and irradiation capsules are given in section 5.2. Finally, the simulated burial containers were irradiated in the Co-60 gamma irradiator in a 5 X 10⁶ rad/hr., field until the total accumulated dose reached 5 X 10⁹ rads or the capsule reached the pressure limit of 200 psig. Pressure versus gamma dose curves are given in section 5.3.

The second part of this investigation was to determine the gas composition inside the resin irradiation capsules at several different dose levels. The gas composition was determined using gas chromotography and the methods and results are discussed in Section 5.4.

5.2 IRRADIATION CAPSULE CONSTRUCTION AND IRRADIATOR DESIGN

In order to meet the time schedule of this project, it was decided that the pressure test and gas chromotograph test capsules should be constructed from commercially available fittings to the maximum extent possible. The construction material chosen was stainless steel in order to match the proposed burial containers as closely as possible. While stainless steel might influence the chemical reactions and be undesirable from a purely scientific point of view, it was a good compromise considering radiation resistance, pressure limitations, chemical reactivity, and the desire to simulate the actual burial containers. In addition, it was required that no organic materials, other than those being tested, be used in any of the units. At the high dose levels involved, organic 0 rings and bellows could breakdown and contaminate the gases or release the gaseous products. All stainless steel valves and pressure gauges were used in the construction of these containers.

Figure 3-1 shows the pressure test capsules. Specifications for the fittings and tubing are given in figure 3-5. The pressure test capsules required an internal stainless steel spacer plug (item 23) to raise the material into the radiation field and to provide the correct material to void ratio. From data supplied by Chem Nuclear Systems it was estimated that the burial containers would have a resin to total volume ratio of 0.875. The pressure test capsule shown in figure 3-1 has a resin to total volume ratio of 0.866. In order to get this ratio as close to the actual ratio as possible, the pressure gauges had to have a small internal volume and had to be connected to the capsule with a minimum 1/8" stainless steel tubing. To keep the tubing connections short, the gauges were located on a rack on the back wall of the hot cell about 5 feet from the capsules. The gauges were outside the most intense radiation field but the glass faces still had to be removed because of radiation darkening. The gauges were Ashcroft 0-200 psi gauges which were calibrated using a dead weight gauge tester. At the inside top of the pressure test capsule there was a stainless steel screen (10 micron openings) to prevent particles from

entering the tubing leading to the gauge. Figure 3-2 shows the details of the top of the pressure capsule and the spacer plug.

To determine the gas composition as a function of the gas chromotograph, capsules shown in figure 3-3 were constructed. As with the pressure test capsules, these were also all stainless steel construction. The resin was weighed into these capsules which had an internal volume of 18.9 cc. The void volume was calculated assuming that the wet resin had a density of 1.1 gm/cc. After irradiation, the samples were removed for analysis using the gas chromotograph sample assembly shown in figure 3-4. The sample assembly was screwed onto the gas chromotograph capsule and evacuated with the capsule valve closed. After evacuation the sample assembly valve was closed and the capsule valve was opened. Samples could then be taken from the septum side arm for analysis by gas chromotography.

The Co-60 irradiator shown in figure 3-6 was assembled to irradiate the test capsules in the Georgia Tech hot cell. The Co-60 was in the form of four plates each containing 6.25 K C1 of Co-60 arranged as shown in figure 3-6. The outside spaces were 1 1/4" wide and the inside space was 1 1/2". The outside spaces held the pressure test capsules and the long term gas chromotograph capsules. Thermocouples were attached to the pressure capsules, the long term GC capsules and several other places on the irradiator. Compressed air was piped into the hot cell and used for cooling the capsules. Before starting irradiation, dose rates were measured at several positions inside the irradiation assembly. The dose rates were measured using Harshaw TL-800 lithium borate thermoluminescent dosimeter. These thermoluminescent dosimeters were calibrated against a Farmer dosimeter, model 2502/3, which had been calibrated using NBS Co-60 at M.D. Anderson Hospital, Houston, Texas. In the outside apace the dose rates were: at the top 3" above center, 4.46 X 106 rads/hr.; center, 5.87 X 106 rada/hr and 3" shove bottom, 4.86 X 106 rads/hr. This gives an average of 5.0 X 106 rads/hr. The center apace for the G.C. capsules had dose rates of 4.3 X 106 rads/hr., at the top; 5.4 X 106 rada/hr., at the center, and 4.60 rada/hr., at the bottom. The average dose rate in the GC sample rack was 4.8 X 106 rads/hr.

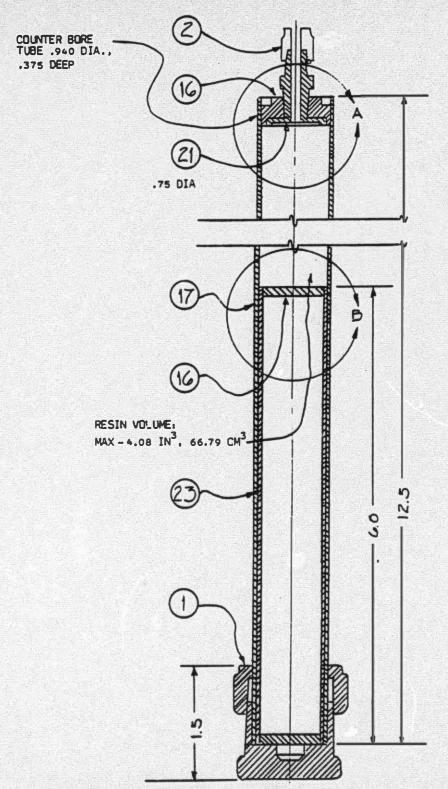


FIGURE 3-1 Section thru Resin Pressure Capsule 3-21

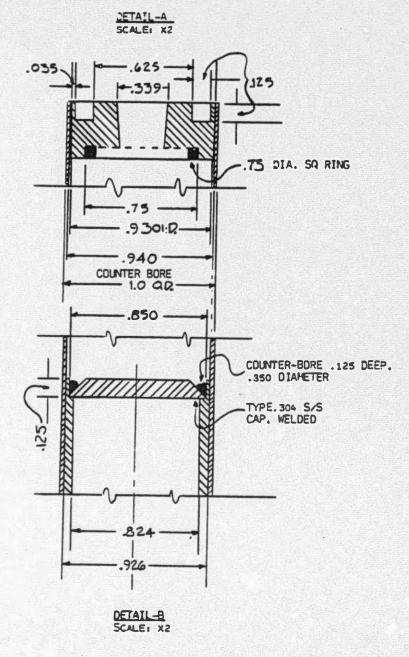


FIGURE 3-2 Detail "A" Enlarged 3-22

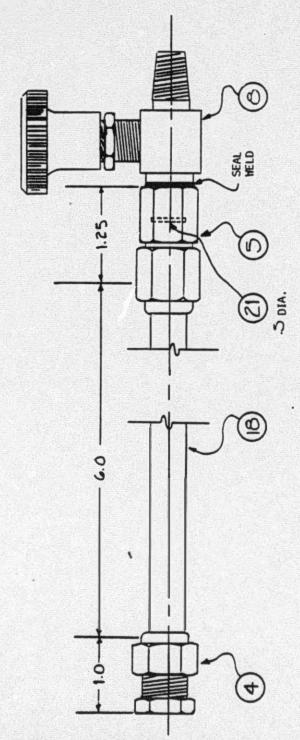


FIGURE 3-3 Gas Chromatograph Capsule 3-23

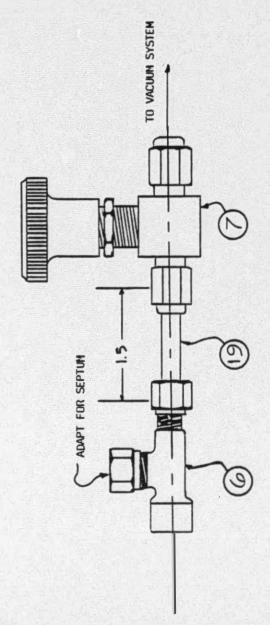


FIGURE 3-4 Gas Chromatograph Sample Assembly

ITEM	QUAN.	CAT PAGE	DESCRIPTION	SWAGELOK
1	8 EA.	20	CAP-1"	SS-1610-C
2	8	7	MALE CONNECTOR	SS-200-1-2
3	8	10	FEMALE CONNECTOR	SS-200-7-4
4	10	20	CAP-1/2"	SS-810-C
5	10	10	FEMALE CONNECTOR	SS-810-7-4
6	10	12	FEMALE RUN TEE 1/4"	SS-400-3-4TF
7	9	NUPRO	H SERIES BELOWS VALVE	SS-4H
8	9	NUPRO 7	H SERIES BELOMS VALVE	SS-4H2
16	4 FT.		1" D. ROUND S/S ROD	
17	9 FT.		1" D.D. S/S TUBE	No. of the second
18	6 FT.		1/2" D.D. S/S TUBE 0.035 HALL SILS	
19	9 2 FT.		1/4" D.D. S/S TUBE 0.035 HALL SMLS	
20	20 40 FT.		1/8" D.D. S/S TUBE 0.032 WALL SMLS	
21	6 EA.		2" SQUARE, 10 MICRON SCREEN S/S	
22	22 7 EA.		2-1/2" D. PRESS. GAGE 0-200 PSI. S/S	
23	23 4 FT.		3/4" S/S PIPE, SCH. 40, TYP. 304	

FIGURE 3-5 Bill of Materials

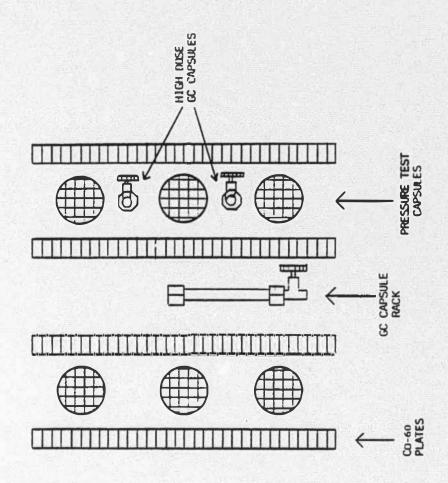


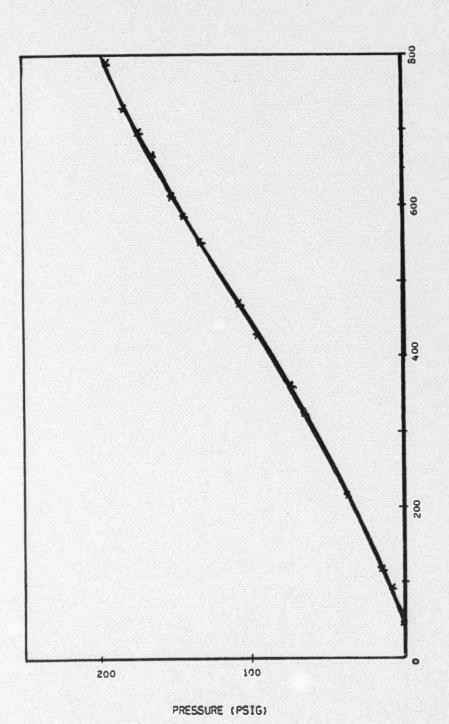
FIGURE 3-6 Co-60 Irradiator

5.3 CAPSULE PRESSURE AS A FUNCTION OF GAMMA DOSE

To simulate the decontamination of TMI liquid radwaste, samples of cation resin (DOW HCR-S), anion resin (DOW SBR-OH) and activated charcoal supplied by Chem Nuclear Systems, were converted to the sodium and borate dorms prior to irradiation. Sodium borate solution was passed through the resin samples until the pH of the effluent from the column was identical to the pH of the original solution. In the case of the activated charcoal, no simple indication of exhaustion could be found. To pretreat the activated charcoal, an amount of sodium borate solution, equal to the amount needed to convert the anion resin to the borate form, was passed through the charcoal sample.

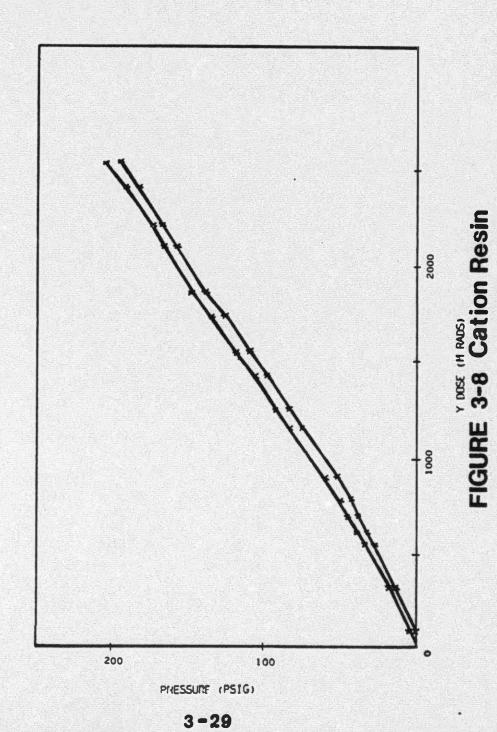
After pretreatment with aodium borate solution, free liquid was removed by pulling air through the column for about 2 minutes. The adsorbent material was then transferred to the pressure test and GC irradiation capsules using a tap fill procedure. Adsorbent loading in the irradiation capsules matched the anticipated loading of the proposed TMI clesn up canisters to within 10%.

The filled capsules were placed in the Co-60 irradiator as above in figure 3-6 and irradiated at 5 X 10 rads/hr., in the Georgia Tech hot cell. The capsule pressure was monitored visually using a monocular sighting through the hot cell window in order not to disturb the irradiation. The capsule temperature was determined using thermocouples with the reader located outside the hot cell. The temperature stabilized within a few hours of the beginning of the irradiation and remained between 30°C and 45°C throughout the teat. The pressure versus gamma ray dose curves for the anion resin, cation resin, and activated charcoal are presented in figures 3-7, 3-8, and 3-9, respectively. The pressure tests on the resin samples were terminated when the pressure reached the limit of the pressure gauge which was 200 paig. Duplicate pressure test capsules containing each of the adsorbent materials were prepared and irradiated. One of the anion pressure teat capsules developed an interval leak in the spacer plug during the irradiation, and the results from that capsule were not reported. The close agreement between the duplicate cation resin testa indicate the reproducibility of the teats.



Y DOSE (M RADS)

3-28



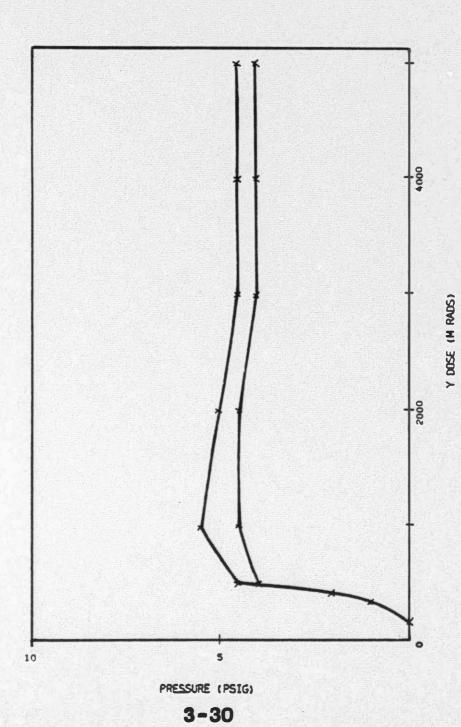


FIGURE 3-9 Charcoal

5.4 GAS COMPOSITION AS A FUNCTION OF GAMMA DOSE

The second part of this study was to determine the composition of the gas inside simulated resin burial containers at several different dose levels. Only the ion exchange resins HCR-S and SBR-OH were tested since it was anticipated that no significant pressure would develop inside the charcoal containers.

The gas chromotograph irradiation test capsules (figure 3-2) were filled with pretrested ion exchange resin using the same procedure as was used for the presaure test capsules. The loaded gas chromotograph sample capsules were sealed and placed in the Co-60 irradiation facility (figure 3-6) for the prescribed amount of time. Separate irradiations were performed to obtain each point since the sampling operation disturbed the resin to void volume ratio. After the irradiation the gas chromotograph sample assembly (figure (3-3) was screwed onto the GC sample capsule valve. With the capsule valve closed, the sample assembly was evacuated, the valve leading to the vacuum pump was closed, and the sample capsule valve was opened to allow the radiolyaia gases to enter the sample assembly. Samples for gas chromotographic analysis were taken from the septum side arm of the sample assembly using gas tight syringes equiped with pressure lock valves. Only the gas phase of each sample was analyzed. In the high dose samples, there was a large liquid phase which approached one half of the total volume of the original resin sample. The total volume of the capsule and the interior of the valve was 18.9 cc. The free volume of the volume of the resin loaded capsule was estimated by assuming the wet resin had a specific gravity of 1.1, calculating the volume of the wet resin, and subtracting from the total. The pressure inside the capsule plus sample assembly was calculated using the preasure versus dose curve to obtain the pressure inside the capsule and allowing for expansion into the 3.1 cc sample assembly. Since the volume of sample taken for analysis could be determined from the syringe, and the pressure was calculated as above, the volume of sample could be corrected to standard pressure and quantitiative analysis could be accomplished using comparison standards.

The samples were analyzed for hydrocarbon gases using a Tracor 220 gas chromatograph with a flame ionzation detector. For the hydrocarbon analyses the column was 1/4" x 6" stainless steel packed with a chemically bonded support n-octane/porasil C. 200/120 mesh. Separations were performed isothermally with the column at 36°C and the inlet at 90°C. The carrier gas was nitrogen at a flow rate of 23cc/min. The chromotgraph was calibrated using mixed hydrocarbon gas standards obtained from Supelco Inc.

The major hydrocarbon gases detected in both the cation and anion capsules were the straight chain, saturated hydrocarbons methane, ethane, and propane. Small amounts of butane were detected in the cation capsules. Very small traces of an unidentified (possibly branched chain and/or unsaturated) hydrocarbon compound were detected in the high dose anion capsule. The results of the hydrocarbon analyses are given in figures 3-10, 3-11, 3-12, and 3-13. Samples from each of the capsules were analyzed for amine and nitrogen gases using the Tracor: 220 gas chromatograph. The column was 1/4 x 6" stainless steel packed with Pennwalt 223 amine packing. Significant amounts of amines were not detected in these samples.

Hydrogen was determined in each of the samples using a portable gas chromotograph (pre-production prototype) manufactured by Zethus Research Corporation. The column was 1/8" x 36" stainless steel packed with Porapak R and the Carrier was air at a flow rate of 9cc/min. The system was calibrated using hydrogen/nitrogen mixtures obtained from Supelco Inc. Figure 3-14 shows the results of the H₂ determinations.

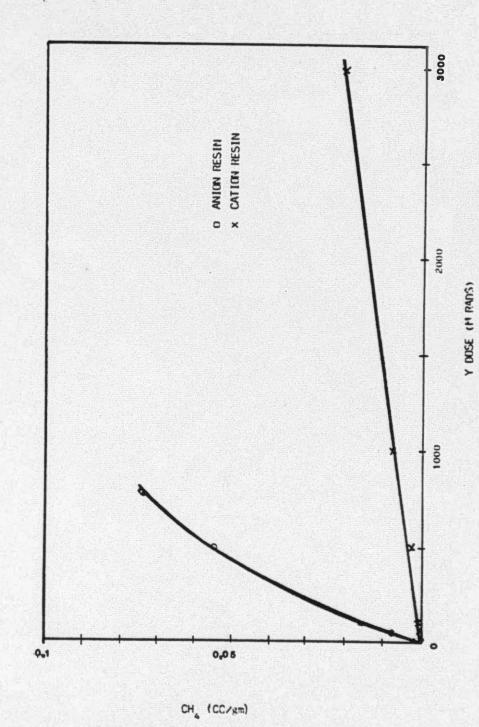


FIGURE 3-10 Methane Production

3-33

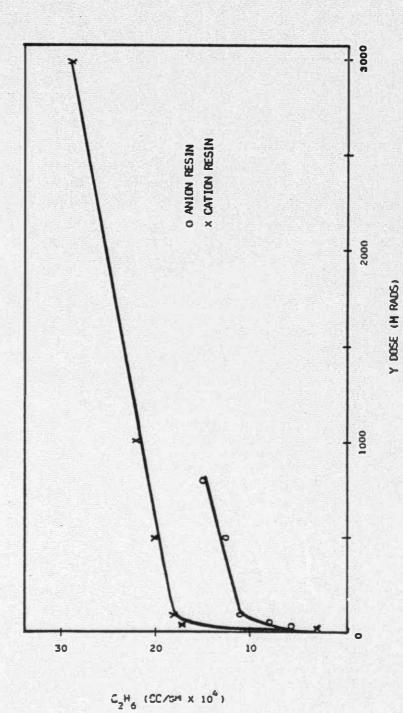


FIGURE 3-11 Ethane Production

3-34

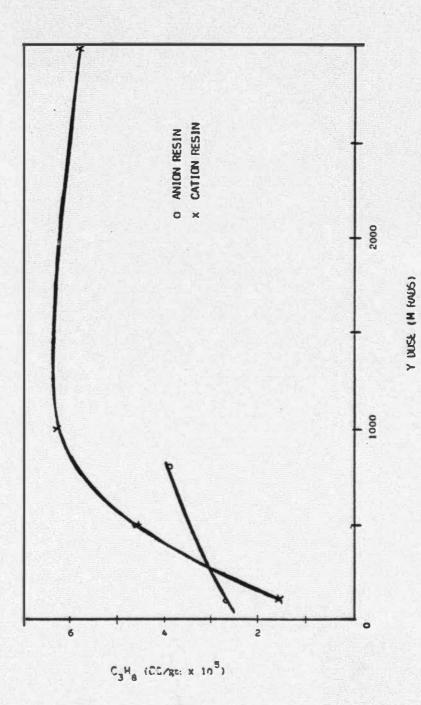


FIGURE 3-12 Propane Production

3-35

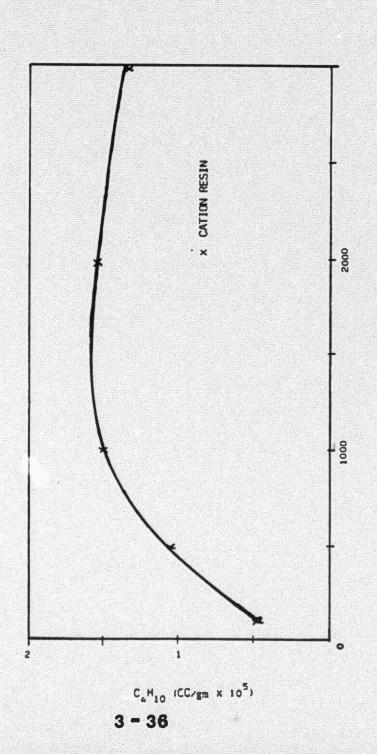


FIGURE 3-13 Butane Production

Y DOSE (M RADS)

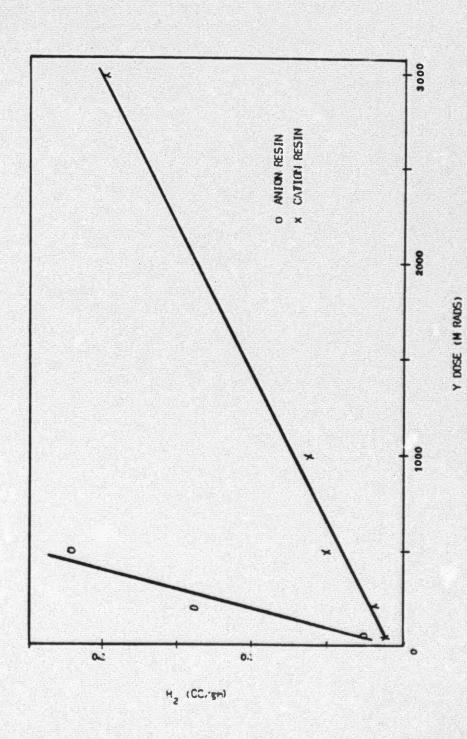


FIGURE 3-14 H₂ Production

3 - 37

6.0 APPENDIX B - CALCULATION OF DOSE TO BURIED ADSOPBENT MATERIAL

Container Dimensions - h=136 cm, r=30.5 cm

Resin Load/Container - 10ft³ - 2.84 X 10⁵cm³

Assumed Activity Loading (per container)

420 C1 Ce-137

50 C1 Cs-134

70 C1 Sr-90

120 C1 Ce-144

6.1 Beta Dose.

Dose Rate =

(Q Ci) (3.7.10¹⁰dps/Ci) (E MeV) (1.6 X 10⁻⁶ergs/MeV) (3600 /3c/hr) (Wgme) (100 ergs/gm/rad)

Assume:

Resin Density = 1gm/cc, or 2.84 X 105 gms Resin per Container

Dose Rate From Ca-137 6

B1 1.18 MeV - 6.0%

82 0.514 MeV - 93.5%

0.557 MeV Average Maximum Energy (Weighted Average)

0.186 MeV Average Beta Energy (Branching Factor 1/3 X 0.537)

DR = (420C1)(3.7 X 10¹⁰dps)(0.186 MeV)(1.6 X 10⁻⁵ergs/MeV)(3600sec/hr) (2.84 X 10⁵gma)(100 ergs/gm/rad)

= 586 Rads/Hr

 $\lambda = 0.0231 \text{ yr}^{-1} \text{ or } 6.326 \text{ } \text{x} \text{ } 10^{-5} \text{day}^{-1}$

Ten Year Dose $D_{10} = \frac{(586 \text{Rads/Hr})(24 \text{hr/day})(1 - e^{-\lambda 3652.5})}{6.326 \times 10^{-5} \text{day}^{-1}}$

- 4.60 X 10 Rade

D = (586 Rads/Hr)(24 hrs/day)6. 326 x 10⁻⁵

= 2.22 X 10⁸ Rads

Dose Rate From Cs-1348

B1 0.662 MeV 71%

62 0.089 MeV 28%

0.495 MeV Average Maximum Energy (Weighted Average)

0.165 MeV Average Beta Energy (Brenching Factor 1/3 X 0.495)

DR + (50)(0.165)(7.50)

= 62Rade/hr

Cylinder r=30.5 cm, h=136 cm; g ~150 assumes tissue eq ivalent.

Dose Rate = C f g Rada/hr, Where
C = m Ci/Cm³

T = gamma ray constant
8 = average geometry factor

Dose Rate From Cs-137 r	
r = 3.3 Rads Cm ² /hr - mCi	
DR= $(3.3)(4.2 \times 10^5 \text{ mC1})(150)$ 2.84 × 10^5Cm^3	- 832 Rads/hr
D ₁₀ "	5.74 X 10 ⁷ Rads
D∞ =	2.80 X 10 ⁸ Rads
Dose Rate From Ca-134 [
Γ = 8.7	
$DR = \frac{(5 \times 10^4 \text{mCi}) (817) (150)}{2.84 \times 10^5 \text{ cm}^3}$	= 230 Rads/hr
D ₁₀ =	5.75 X 10 ⁶ Rads
D∞ =	5.95 X 10 ⁶ Rads
Dose Rate From Sr-90 - Gamma Dose Is Zero	
Dose Rate From Ce-144 [
r = 0.4	
DR= $\frac{(1.2 \times 10^5 \text{ mC1})(0.4)(150)}{2.84 \times 10^5 \text{ cm}^3}$	* 25.4 Rads/hr
D ₁₀ =	2.49 X 10 Rads
D∞ =	2.52 X 10 ⁵ Rads
Total Gamma Dose	
$\overline{D_{10}} = 5.74 \times 10^7 + 5.75 \times 10^6 + 0 + 2.49 \times 10^5$	= 6.34 X 10 Rads
$p= = 2.80 \times 10^8 + 5.59 \times 10^6 + 0 + 2.52 \times 10^5$	= 2.86 X 10 ⁸ Rads
Total Dose - Beta and Gamma	
$^{D}10^{=D}10^{\beta}total + ^{D}10^{\gamma}total$ = 9.56 x 10 ⁷ + 6.34 x 10 ⁷	= 1.59 X 10 ⁸ Rads
	- 1137 A 10 Rads
D= = D=β _{total} + D∞ Υ _{total}	
$= 4.08 \times 10^8 + 2.86 \times 10^8$	- 6.94 X 10 ⁸ Rads

6.4

6.5

SECTION 4 OPERATIONS AND MAINTENANCE

1.0 SUBTASK A. PLANT ENGINEERING

1.1 SCOPE

1.1.1 REACTOR BUILDING PURGE

Provide engineering support to the Special Projects group for the purge program.

1,1.2 IN-PLACE RECOVERY SYSTEMS AND PRE-ACCIDENT PLANT SYSTEMS

Provide engineering support to operations and maintenance to solve problems encountered during operations and maintenance. Define required design modifications. Prepare operations and test procedures.

1.1.3 PLANT FIRE PROTECTION

Provide engineering support for plant fire protection systems and procedures. Interface with insurance organizations. Prepare design criteria for new systems, and modifications to existing systems.

1.1.4 RECOVERY SYSTEMS

Provide engineering support to Recovery Engineering during the development of design criteria, and a review of system designs from operations and maintenance viewpoint.

1.1.5 PLANT CHEMISTRY AND RADIOCHEMISTRY

Obtain liquid and gas samples from plant systems and facilities to support plant operations and special projects. Analyze samples chemically and perform radioactive counting. Evaluate and report results.

1.1.6 START-UP AND TEST

Provide start-up and test services for new recovery systems.

1.2 CURRENT ACTIVITIES

1.2.1 REACTOR BUILDING PURGE STATUS

Calibration procedures for the stack and purge line radiation monitors, to be utilized during the purge process were prepared. Containment isolation valve operability was confirmed. A revised procedure for sampling and analysis of the reactor building atmosphere was prepared.

1,2,2 IN-PLACE RECOVERY SYSTEMS AND PRE-ACCIDENT PLANT SYSTEMS STATUS

1.2.2.1 STANDBY PRESSURE CONTROL SYSTEM

This system is operational and has been used intermittently for RCS pressure control. The small variable charging pump has incurred periodic packing failure. A replacement pump of different design is being investigated. Provisions for taking total gas samples at the system interface with the makeup system are being made.

1.2.2.2 EMERGENCY DIESEL GENERATOR MAINTENANCE

Scheduled maintenance and testing of the in-plant emergency diesel generator was completed.

1.2.2.3 WASTE GAS COMPRESSOR

An evaluation of the previous failure of the Waste Gas Compressor was performed. As a result, operating procedure revisions were instituted.

1.2.2.4 REACTOR BUILDING WATER LEVEL MEASUREMENT

Installation of an alternate method for reactor building water level measurement (manometer) was completed and successfully tested. Results to date are consistent with the previous procedure (pressure measurement on the building sump recirculation line).

1.2.2.5 STEAM GENERATOR WATER LEVEL MEASUREMENT

The back-up steam generator water level measurement systems were modified to provide a more accurate reading and more useable indication.

1.2.2.6 HEATING AND VENTILATION SYSTEMS

DOP efficiency testing of the auxiliary building and fuel handling building HEPA filters was performed.

1.2.3 PLANT FIRE PROTECTION STATUS

An update to the Fire Protection Plan, considering present plant conditions, is currently in preparation. Installation of the fire protection system for the solid waste storage facility, south of the plant, is nearing completion. Engineering for an associated, remote fire alarm was completed. Evaluation of cracking in "Firewall 50" barriers continues.

1.2.4 RECOVERY SYSTEMS STATUS

1.2.4.1 MINI DECAY HEAT SYSTEM

Instrument calibration packages were completed. Operating and emergency procedures, and alarm responses were issued for review.

1.2.4.2 SUBMERGED DEMINERALIZER SYSTEM (SDS)

The instrument list was reviewed. Requirements, to ensure conformance of instrumentation hardware and software to existing plant standards, were reviewed with Chem Nuclear.

1,2,4,3 SYSTEM DESIGN CONCEPTS

Deaign concepts for power distribution to SDS, waste evaporation, and other temporary and permanent recovery facilities, were developed with Bechtel Corporation.

1,2,4,4 DIESEL GENERATORS AND 13,2 KV TRANSFORMERS

Technical evaluation report, revisions to blackout procedures, and load dispatching procedures were prepared, in support of disconnection and removal of the "BOP" Diesel Generators and 13.2 KV backup transformers.

1.2.5 PLANT CHEMISTRY AND RADIOCHEMISTRY STATUS

Construction is nearing completion on the expansion to the gamma spectroscopy facility on the turbine deck.

Engineering was completed for installation of an on-line oxygen monitor for reactor coolant sampling.

1.2.6 START-UP AND TEST STATUS

Start-up of the Standby Pressure Control System was completed, with turnover to operations. Testing of the Temporary Sampling System and Mini Decay Heat Systems were completed, with the exception of final leak testing, delayed by design modifications.

2.0 SUBTASK B. PROCESS SUPPORT

2.1 SCOPE

The Process Support group provides overall guidance to Plant Operations in the area of radioactive water processing. Within this responsibility, other more specific tasks are identified:

- Water processing scheduling includes planning and coordination of contaminated water transfers, to accomplish cleanup expeditiously.
- Shift Radwaste Engineering provides operations advice, on an around-the-clock basis for the Operations group. This includes data analysis of all water movement and processes.
- Recovery Systems Engineering provides design, design review, construction management, operational review and performance evaluation, of systems associated with water processing and radioactive material handling.

- 4. Radioactive Material Shipment Engineering includes evaluating compliance requirements with NRC/DOT regulations for radwaste shipments. Radioactive shipments of samples and waste are prepared for transport. These shipments are coordinated and monitored to ultimate destination.
- 5. Respirators and anti-contamination clothing are processed for re-use by Support Services. These articles are picked up at predetermined check points, cleaned to required standards and returned to the check points.

2.2 CURRENT ACTIVITIES

2.2.1 FUEL POOL WASTE STORAGE SYSTEMS STATUS

2.2.1.1 SYSTEM FUNCTION AND DESIGN OBJECTIVES

This Fuel Pool Waste Storage System is used for temporary storage of liquid waste. These tanks add approximately 110,000 gallons to the present storage capacity of the plant, and are located within the "A" spent fuel pool. These tanks can be filled with liquid waste from the Reactor Building Sump and the Miscellaneous Waste Hold-Up Tank. This system enhances the capability of the plant to move and process radioactive waste.

2.2.1.2 SYSTEM DESCRIPTION

The system consists basically of upper (4 at 15,000 gallons each) and lower (2 at 25,000 gallons each) tanks, forming two separate storage areas. Either storage area is capable of being filled from either the Reactor Building Sump or the Miscellaneous Waste Hold-Up Tank, and each has level indication. The tanks are protected from over-filling by automatically closing the feed valve when the storage area is nearly full. Provisions have been made to both flush the piping system after completion of the pumping operation, and to drain the piping system as required.

The vents from the tanks and the stand pipes are directed through a dryer and a charcoal filter, to remove moisture and iodine before proceeding to the fuel pool ventilation system. The tanks and vent system is protected by a relief valve which vents through a parallel set of dryers and charcoal filters.

The tanks will be emptied as necessary by steam eductors. Two eductors are permanently installed in each stand pipe.

2.2.1.3 SYSTEM OPERATION

Water is transferred from the Reactor Building Sump of the Miscellaneous. Waste Storage Tank to the tank farm. After either the lower set of tanks or upper set of tanks is full, the level controllers automatically close the air operated inlet valves.

Air forced from the tanks during the filling process is vented to a charcoal filter & dryer to remove moisture and iodine. This air is then piped to the Fuel Pool Ventilation System.

The steam eductors give the capability to transfer waste water from the tank farm to the Miscellaneous Waste Storage Tank or EPICOR II Rad Waste System, from the upper tanks to the lower tanks in the tank farm (or vice versa) or to recirculate the water in the tanks.

A high temperature alarm, and temperature switch to close the steam control valve, is installed in the tank vent line to prevent damage to the filter/dryer skids during use of the eductors.

2,2,1,4 SYSTEM STATUS

The system is being used to store 93,000 gallons from the Unit 2 Miscellaneous Waste System. The steam eductors have not been used, since no water has been pumped out of the tanks to date. The water in the tanks falls in the intermediate activity category. Shielding has proven highly adequate, and access above, and adjacent to the "A" Spent Fuel Pool, is unrestricted.

2.2.2 LIQUID RADIOACTIVE WASTE PROCESSING SYSTEM TITLED "EPICOR II" STATUS

2.2.2.1 SYSTEM FUNCTION AND DESIGN CRITERIA

The system is designed to cleanup radioactive liquids so as to produce water capable of being released from Three Mile Island. Cleanup includes removal of radioisotopes and chemical constitutents, to comply with Plant Technical Specifications for water releases to the Susquehanna River. The design is optimized with respect to ALARA considerations.

Instrumentation and controls are provided for monitoring system performance. Water flows are monitored where the values are critical to the process and/or system safety. Inline monitoring and comprehensive sampling system are provided, for thorough analyses of system water cleanup performance. Radiation and airborne monitoring equipment is provided for analysis of activity levels.

Shielding is being provided to minimize exposure related to the operation of this system.

An HVAC subsystem is utilized to cleanup and monitor any gases that might be released from the liquid processing system. It is the goal to minimize gas releases from the system, however, should they occur, they will be cleaned to reduce any releases to the environment. Monitoring of the air exhaust will continue to detect any potential radioactive gas. A slight negative pressure is maintained to ensure building inleakage is maintained. The system is being optimized with respect to ALARA considerations.

2.2.2.2 SYSTEM DESCRIPTION

2.2.2.2.1 LIQUID PROCESSING

The TMI Station Chemical Cleaning Building is used to house the system along with the existing tankage and sump existing in that building. Piping and pumps are provided for water movement through cleanup vessels. The system is composed of a pre-filter, two demineralizers and an after-filter. The pre-filter and demineralizers are designed for ease of

hookup and disconnect to allow for quick installation and remote, reliable removal.

2.2.2.2.2 GAS PROCESSING

The primary components are a fan, an air cleanup filter train, and necessary ducting. The main HVAC components are located external to the Station Chemical Cleaning Building, but are enclosed in their own shelter.

2.2.2.3 SYSTEM OPERATION

The Auxiliary Building Emergency Liquid Cleanup System consists of a vendor supplied, liquid radwaste process system which is located in the Chemical Cleaning Building. The system is designed to decontaminate, by filtration and ion exchange, approximately 400,000 gallons of radioactive waste water contained in the Auxiliary Building of TMI-2. Contaminated water is being pumped from a connection located on the Miscellaneous Waste Holdup Tank (WDL-T-2), by a pump located on the Chemical Cleaning Building, through the yard and into the process system. Yard piping is enclosed within a guard pipe, the end of which terminates inside the Chemical Cleaning Building.

Decontaminated water is delivered to the Clean Water Receiving Tank (CC-T-2) for sampling and analysis, and pumped to the Liquid Waste Disposal System of TMI-2 for storage if within specs. Otherwise, it is transferred to the Off Spec Water Receiving Batch Tank (CC-T-1) for recycling through the process system. Capability also exists to discharge to a tank truck and the TMI-2 "B" Spent Fuel Pool. CC-T-1 may also be used for storage.

The Chemical Cleaning Building (CCB) has been made into a low leakage, confinement building, and provided with an exhaust ventilation system to maintain the building at a negative pressure. HEPA and charcoal filtering is provided on the ventilation system, which discharges to a local stack at the roof line of the CCB where all effluent air is monitored for radioactivity.

Normal operation of the processing system is by remote means except for infrequent operations, such as sampling and chemical addition.

All remote system operations are controlled from the TV Monitor Control Building, located outside the northwest corner of the Chemical Cleaning Building.

Remote handling of spent resin containers, from their position inside the Chemical Cleaning Building to the transport cask and truck, are provided.

The system interfaces with the TMI-2 Radwaste Disposal Miscellaneous Liquids System, the TMI-2 Liquid Waste Disposal System, Demineralized Water System and the Service Air System.

2.2.2.4 SYSTEM STATUS

The system is operating successfully and has processed approximately 166,000 gallons. A total of thirty-four (34) spent resin liners have been used and are in the waste staging area. Processed water is stored in CC-T-1, Evaporator Condensate Test Tank B and Spent Fuel Pool "B".

During the month of January, the system underwent extensive testing to identify specific chemistry related problems. Upon completion of this testing, the system was started up and resumed processing. Due to information gathered during testing, system performance was significantly improved.

PROCESSING PERFORMANCE TABLE (BATCH 26)

Inlet (pc	[/ml)	Effluent (pci/ml)
	31.65	< 5.586 x 10 ⁻⁶
Cs 134	5.974	$< 7.541 \times 10^{-6}$
Sr 89	0.25	2.79 x 10 ⁻⁶
Sr 90	0.48	5.37 x 10 ⁻⁶

Highly successful processing of the "A" Reactor Coolant Bleed Tank was completed. This was the highest activity water in the Auxiliary and Fuel Handling Building.

- 1. Processing rate --- over 2 gpm (Highest to date)
- 2. Man Rem exposure per gallon processed —— .021 (Lowest to date)
 An outage was begun on March 14, for the purpose of system modification.
 The modification will enhance system reliability and provide greater processing flexibility.

2.2.3 STAGING FACILITIES FOR DEWATERED RESINS AND EVAPORATOR BOTTOMS STATUS

2.2.3.1 WG-21 - INTERIM SOLID WASTE STAGING FACILITY

2.2.3.1.1 SYSTEM FUNCTION AND DESIGN CRITERIA

Facilities are needed to stage dewstered radioactive resin and filters, generated by EPICOR I and EPICOR II until they can be shipped to a burial site. WG-21 provides space for this staging.

2.2.3.1.2 SYSTEM DESCRIPTIONS

The facility consists of 16-54" dismeter cells and 12-84" dismeter cells to receive 4' X 6' and 6' X 6' resin liners. The cells are installed in the Unit-2 cooling tower desilting basin, backfilled for shielding and capped with 3' thick concrete plugs.

2.2.3.1.3 SYSTEM OPERATION

Eight (8) EPICOR I Resin Liners, one (1) EPICOR I Prefilter, and one (1) smaller resin liners (used to remove trace activity and fluorescein dye) are staged in the facility. Sixteen (16) EPICOR II resin liners and one (1) Unit 1 used precoat liner are also staged in the facility.

2.2.3.1.4 SYSTEM STATUS

The interim solid waste staging facility is operational. Additional shielding (lead bricks) was installed along the interface, between the cell ver and facility top, to provide shielding due to streaming on some of the cells that are loaded. Readings are below the 5 mr/hr design criteria. All but one 4 X 4 and one 6 X 6 cell are filled. We have commenced shipment to the burial site from the cells.

2.3.2 WG-22 SOLID WASTE STAGING FACILITY

2.2.3.2.1 SYSTEM FUNCTION AND DESIGN CRITERIA

Facilities are required to stage the following radioactive wastes until they can be shipped to a burial site:

- 1. Dewatered radioactive resins from EPICOR I.
- 2. Dewatered radioactive resins from EPICOR II.
- Dewatered radioactive resins or solidified evaporator bottoms from systems used to process water more radioactive than that processed by EPICOR I or EPICOR II.

The sump meets the seismic requirements of USNRC Regulatory Guide 1.143. Contact readings on the sides of the facility will be less than 0.5 mr/hr and less than 2.5 mr/hr on the top.

2.2.3.3 SYSTEM DESCRIPTION

The facility is designed as a modular one. Each module consists of 60" - 84" diameter cells imbedded in concrete capped with 3' thick concrete plugs. Each cell has a drsin line to a sump which will serve three modules. The sump is designed to collect any leakage from liners installed in the cells and meets the seismic requirements of USNRC Regulatory Guide 1.143.

2.2.3.4 SYSTEM OPERATION

Module A is complete with 27 cells in use.

2.2.3.5 SYSTEM STATUS

Module A is operational:

- 1. First liner in Module A January 8, 1980.
- 2. As of March 31, 1980, there were thirty (30) liners in the A Module.

Radiation levels are as expected.

Work is underway on Module B:

1. Scheduling B Module is in progress; integrating expected liner generation rate with construction rate.

2.2.4 NUCLEAR SAMPLING SYSTEM STATUS

2.2.4.1 SYSTEM FUNCTION AND DESIGN OBJECTIVES

This nuclear sampling system is to be used as a temporary liquid waste sampling facility, to allow TMI-2 recovery operations to continue without interfering in the normal operations of TMI-1, when that unit is returned to service. It will provide a single controlled station, whereby fluid samples may be taken from tanks otherwise inaccessible for local sampling, and/or from tanks that require frequent sampling for analyses of chemical and radiochemical content. Included in the sampling scope will be capability for representative samples of TMI-2 Reactor Coolant from the pressurizer steam or water space or upstream of letdown coolers, and from the Mini-Decay Heat System; samples from the three TMI-2 Reactor Coolant Bleed Tanks, TMI-2 Miscellaneous Waste Hold-Up Tank and the Fuel Pool Waste Storage System, containing liquid waste from both the TMI-2 Reactor Building Sump and Miscellaneous Waste Hold-Up Tank. Provisions have also been provided in the system for monitoring of boron concentration in the reactor coolant.

2.2.4.2 SYSTEM DESCRIPTIONS

TMI-2 Sample Lines, which presently run into TMI-2 sampling area, shall be rerouted to a new sample sink which will be located in the Fuel Handling Building 305' elevation of TMI-2. In an adjacent room, the so-called "model room" a boronometer shall be installed.

The system shall provide for adequate recycle, purge and return of waste liquids. Purging of radioactive piping shall be performed prior to installation of new sample lines.

Drainage from the sample sink will be routed to the Fuel Pool Waste Storage System. A shielded bottle to collect drainage will also be provided. All piping, valves and components of the sampling system will meet the design conditions of the system with which they are associated, or will meet 150 psig and 200°F. Primary coolant sampling points will have the design condition of 2500 psig and 670°F up to valve SNS-V-70.

Air exhausted from the sample hood will be filtered through charcoal and HEPA filters, and discharged to the Auxiliary Building ventiliation system exhaust ductwork.

2.2.4.3 SYSTEM OPERATION

Samples from the Reactor Coolant, Mini Decay Heat Removal and Fuel Pool Waste Storage Systems, can be collected by in-line sample containers. All samples may be taken as grab samples. In addition, a boronometer is provided to monitor the boron concentration in the primary coolant, circulating in the sample lines. A separate loop, with its own pump tank, is provided to limit fluid temperatures at the boronometer inlet, and to limit reactor coolant grab sample temperatures.

Sample lines from the Reactor Coolant System and the Mini Decay Heat Removal (MDHR) System, are purged either to the Bleed Hold-Up Tank or to the TMI-2 Miscellaneous Waste Hold-Up Tank. Sample Lines from the Fuel Pool Waste Storage System are purged first, on a continuous cycle within the storage system standpipes, and then on a batch basis to the sample sight bottles from which the water is returned to the waste storage system. Sample lines to the sample hood sink are purged through the sink to sample waste container SNS-T-1, which may be drained to the sample sight bottle by drawing a vacuum. From there, the water is returned to the Fuel Pool Waste Storage System.

The sample hood and room are ventilated by a filtered ventilation system which draws air from the hood and the room and exhausts to the Auxiliary Building ventilation system.

Containment isolation valves are operated from the TMI-2 Control Room (Containment Isolation Panel 15). For the reactor coolant and radwaste samples, some valve control is from Panel 329 in Unit 1 at the original nuclear sampling station. For the Fuel Pool Waste Storage

System, some local valve operation is necessary at the fuel pool. An intercom station operation is necessary at the fuel pool. An intercom station is provided in the sample room to coordinate sampling operations.

Valves, at or near the sample hood, are all manually operated. Pressure and temperature instruments and flow meters, at or near the hood, are read locally.

All liquid samples collected in containers are analyzed elsewhere, either in TMI-1 or offsite.

2.2.4.4 SYSTEM STATUS

The system design is essentially complete. Construction is in progress and will be completed in early 1980.

A start-up and test procedure was written to verify system construction and operation. Modifications were done to enhance system operability.

2.2.5 SOLID WASTE STATUS

Solid Waste, in the form of LSA boxes and LSA drums, continues to be generated and shipped as possible. The generation rates for the first quarter of 1980 are:

LSA Boxes 15 Boxes/Month
LSA Drums 85 Drums/Month

These continue to be stored onsite until shipment for disposal occurs.

Specifically tailored training of personnel involved in generating and handling this waste, has been implemented this quarter to reduce the volume of waste. Volume reduction of waste has been a key objective and continues to be a goal of the Waste Management Group.

Shipment of waste has not been allowed since mid February. Completion of training requirements is in progress to gain necessary NRC approval to reestablish shipment.

3.0 SUBTASK C. DECONTAMINATION

3.1 SCOPE

3.1.1 DECONTAMINATION OF AUXILIARY AND FUEL HANDLING AUILDING

The decontamination basis for the Auxiliary and Fuel Handling Building is to achieve less than 1000 DPM contamination levels in all areas and to reduce radiation levels to within design levels.

3.2 CURRENT ACTIVITIES

3.2.1 DECONTAMINATION STATUS

- Decontamination of open areas (corridors, stairwells, etc.)
 is 89% complete. Contamination levels on the 328' and 305'
 elevations have been reduced to less than 1000 DPM, and
 general radiation levels are less than (1) mR/hr. Contamination of the 280' 6" elevation is less than 2000 DPM, and
 general radiation levels are less than one (1) mR/hr.
- 2. Decontamination of cubicles continued, with the following cubicles deconned to less than 1000 DPM:
 - a. Spent resin A&B cubicles.
 - b. Spent resin transfer pump cubicle.
 - c. Waste gas compressor A&B cubicles.
 - d. Waste gas filter cubicle.
 - e. Valve rooms associated with the waste gas system.
 - f. Deborated demineralizer cubicles.
 - g. Valve rooms associated with the deborated demineralizer system.
 - h. Spent fuel demineralizer cubicle.

Cubicle decontamination is seventy-five (75%) percent complete.

- Fifty (50%) percent of the floor drain covers and drain bells were removed and the drain inlets deconned in preparation for hydrolasing the drain lines.
- 4. An additional one thousand eighty (1,080) gallons of decontamination solution has been solidified during this report

period. The generation of decontamination solution waste diminished to approximately one hundred fifty (150) gallons with the use of processed water and hydrolasing.

- 5. Four (4) tanks were inspected for aludge accumulation and were found to be clean. The tanks were:
 - a. Evaporator condensate test tanks A&B.
 - b. Contaminated drain tanks A&B.
- 6. The Auxiliary Building sump tank was sampled for sludge and was found to be free of same. A test was run on the inside walls of the tanks by hydrolasing areas inside the tank. It was determined by this test that the hydrolaser removed the contamination from the areas tested, indicating that the tank internals can be decontaminated utilizing this technique.
- 7. The area where the hydrogen recombiner was removed from TMI-2 was decontaminated. The control panel was released. The hydrogen recombiner is being decontaminated for removal.

4.0 SUBTASK D. PLANT MAINTENANCE

4.1 SCOPE

The objective of the TMT-2 Maintenance Department is to repair, replace, calibrate and maintian plant equipment in an operable condition.

To this end, Met-Ed personnel are disciplined in Electrical, Mechanical, Instrument and Controls, and Utility (general labor) Departments. These Departments are further divided into Corrective, Preventive and Layup Maintenance sections to address the varied facets of a compalte maintenance program. Should additional manpower be required, the Departments are supplemented by outside contractor personnel.

4.2 CURRENT ACTIVITIES

4.2.1 AUXILIARY BUILDING VENTILATION SYSTEM STATUS

Three, of the four Auxiliary Building ventilation exhaust fans, were out of service at the beginning of the quarter. The objective was to

have all four fans back in service.

The "A" train of the exhaust system is now in service. The "B" train is presently out of service while installing a refurbished fan motor.

4.2.2 EQUIPMENT LAYUP STATUS

Work continued on plans, procedures and schedules for the systematic layup of equipment that will be removed from service during the recovery period.

A detailed turbine layup schedule has been prepared. Plans are now being formulated for the balance of the secondary plant. No real implementation of the layup plans can be accomplished until an alternate means of core cooling is established.

4.2.3 NUCLEAR SERVICE RIVER WATER PUMP STATUS

The "B" and "D" pumps are presently out of service. These and all other deep well, vertical pumps have had problems generically on both units.

Currently, repairs cannot be made until replacement parts are received. Parts are due to ship in April. Rebalancing has been completed to the maximum extent possible without replacement parts. Engineering is evaluating the generic problems associated with these pumps.

4.2.4 WASTE GAS COMPRESSOR STATUS

The Waste Gas Compressor is currently out of service, awaiting ordered replacement parts for repair.

4.2.5 NEW PROJECT INSTRUMENTATION STATUS

Ongoing support, such as calibration and recording baseline data for Mini Decay Heat System instrumentation, EPICOR II instrumentation, and in plant radiation monitors, continued during this quarter.

4.2.6 PREVENTIVE MAINTENANCE STATUS

Work continued on developing and implementing programs for scheduled inspections and preventive maintenance of equipment, as recommended by vendors or from past experience, for specific equipment. Annual emergency diesel inspections have been completed, as have electrical inspections per industry bulletin, oil and grease changes, meggering of electrical equipment and IRD vibrational analyses of rotating equipment.

SECTION 5 RADIOLOGICAL CONTROLS

1.0 SCOPE

The objective of the Radiological Control Department is to develop and administer a strong, efficient Radiological Control Program in support of the recovery activities at TMI-2. The specific actions planned to achieve this objective are documented in the Management Plan for TMI-2 Radiological Control Program (Appendix A). The objectives for each group within the Radiological Control Department are presented below.

1.1 RADIOLOGICAL TECHNICAL SUPPORT GROUP

The Radiological Technical Support Group is responsible for revising all current Radiological Control procedures (Health Physics procedures) and generating new procedures for operations not previously addressed in a procedure. In addition, this group provides technical support for all Radiological Control functions and coordinates the ALARA program, and the effluent monitoring program.

1,2 RADIOLOGICAL FIELD OPERATION GROUP

The responsibility of this group is to perform radiological monitoring and to implement radiological controls for all work conducted at TMI-2.

1.3 RADIOLOGICAL TRAINING GROUP

This group is responsible for the development and administration of the Radiological Training Program for Radiological Control technicians and their foremen. In addition, this group is responsible for recommending the content and monitoring the effectiveness of the Radiological Control Training Programs presented to all personnel employed at TMI Unit 2.

1.4 DOSIMETRY GROUP

The Dosimetry Group develops and administers the personnel dosimetry programs. This responsibility includes selection, maintenance, issuance, and processing of TLD's, initiation and maintenance of dosimetry records, and the maintenance of environmental dosimetry devices.

1.5 RADIOLOGICAL SUPPORT SERVICES GROUP

This group is responsible for radiological instrumentation calibration and maintenance, the respiratory fitting and training program, bioassay program, the radiological laboratory, and radiation health activities.

2.0 CURRENT ACTIVITIES

The specific activities performed by the Radiological Control Department during this reporting period are outlined in the Management Plan for TMI-2 Radiological Control Program (Appendix A) and the Quarterly Progress Report on the Management Plan (Appendix D). An overview of the activity performed by the Radiological Control Department is presented below.

2.1 INITIAL REACTOR BUILDING RE-ENTRY PROGRAM

The Radiological Technical Support group has provided technical and ALARA support since the start of this program. Contributions include analysis and recommendation of dosimetry equipment, development of protective clothing, instrumentation selection and testing (both personnel and area), and procedure review.

2,2 RADIOLOGICAL CONTROL PROCEDURE REVISION

The Radiological Technical Support group is currently coordinating a major procedure revision program, intended to develop accurate procedures, which will allow and require verbatim compliance.

2.3 DOSIMETRY PROGRAM

The Radiological Technical Support and Dosimetry group has been involved

with upgrading the dosimetry program procedures and bioassay program procedures. In addition, QA programs for the TLD systems and a computerized on-line exposure-tracking program is being developed.

2.4 TRAINING PROGRAM

The Training Group has developed a qualification program for Radiological Control Technicians and their foremen. Training, in accordance with this program, is currently underway. In addition, the Training Program for all TMI-2 workers has been developed and is currently in the review circuit.

2.5 ALARA PROGRAM

The ALARA review procedure which defines the current ALARA review process is currently developed and is approximately 95% complete.

2.6 INSTRUMENTATION

Radiological instrument selection is an on-going activity. Currently, instrumentation capable of measuring the beta levels associated with the post-accident primary coolant and radiological conditions expected in the reactor building are being tested and selected, based on the results of testing programs. In addition, the instrument calibration procedures are being revised to reflect current practices, and the calibration facility has been upgraded.

2.7 RADIATION PROTECTION PLAN

The Radiation Protection Plan, which outlines the philosophies and objectives of the TMI-2 Radiological Control Program has been prepared and submitted to the NRC for approval in January 1980.

3.0 APPENDIX A - MANAGETENT PLAN FOR TMI-2 RADIOLOGICAL CONTROL PROGRAM

3.1 INTRODUCTION

The purpose of this plan is to identify the planned corrective actions in the TMI-2 management's commitment to eliminate the identified weaknesses in the TMI-2 Radiological Control Program, and to present a schedule for implementation and completion of these corrective actions. The schedule for implementing and completing the identified corrective actions will be closely monitored by the Manager of Radiological Controls. A quarterly status report on the progress made in each of the major areas of deficiency listed below will be prepared by the Manager of Radiological Controls for presentation to the Senior Vice President, Metropolitan Edison Company. The progress made implementing this plan will be independently monitored by Quality Assurance. The auditing group's findings will be reviewed monthly with the Senior Vice President, Metropolitan Edison Company and the TMI managerial personnel assigned responsibility for the specific corrective actions.

3.2 SPECIFIC PLAN OBJECTIVES

3.2.1 <u>ESTABLISH MANAGEMENT'S COMMITMENT TO ACHIEVING A HIGH QUALITY</u> RADIOLOGICAL CONTROL PROGRAM AT TMI-2

A morale and attitude problem existed in the radiation safety organization. Personnel within the organization felt they did not have the authority nor the management support to stop operations in the interest of radiological safety.

3,2.1.1 CORRECTIVE ACTIONS

 The Senior Vice President, Metropolitan Edison Company, held meetings with all of TMI's managerial and line supervisory personnel to express Met-Ed's strong commitment to achieving a high quality Radiological Control Program. He pointed out at this meeting that the Radiological Control Department is responsible for establishing and maintaining the Radiological Control Program, which includes the stoppage of any work not being conducted in a radiologically safe manner. It is, however, the responsibility of all personnel at TMI to ensure compliance with the Radiological Control Program.

Action due date: Policy statement session - complete

2. The Radiological Control Department was restructured under a manager reporting directly to the Senior Vice President. The reason for this reorganization was to remove the Radiological Control organizations from the direct management and influence of the operations organizations, and to provide a direct means of communication between the Radiological Control Department and the top management personnel at TMI-2.

Action due date: Complete

3. A Radiation Protection Plan, outlining the philosophy, basic policies and objectives of Metropolitan Edison Company and General Public Utilities Corporation concerning the TMI Unit 2 Radiological Control Program was initially drafted on December 7, 1979, revised on January 14, 1980, and is currently awaiting final NRC approval for issuance. This plan outlines the Radiological Program, and stresses the management's commitment to a high quality Radiological Control Program.

Action due date: Two weeks after receipt of NRC action on January 14 revision

4. A Radiological Assessment group, independent of the Radiological Control Department, was formed to independently monitor TMI's progress implementing and adhering to a strong Radiological Control Program within the concept of ALARA. This group also has the authority to stop any work that is not being conducted in accordance with sound radiological work practices. This group reports it's findings directly to the Senior Vice President and the Director of Recovery.

Action due date: Completed

5. To provide additional support and direction for radiological control technicians working in the field, all technician supervisors have been assigned solely to on-the-job supervisory duties. In the past, technician supervisors were assigned to tasks such as procedure writing and assignments as procedure review committee members. These duties distracted from the supervisor's main objective; support and direction for the radiological control technicians.

Action due date: Completed

 Supervisory and Management Development Training programs will be utilized to upgrade supervisory and management skills.

Action due date: December 1980
Responsible Individual: Director of Reliability Engineering

3.2.2 FORMALIZE THE ORGANIZATIONAL STRUCTURE FOR THE TMI UNIT - 2 RADIOLOGICAL CONTROL PROGRAM

There existed a high degree of uncertainty regarding responsibilities, functions, assignments and lines of authority within the THI organizations.

3.2.2.1 CORRECTIVE ACTIONS

The manager of Radiological Control reorganized the Radiological Control Department. The department reorganization identifies the chain of command and delineates areas of responsibility within the Radiological Control Department. All contractor controlled radiological functions are included within this organization along with Met-Ed/GPU employees under the management and direction of Met-Ed/GPU supervisory personnel.

Included in this reorganization, tasks previously performed by radiological control personnel which were considered not to be essential to the Radiological Control program were reassigned to operationally oriented groups. Radiochemistry operations are now the responsibility of a Chemistry Department and decontamination operations are performed by a Decontamination Department. The Radiological Control Department activities and functions were reorganized into five groups under the direction of management level personnel as follows:

- a. Radiological Technical Support: Prepares procedures used in the Radiological Control Department. Provides technical support for all groups in the Radiological Control Department. Coordinates the ALARA program.
- b. Radiological Field Operations: Performs radiological monitoring and implements radiological controls in the field.
- c. Radiological Training: Trains radiological control technicians and their supervisors. Oversees the radiological control training of workers.
- d. Dosimetry: Implements and administers dosimetry programs.
- e. Radiological Support Services: Radiation instrument calibration and repair, respirator testing, bioassay, radiological laboratory, resistion health activities.

A recruiting program is currently in progress to fill the management positions for the above five groups with personnel possessing previous supervisor skills, in an attempt to upgrade the Radiological Control Department's capabilities to supervise its people and operations. Three of these positions have been filled to date.

Action due data: Reorganization - Complete

2. In the past, operations personnal were utilized to perform radiological control functions during outages to alleviate manpower shortages in the Radiological Control Organization. Henceforth, only radiological control technicians or their foremen who have been trained in accordance with the training program addressed in this plan will be utilized to provide radiological control coverage for work at TMI-2.

Action due date: Training to be completed by June 30, 1980
Responsible Individual: Supervisor, Radiological Control
Training

3.2.3 INCREASE THE TECHNICAL DEPTH OF THE RADIATION SAFET! PROGRAM

Professional depth and input for the Radiation Safety Program at TMI-2 was apparently lacking.

3.2.3.1 CORRECTIVE ACTIONS

Sufficient professional depth has been available to TMI-2
throughout the initial phases of recovery through contractor
organizations, however, their activities were not adequately
coordinated or managed by Met-Ed supervision. The previously
described reorganization is expected to provide the desired
level of coordination and management for these activities.

In addition, a recruiting program is currently in progress to place highly skilled managerial, professional and technical personnel within the structure of the TMI-2 Radiological Control Organization. Authorization has been received to add one management level, four technical/supervisory, aix operations/supervisory, eleven technical/engineering, two training instructors, and eighteen technician personnel in addition to the existing Met-Ed and contractor personnel, to reinforce the Radiological Control efforts. Completion of the

reinforcement program is expected prior to initiation of major evolutions inside the reactor building following initial reentry.

Action due date: August 1, 1980

Responsible Individual: Manager of Radiological Control

3.2.4 UPGRADE THE RADIOLOGICAL CONTROL TECHNICIAN AND RADIOLOGICAL WORKER TRAINING PROGRAMS

3.2.4.1 CORRECTIVE ACTIONS

1. As part of the reorganization of TMI-2 Radiological Control group, a Radiological Control Training group reporting directly to the Manager of Radiological Control has been established. The training group formslized the training program for technicians and foremen in December and began implementation of the program in January. This training program requires formal qualification of Junior Technicians, Senior Technicians, and Foremen. It states the required minimum acceptable knowledge, understanding, practical abilities and experience standards for qualification. Additionally, qualification is based upon satisfactory performance on a written examination, demonstration of practical abilities and satisfactory performance on an oral examination covering response to abnormal situations.

A 40-hour training course is being given to technicians prior to their written examination. A course provides refresher training on radiological fundamentals; relates these fundamentals to the nuclides, instrumentation and procedures used at IMI-2; provides "thumb rulea" to allow technicians to make rapid field evaluation of the abnormal conditions; familiarizes the technicians with TMI-2 systems, expected concentrations of liquid in these systems and associated radiation levels; informs the technicians of their responsibilities

and expected response in routine and abnormal situations. Included in the course are problem-solving sessions which review past abnormal radiological situations and postulated potential situations with student participation in the initial analysis of radiological data, immediate and supplementary protective and corrective actions, taking of additional radiological measurements and a review of the radiological consequences of the postulated situation. To date, 16 technicians and foremen have completed this course and satisfactorily passed their written examinations.

Oral examinations have been administered to 3 foremen and 3 technicians, to date, who have satisfactorily demonstrated their knowledge, understanding and ability to handle unusual situations. The examinations are administered by senior technical, training, and radiological control operations personnel. The examinee is presented with a situation in which radiological data is given or an unusual situation is observed. The examinee must then state his actions and assessment of the situation. Additional data is provided based on the examinee's responses, The examinee is required to provide an assessment of the radiological consequences of the occurrence, based upon the data provided. The situations which are presented relate to high airborne activity, spread of surface contamination, liquid spills, contaminated injured personnel, and unusual gamma or beta level exposure. The oral examination board then evaluates the performance, critiques the performance with the examinee. and documents the results.

Practical ability demonstrations by technicians and foremen are required to assure that they understand the requirements for, and can satisfactorily perform routine surveys and operations required of technicians. Additionally, satisfactory performance in radiological spill drills are required as practical abilities. These practical abilities are witnessed and verified by individuals who are responsible for the direction

and/or review of performance of persons demonstrating the practical ability, by training personnel, or by radiological control technical support personnel.

Two instructors and one training supervisor have been hired and are expected to report to work within the next several weeks. This brings the training staff up to our projected full-time instructor manning level.

We also intend to utilize others in the Radiological control Department on a part-time basis in their areas of technical competence. Although initial qualification will be a continuing effort; all radiological control technicians and foremen will be qualified, or shall be restricted in their assignments by June 30, 1980.

Action due date: June 30, 1980

Responsible Individual: Training - Supervisor Radiological

Control Training

Restriction in assignments - Supervisor kadiological Control - Field Operations

 Radiological Safety Training for all personnel employed at TMI-2 is being performed by the Met-Ed Training Department.

The responsibility to ensure that this training meets the minimum standards necessary to perform work in a radiological safe manner in the environment which exists and which will exist in THI Unit 2, has been assigned to the Supervisor of Radiological Control Training. He has been directed to review, to change as necessary, and to approve course material, examinations, presentations, and practical factor performance tests. Implementation of the training program is expected to begin May 1, 1980.

Action due date: May 1, 1980

Responsible Individual: Supervisor, Radiological Control

Training

3. In addition to Radiological Control Training described above, special training, auch as mock-up training, walk-through exercises, and detailed worker briefings will be required for major evolutions, and those tasks which may result in encountering unusual or uncertain radiological environments. The determination for the necessity of this additional training will be made by the ALARA engineering personnel, based on the review of work procedures or task definition. The actual training/briefings will be conducted by technical operations personnel in conjunction with radiological control personnel. An example of this type task is the reactor building initial entry, for which training is underway.

The guidelines for making determination of which tasks require siditional training will be established by the Radiological Technical Support Branch by July 1, 1980. In the interim, this determination will be made in consultation with the Manager of the Radiological Technical Support Group.

Action due date: July 1, 1980

Individual Responsible: Manager Radiological Technical Support

3.2.5 IMPROVE RESPONSE TO AND RESOLUTION OF AUDIT FINDINGS

3.2.5.1 CORRECTIVE ACTIONS

- The responsibility for coordination of audit finding responses has been assigned to the Radiological Technical Support Group. A procedure describing the audit response proceas will be formulated and implemented by March 15, 1980. This procedure will include the following:
 - a. All audit findings associated with Radiological Safety and operations will be distributed to the individual assigned corrective actions, and the Radiological Technical Support Group.

- b. These findings will be reviewed by the Radiological Technical Support Group and evaluated to assess the overall program performance, and to identify trends which may indicate a decline in radiological control performance. These performance deficiencies may be further indication of generic procedural, operational, technical or managerial deficiencies.
- c. A commitment record, documenting the suggested corrective action, action due date, and the individual responsible for the corrective action, will be distributed to the management individuals responsible for the area in which the deficiency was observed.
- d. Upon notification of corrective action completion, the Radiological Technical Support Group will perform a follow-up inspection of the area of the deficiency, to determine if the corrective action performed is acceptable, prior to closing out the commitment record.
- e. A monthly status report on all open action items will be made and presented to the Manager of Radiological Controls.

Although audits performed in radiological work areas customarily categorize the deficiencies as radiological deficiencies, the cause of the deficiencies and initiation of corrective actions is not entirely the responsibility of the Radiological Control Department. Many deficiencies are an indication of poor radiological work practices. It is the responsibility of the Radiological Control Department to evaluate radiological conditions, to initiate precautionary measures, and to correct deficiencies, if possible. The responsibility of all workers and their supervisors is to ensure that all work performed in a radiological work area is performed in accordance with the established radiological procedures and the concept of ALARA.

It is the intent of this procedure to identify responsibility for radiological deficiencies, and to hold the responsible groups accountable for implementation and completion of the corrective actions.

Action due date: Procedure for audit responses: March 15, 1980 Responsible Individual: Radiological Technical Support Manager

2. All previous NRC audit findings and the latest Quality Assurance audit (November 1979) findings are currently being reviewed by the Radiological Technical Support Group to assign responsibility for corrective action, to determine acceptability of intended corrective actions, and to assign action due dates for completion of corrective actions. Commitments for corrective actions will be assigned to the responsible individuals by February 15, 1980.

Action due date: February 15, 1980
Responsible Individual: Radiological Technical Support Manager

3. All audit findings, other than those indicated above, will be re-audited by the Quality Assurance audit group. Any open items will be reissued as new audit findings, and items which no longer apply due to changing conditions or operations will be closed out by the Quality Assurance audit group. A report, listing the current open audit items, will be forwarded to the Manager of Radiological Control.

Action due date: March 1, 1980

Responsible Individual: Supervisor, Quality Assurance Audit

4. An "in house" surveillance program is currently being developed. To identify weaknesses in radiological work practices in a more timely fashion and reduce the number of findings resulting from formal audits. It is the intent of this program to document all def: ciencies noted, no matter how apparently insignificant, and whether or not they are immediately corrected, in order to monitor radiological work practices and to identify weaknesses in the Radiological Control Program. These deficiencies will be documented by any worker observing the condition. Copies of the deficiency reports will be distributed to the Radiological Technical Support Group for review and trend analysis. Recurring minor deficiencies in a particular srea or category may indicate a large underlying problem area which necessitates identification on the commitment system described below.

Action due date: April 15, 1980

Responsible Individual: Radiological Technical Support
Hanager

3.2.6 REVISE AND IMPLEMENT PROCEDURES WHICH WILL ENSURE STRICT, VERBATIM COMPLIANCE, AND REVISE THE PROCEDURE REVIEW PRACTICES TO EXPEDITE IMPLEMENTATION OF RADIOLOGICAL CONTROL PROCEDURES.

3.2.6.1 CORRECTIVE ACTIONS

The format for all Radiological Control associated procedures is currently being restructured to achieve verbatin compliance. These procedures will be incorporated in a Radiological Control Procedure Hanual, separate from the TMI site procedures. The revision for all radiological control procedures is estimated to require six months of work. A priority list for procedure revision has been

compiled, with procedures important to the continuing work effort given the highest priority. Following revision, all procedures will be field tested prior to formal implementation to ensure vertabim compliance is possible. Revisions to existing routine procedures applicable to the current recovery operations have been initiated. Revisions to the following procedures are expected to be issued, following field testing and training in their use, by April 1, 1980:

- a. RWP Use .
- b. Invistigative Reports,
- c. ALARA Review,
- d. Administrative Procedure,
- e. Administrative Exposure Guidelines.

All current radiological control procedures are expected to be revised, as required, and implemented following field testa and training in their use by December 1, 1980.

Action due date: Initial Revisions - April 1, 1980;

Radiological Control Procedure Manual
December 1, 1980

Responsible Individual: Radiological Technical Support
Manager

2. Action sign off steps will be added to all work procedures for work on major evolutions during the procedure review performed by ALARA engineers. The purpose of these sign off atepa is to ensure a responsible individual verifies by signature that the radiological safety requirements have been satisfied, prior to continuing with the work evolution. This format will be used for the Resctor Building re-entry procedure, and a procedure defining this practice and establishing the criteria for its use will be implemented by August 1, 1980.

Action due date: Procedure implementation - August 1, 1980
Responsible Individual: Radiological Technical Support
Manager

3. The current procedure review circuit employed at TMT-2 prohibits the expedient implementation of procedures and procedure change. A revision to the TMI-2 Technical Specifications is currently being discussed with the NRC to expedite the review process for radiological control procedures, while maintaining compliance with the review requirements.

Action due date: Pending resolution by the NRC Responsible Individual: TMI-2 Licensing Supervisor

3.2.7 IMPROVE THE EXTERNAL PERSONNEL DOSIMETRY PROGRAM.

TLD systems currently available to the industry do not adequately respond to energetic beta radiations that may be encountered during expanded recovery operations. The current quality assurance program does not include comparisons of results obtained from outside agencies; the present system of radiation exposure management does not allow the tracking of exposures received for specific work evolutions and there is insufficient technical expertise within the dosimetry group to permit comprehensive evaluations.

3.2.7.1 CORRECTIVE ACTIONS

 Beta radiation associated with post accident primary coolant at TMI-2 presents a complication to personnel exposure monitoring. At present, there is no known, commercially available system in use within the industry, that possesses the capability of measuring the beta radiation exposures with the high degree of accuracy desired by Met-Ed. At present, dosimetry systems under development and modifications to the presently-used Harshaw TLD system are being evaluated to determine their ability to more precisely measure beta exposures. In addition to the accuracy factor, these systems are being evaluated to determine their compatability with the existing reading equipment, in order to reduce the cost of system changeovers, if possible. All test data and cost study information, resulting from dosimetry system evaluations will be available, in time to permit a decision on system selection by July 1, 1980. System implementation will be accomplished by December 1, 1980.

Tests are currently being performed to determine the ability of existing dosimetry equipment to accurately monitor the exposures received by personnel performing the initial Reactor Building re-entry. The results of this analysis and subsequent recommendations will be made by February 15, 1980.

Beta radiation exposure determinations, made to date for personnel entering high beta radiation fields, have not relied solely on the existing TLD system results, due to known inaccuracies associated with beta radiation detection. Evaluations are parformed by professional Health Physics personnel.

Action due date: Reactor building recommendations February 15, 1980

System Modification Implementation -

December 1, 1980

Responsible Individuals: Radiological Technical Support
Manager/Supervisor, Dosimetry

2. Although technical expertise has been available to TMI-2, in the form of contracted advisors present at TMI and support agencies outside TMI, coordination and direction of this expertise was not achieved. Coordination of these efforts is assigned as the responsibility of the Radiological Technical Support Group. This responsibility will be documented in the Organization and Responsibilities Chapter of the Radiological Control Procedures Manual, scheduled for completion by February 1980. All dose assessments for non-routine exposure evaluations will be reviewed by the Radiological Technical Support Group.

Action due date: February 1980
Responsible Individual: Radiological Technical Support Manager

3. The current TLD Quality Assurance program is being expanded to include comparison with outside agencies and this program will be issued by April 30, 1980.

Action due date: April 30, 1980
Responsible Individual: Supervisor, Dosimetry

4. The current computerized exposure record system is designed to maintain accountability of personnel exposures, however, it does not provide a means of tracking exposures by the tasks performed. A study is presently being conducted to determine the best method to satisfy the above goal. By April 1, 1980, a system capable of tracking personnel exposures by work groups and by major tasks will be implemented. By December 31, 1980, a system capable of tracking exposures by specific individual tasks will be implemented.

Action due date: Exposure tracking by work group and
major task - April 1, 1980

Exposure tracking by specific tasks December 1, 1980

Responsible Individual: Supervisor, Dosimetry

3.2.8 IMPROVE THE INTERNAL DOSIMETRY PROGRAM

3.2.8.1 CORRECTIVE ACTION

 Through contractor support, technical expertise has been available and utilized to evaluate results obtained from the internal exposure monitoring program. These efforts will be coordinated and managed by the Radiological Control Department reorganization described earlier in this plan.

Action due date: Complete

2. The current bioassay program is being revised to formalize the basis for bioassays under the routine conditions, the follow-up assays of skin contamination or internal deposition, and evaluations for Sr-90 depositions. All dose assessments and evaluations of internally deposited radionuclides will be reviewed by the Radiological Technical Support Group.

Action due date: April 1, 1980

Responsible Individual: Supervisor, Dosimetry

3.2.9 UPGRADE THE RADIATION PROTECTION INSTRUMENTATION PROGRAM

3.2.9.1 CORRECTIVE ACTION

 All instrumentation selection, installation, calibration and maintenance currently performed by contractor technicians will be coordinated and managed by the Radiological Control Department organization as identified earlier in this plan.

Action due date: Complete

2. Instrumentation evaluation and subsequent selection is continuing at TMI Unit 2, to ensure that the most accurate and reliable instrumentation available is employed in the Radiological Control Program. As advances are made in instrumentation, or as the current instrumentation proves to be inadequate for conditions encountered, the search for, evaluation of, and subsequent selection of the most reliable instrumentation available to the industry will be made. There are currently two areas in which the current instrumentation used at TMI-2 proves to be less than desirable: high level energetic beta fields associated with undiluted post-accident primary coolant, and radiation measurements taken within the Kr-85 environment of the Reactor Building.

The search for a beta instrument capable of accurately measuring the beta fields associated with the post-accident primary coolant, is a difficult task complicated by the fact that accurate measurement of beta radiation has been neglected in the field of Health Physics. The Department of Energy and its contractors at the Idaho National Engineering Laboratory have been focusing on this problem for 2 to 3 years, and consequently have made significant steps towards improving the capability to monitor for, and to calibrate instruments for beta radiation. The Radiological Technical Support Group sent an instrumentation team to the Idaho National Engineering Laboratory during January, with newly-developed high-range and existing beta instruments, to perform calibration and comparative performance tests. The information obtained will be used to make a selection of the most suitable instrument for measuring beta radiation fields.

The second condition, in which the currently-used instrumentation proves to be ineffective, is radiation measurements

performed within the Kr-85 environment contained in the Reactor Building as a result of the post-accident conditions. The Kr-85 apparently migrates through the instrumentation sealant materials, producing unreliable measurements. A search is currently being conducted by the Radiological Technical Support Group for instrumentation or sealant systems capable of producing reliable measurements under the conditions described.

Instrumentation selection for the Reactor Building re-entry program will be made, following resolution of the above-indicated problem areas, prior to March 1, 1980.

Action due date: Reactor Building Entry Instrumentation -- March 1, 1980

Responsible Individual: Radiological Technical Support
Manager

3. The Radiological Technical Support Branch is currently preparing a Quality Assurance Program for instrument calibration. This program is considered necessary to ensure that all portable instruments used at TMI-2 are properly calibrated. This program will cover calibration procedures performed at TMI and at off-site facilities.

Action due date: July 1, 1980

Responsible Individual: Radiological Technical Support

Manager

4. The TMI instrument maintenance and calibration facility
has been upgraded, and is considered adequate to meet
our current needs. The Radiological Technical Support
Group has presented design criteria to Bechtel Corporation,
for design and construction of a new facility. This facility
should be operational prior to expanding decontamination
activities into the Reactor Building.

Action due date: December 31, 1980

Responsible Individual: Supervisor, Radiological Support

Services

5. Rapid and accurate assessment of radiation and contamination levels in TMI-2 areas is essential to the Radiological Control Program. The present counting facilities for air activity and surface contamination levels are inadequate. There is a need for improved contamination analysis, isotopic analysis, and low energy beta analysis capabilities. Recommendations are being prepared by the Radiological Technical Support Group to upgrade the existing Health Physics Counting Laboratory.

Action due date: Recommendations - February 15, 1980

Implementation - June 1, 1980

Responsible Individual: Radiological Technical Support

Manager

6. In the past, area air quality measurements were performed with air sampling equipment installed in the filtered ventilation system. Although these units are still in use, area monitoring equipment has been installed through out the TMI-2 auxillary and fuel handling buildings. This equipment is used to constantly monitor the airborne activity levels in the general work spaces and is placed in specific work areas for operations which have a potential for generation of airborne activity.

Action due date: Complete

7. Previous portable air sampling practices for operations in radiological work areas were considered to be inadequate. Portable air sampling frequencies have been increased. Portable air samples are taken at the start, during, and after work activities which are identified as having potential for generating airborne contamination.

Action due date: Complete

8. Radioiodine sampling and analysis performed prior to the accident at TMI Unit 2 was considered inadequate. Immediately following the accident, TMI-2's capabilities to monitor for radioiodine increased to an acceptable level.

Although TMI-2 has maintained the capability of sampling and analyzing radioiodines, this practice is not performed routinely at present because radioiodines are no longer limiting factors for recovery operations.

Action due date: Complete

9. Survey frequencies followed under pre-accident conditions at TMI were considered to be inadequate. Survey frequencies increased during post-accident conditions. A new schedule for survey frequencies has been drafted in procedural format and is expected to be implemented by February 1, 1980.

Action due date: February 1, 1980

Responsible Individual: Supervisor, Radiological Field

Operations

3.2.10 IMPROVE TMI-2 RADIOACTIVE MATERIAL SHIPPING AND LABELING PROCEDURE.

 All procedures associated with the packaging, handling, shipping, and receipt of radiosctive material at TMI-2 have been revised. In addition, the position of Radioactive Material Coordinator has been created and filled. The responsibility of this position is to ensure all shipments to or from TMI-2 are in accordance with the regulatory agency's requirements. Action due date: Complete

2. Curie estimates performed on shipments of radioactive material during the pre-accident conditions were not consistent. All curie estimates performed since the accident have been coordinated by the Radioactive Material Coordinator, with the assistance of the Radiological Engineers currently assigned to Radiological Technical Support Group. The Radiological Technical Support Group is currently preparing guidelines for the performance of curie estimates by radiological control technicians for commonly-used containers (1.e. LSA boxes, 55 gal. drums), and the requirement to consult the Radiological Technical Support Group for other containers.

Action due date: April 1, 1980

Responsible Individual: Radiological Technical Support

Manager

3.2.11 IMPROVE DECONTAMINATION PROCEDURES FOR EQUIPMENT AND TOOLS.

3.2.11.1 CORRECTIVE ACTIONS

During pre-accident conditions at TMI-2, decontamination operations were performed by the already overburdened radiological control personnel. This practice resulted in a backlog of work in the decontamination areas. This backlog resulted in tools and equipment being disposed of as waste, and in personnel performing their own decontamination operations. The decontamination operation is now being performed by a separate decontamination group, reporting to operations. No item is decontaminated unless it is tagged with the name and extension number of the individual to be contacted after decontamination. All items are surveyed for release by Radiological Control Technicians.

Action due date: Complete

3. It is the responsibility of all Met-Ed/GPU and contractor aupervision to ensure that radiation exposures received by individuals reporting to them are as low as reasonably achievable. The reports, based on the computer returns described above and issued by the Radiological Technical Support group, should be used as an aid in tracking personnel exposures and identifying operations which may need ALARA engineering reviews to reduce exposures at TMI-2.

3.2,13 RADIOLOGICAL CONTROL PROGRAM FAMILIARIZATION

In order to achieve a atrong Radiological Control Program, personnel must be made accountable for the actions they take. They must underated their responsibilities and expectations in achieving a sound radiological control program. Upper management, as indicated earlier in this plan, is committed to achieve a strong Radiological Control Program. The following corrective actions are being implemented to ensure that everyone at TMI understands their responsibilities to this comment.

3.2.13.1 CORRECTIVE ACTIONS

 As indicated earlier in this plan, reaponsibility for corrective actions, performed to satisfy audit findings, will be delegated to aupervising personnel reaponsible for the area or operations in which the deficiency occurred.

Action due date: Continuing
Responsible Individual: Radiological Technical Support
Manager

2. Action items will be inserted in operational work procedures, to ensure proper attention is given to radiological considerations, prior to the performance of work steps. These action items shall be signed off by personnel responsible for, and cognizant of the work evolution, verifying the conditions have been satisfied prior to initiating the work atep.

Action due date: August 1, 1980

Responsible Individual: Radiological Technical

Support Manager

3. Critiques will be conducted for unusual radiological occurrences, as defined by guidelines prepared by the Radiological Technical Support Group. The purpose of these critiques is to identify the cause and to determine corrective actions to prevent reccurrence, including disciplinary action if deemed necessary. A procedure presenting the guidelines and criteria for conducting a critique will be prepared by the Radiological Technical Support Group and incorporated in the Radiological Control Procedure Manual by December 1, 1980.

Action due date: December 1, 1980

Responsible Individual: Radiological Technical Support Manager

4.0 APPENDIX B - MANAGEMENT PLAN SCHEDULE

4.1 PURPOSE AND SUMMARY

The following compendium describes the management plan corrective actions for improvements in the THI-2 Radiological Control Program. Target dates for completion of the identified corrective actions are presented in the form of a bar chart, Figure 5-1. Proposed starting dates for major recovery activities. are included on the bar chart to present a comparative view of the program implementations, with the start of the major recovery actions. It should be noted that all programs are scheduled for completion prior to starting the Reactor Building decontamination operations. It is not considered necessary to complete all of the corrective actions identified in the management plan prior to the Reactor Building re-entry. This major recovery task has received a significant amount of managerial and technical attention since the start of the program. Radiological engineering (ALARA) has been following the procedure writing, and assisting in overviewing performance of special tests and evaluations, to analyze exposures, protective clothing, respiratory protection equipment, dosimetry equipment, and expected environment and radiological conditions for the personnel making the initial re-entry. All re-entry teams members have undergone intensive medical examinations and special intensive training on equipment usage, operations to be performed, and the radiological conditions, requirements, and limits associated with the re-entry. Team members will also undergo intensive physical fitness training and practical factor training, utilizing the equipment selected for re-entry. The radiological control personnel selected for providing coverage during the re-entry, will receive special training prior to performing the re-entry.

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Figure 3-1

5.0 APPENDIX C - MATRIX RELATING NUS AND NRC AUDIT FINDINGS WITH MANAGEMENT PLAN

5.1 PURPOSE AND SUMMARY

This appendix presents a matrix which illustrates how the corrective actions stated in this management plan address the NUS Corporation and the NRC Special Panel audit findings. The NUS Corporation audit findings are addressed in Table 5-1, and the NRC Special Panel findings are addressed in Table 5-2. The corrective actions listed adjacent to each major finding relate to the numbering system used to identify each objective presented in this management plan (Appendix A).

AUDIT FINDINGS/RECOMMENDATIONS		HANAGEMENT FLAN CORRECTIVE ACTION PARAGRAPH		
1.	Organization			
	A. Separate health physics from chemistry group	3.2.2.1-1.		
	S. Assign an engineer to redweate pack- aging	3.2.10.1-1.		
	C. Remove redvaste functions from health physics	3.2.2.1-1.		
	D. Remove decontamination functions from health physics	3.2.2.1-1.		
	Z. Remove RMP filing from health physics	3.2.2.1-1.		
	P. Assign dominatry responsibilities to an analyst	3.2.2.1-1.		
	G. Auxiliary operators should not be used as H.P. Technicians	3.2.2.1-2.		
2.	Realth Physics Credibility			
	A. Inadequate technician training	3.2.4.1-1.		
	B. Decisions made by health physics tech-	3.2.1.1-5.		
	niciane ere overridden			
3.	Communications			
	A. Operations performed without health physics notification	3.2.1.1-3.,-4.; 3.2.6.1-1.,-2		
	B. Information not being passed down to Technicians	3.2.1.1-5.; 3.2.4.1-1.		
	C. Techniciene not notified of procedure changes	3.2.1.1-5.; 3.2.4.1-1.		
	D. Procedures are not referred to during performance of work	3.2.6.1-1., -2.		
4.	Personnel Docimetry			
	A. TLD celibration discrepancies	3.2.7.1-3.		
	B. Improper raview of perconnel documetry records	3.2.2.1-1.; 3.2.7.1-4.		
	C. TLD's should be processed by same technicism	3.2.2.1-1.		
5.	Radiological Surveillance			
	A. Continuous sirborns radioactivity monitoring from ventilation planums	3.2.9.1-6.		
	B. Schedules for portable sir empling should be reevaluated	3.2.9.1-7.		
	C. So program for radiolodine sampling	3.2.9.1-8.		
	D. Use portable CAN's for monitoring specific work areas	3.2.9,1-6.		
	E. Schedules for radiation and con- tawination should be reevaluated	3.2.9.1-9.		
6.	Tool end Equipment Control			
	A. Individuels perform their own decon-	3.2.11.3		
	3. Hany items left for decentemination are disposed of as solid redirective waste	3.2.11.1		
7.	Radiosctive Shipment			
	A. Improper packaging	3.2.10.1-1.		
	B. Inconsistent curie content estimates			
	o. Incommistant CALTA CONTANT BALLIANIA	3.2.10.1-2.		

TABLE 5-2. NRC SPECIAL PANEL FINDINGS

AUDIT FINDINGS/RECDIMENDATIONS		MANAGEMENT PLAN CORRECTIVE ACTION PARAGRAPH
1. Ma	nagement Deficiencies	
۸.	Management commitment in support of	
	Radiation Safety Program	3.2.1.1 , 3.2.1.2
в.	Organizational structure	3.2.1.2 , 3.2.2.1
c.	Technical depth of Radiation Safety program	3.2.3.1-1.
D.	Training	3.2.4.1-1. , -2. , -3.
E.	Resolution of audit findings	3.2.5.1-1. , -2. , -34.
F.	Preparation and implementation of procedures	3.2.6.1-1. , -2. , -3.
2. Te	chnical Deficiencies	
۸.	External personnel dosimetry	3.2.7.1-1. , -2. , -3. , -4.
В.	Internal dosimetry	3.2.8.1-1. , -2.
c.	Instrument program	3.2.9.1-1. , -2. , -3. , -45.
D.	Radiation control	3.2.12.1-1. , -2. , -3.

6.0 APPENDIX D - CURRENT PROGRESS RELATED TO THE MANAGEMENT PLAN.

6.1 PURPOSE AND SUMMARY

This appendix summarizes action initisted, in progress, or completed since the last progress report was issued. This appendix will primarily address the open action items committed for completion by April, 1980, and will be presented in the chronological and alpha-numeric sequence used in the Management Plan (Appendix A).

6.2 CORRECTIVE ACTION STATUS FOR COMMITMENTS DUE ON APRIL 1, 1980

- Action Item 3.2.1.1.3: The Radiation Protection Plan for TMI Unit 2 is still awaiting NRC approval. This plan is expected to be issued two weeks after receipt of NRC approval.
- Action Item 3.2.5.1.1: This procedure was submitted to the review and approval cycle by the committed date of April 1, 1980. This procedure is expected to be implemented following final approval.
- Action Item 3.2.5.1.1: A list of the open audit findings
 was received by the Radiological Technical Support Group.
 Assignments for corrective action and action due dates
 have been assigned to all of these items. This action is
 complete.
- 4. Action Item 3.2.6.1.1: The committed corrective action was to complete revision on five procedures prior to April 1, 1980, and to completely revise the remaining Radiological Control Procedures by December 1, 1980. The status of the initial five procedures is as follows:
 - a. RWP Use Procedure: This procedure completed the review cycle and all comments were incorporated by the committed date of April 1, 1980. This procedure will be implemented following final approval.

- b. Investigative Report Procedure: This procedure completed the "in-house" review cycle and was submitted to the NRC on March 27, 1980. This proce'ure is expected to be implemented within two weeks following the NRC review.
- c. ALARA Review Procedure: This procedure will be submitted to the review and approval cycle by April 30, 1980.
- d. Administrative Procedure: This procedure has been submitted to the "in-house" review cycle; all comments generated were incorporated by the committed date of April 1, 1980. This procedure will be implemented following final approval.
- e. Administrative Exposure Guidelinea: This procedure
 was submitted to the "in-house" review cycle; all comments generated were incorporated by April 1, 1980.
 This procedure will be implemented following final
 approval.
- 5. Action Item 3.2.7.1.1: The committed action was to make recommendations on personnel dosimetry for use during the reactor building re-entry prior to February 15, 1980, and perform system modification by December 1, 1980. A report, describing the results of test performed in the containment building through penetration number 626 using Harshaw TLD's, self-reading pocket dosimeters and film badges, was issued prior to January 15, 1980. This report also made preliminary recommendations on TLD usage for the reactor building re-entry program. A letter, describing the specific dosimetry equipment and its placement, was issued on March 7, 1980. The format described by this letter was issued during the dress rehearsals of the reactor building re-entry.
- 6. Action Item 3.2.7.1.2: The organization and responsibilities chapter of the Radiological Control Procedures Manual was reviewed by PORC on March 6, 1980, and is currently awaiting approval.

- 7. Action Item: 3.2.7.1.4: The computer system used for personnel dosimetry is currently undergoing a major conversion from a data bank system to an on line retrieval system. This system will allow immediate input and retrieval of dosimetry information via installed CRT's. Due to this system change, program modifications to the existing system are behind schedule, however, the commitment established in the Hanagement Plan is expected to be achieved on scheduls.
- 8. Action Item 3.2.8.1.2: The bioassay program procedure is currently being written. The draft completion date for this procedure has alipped to April 30, 1980, with implementation expected within 30 days of submittal to the review and approval cycle.
- 9. Action 3.2.9.1.2: The testing of instrumentation within the reactor building atmosphere, was delayed unit NRC approval of the operating procedures for the conductance of tests, using the R626 penetration glove box. The instrumentation tests were performed during the week ending March 8, 1980.
- 10. Action Item 3.2.9.1.5: Recommendations for counting facility improvements have been submitted, and are currently being reviewed by the Manager of Radiological Technical Support, prior to initiation of purchase requisitions.
- 11. Action Item 3.2.9.1.9: A memo was issued in January, establishing the survey frequency schedule currently in use. A survey procedure was submitted for review and approval by the committed date of April 1, 1980. This procedure will be implemented following final approval.
- 12. Action Item 3.2.10.1.2: Guidelines for the performance of curie estimations were presented to PCRC in the form of a procedure change request on February 29, 1980. As of this date, PORC has not reviewed this procedure. This procedure change is expected to be implemented by may 1, 1980, as schoduled.

6.3 CORRECTIVE ACTION STATE'S FOR COMMITMENTS DUE DURING THE SECOND QUARTER 1980

- Action Item 3.2.2.1.2: The committed action is to complete radiological controls training for all current radiological control technicians and foremen. The classroom phase of this training program, which includes a written examination, was completed for all of the committed technicians and foremen as of March 14, 1980. By the commitment date of June 30, 1980, the remaining phases of the qualification program will be completed.
- Action Item 3.2.4.1.1: The committed action for this item
 was the same as the action required for ltem No. 2s above.
- 3. Action Item 3.2.4.1.2: The procedure for radiological control training for all personnel employed at TMI-2 has been prepared by the Supervisor of Radiological Control Training, reviewed within the Radiological Control Department, and returned with comments which are currently being resolved. This procedure is expected to be issued before the commitment date of May 1, 1980.
- 4. Action Item 3.2.5.1.4: A procedure describing the "in bouse" surveillance program has been prepared, submitted to PORC, and returned with comments which are currently being resolved. This procedure will be re-submitted for final review and approval by the Ap ril 15, 1980, commitment date.
- 5. Action Item 3.2.7.1.3: The QA program for the TLD system is currently being prepared by the Radiological Technical Support Group. This procedure will be submitted for review and approval by the committed date of April 30, 1980.

6.4 ADDITIONAL ACTIVITY IN PROGRESS

 Action Item 3.2.3.1.1: The recruiting program to place highly skilled managerial, professional and technical personnel within the TMI-2 Radiological Control Department is a current and continuing activity. To date, there are 24 individuals with college degrees, and 3 individuals with Health Physics certifications in the Radiological Control Program.

In addition, three technician foremen, two training instructors, one training administrator, one training supervisor, two engineering aupervisors, four engineers, one dosimetry supervisor, one support services supervisor, three radiquogical control technicians, and all but one management level positions have been filled.

- 2. Action Item 3.2.6.1.2: Action aign off steps have been added to the Reactor Building air lock and initial entry procedures, to ensure precautions and requirements have been satisfied prior to continuing with the action. The procedure for TMI-2 wide use has not been developed as of this date. The commitment date for this action is August 1, 1980.
- 3. Action Item 3.2.6.1.3: A revision to the TMI-2 technical specifications, which would provide appropriate and timely review and approval for radiological control procedures, has been submitted to the NRC, and is currently awaiting approval.
- 4. Action Item 3.2.9.1.3: The Radiological Technical Support group is developing a QA program for instrument calibration. This program is expected to be implemented by the commitment date of July 1, 1980.
- 5. Action Item 3.2.9.1.4: The TMI instrument calibration and maintenance facility has been upgraded as indicated

- in the Management Plan; construction of a new facility is no longer necessary, since the facility presently in use it considered to be adequate for the present and the immediate future.
- 6. Action Item 3.2.13.1.3: Critiques for unusual radiological occurrences are currently being conducted with the Manager of Radiological Control, the individual(s) involved and their supervision, as a minimum, to determine the cause and to initiate corrective actions. The procedure formalizing this practice has not been developed, however, it is expected to be implemented on schedule.

SECTION 6 SPECIAL PROJECTS

1.0 SCOPE

Special Projects is responsible for accomplishing a cleanup of the Reactor Building atmosphere and for conducting the initial entries into the Reactor Building. To support these activities, Special Projects conducts Reactor Building air samples and measurements and experiments designed to measure radiation and contamination levels in the Reactor Building.

Special Projects' tasks and task objectives are:

- Hydrogen control system modifications make changes to the Reactor Building hydrogen control system to allow use of this system for purging the Reactor Building.
- Ante-Room modifications make changes to the ante-room area around Reactor Building personnel airlock number 2 to all use of this area for the initial Reactor Building entries.
- Airborne activity samples determine the particulate, gaseous and iodine activity levels of the Reactor Building atmosphere.
- 4. Gamma radiation readings through the equipment hatch determine the isotopic identity and magnitude of plate-out on the 305' elevation.
- 5. Germa radiation readings through the inner flange of penetration R605 (approximately 2 feet above the sump water level, near the basement of the Reactor Building) determine sump level and specific activity of the contamination in the sump.

- Sump water sample from penetration R401 (approximately 2 feet above the sump water level) - perform an activity analysis of the water.
- 7. Gamma radiation readings through the inner metal flange of penetration R626 (at the 347' elevation approximately 11 feet above the Reactor Building operating floor) determine general area radiation levels and determine the iaotopic identity and magnitude of plateout on the 347' elevation operating floor.
- Radiation mapping of the number 2 personnel airlock determine airborne activity level and radiation reading inside the airlock.
- 9. Analysis of the hydrogen recombiner inlet spool piece determine what plateout exists on the spool piece as a result of the several days of flow through the hydrogen recombiner which occurred within the first month after the accident.
- 10. Remote TV camera and radiation surveys through penetration R626 obtain an initial visual assessment of the damage that may have been done by the accident and obtain the first <u>direct</u> radiation measurement readings inside the building.
- Airlock entry obtain better information on the 305* elevation radiation levels and the 305* elevation plateout acurce.

2.0 OURRENT ACTIVITIES

2.1 HYDROGEN CONTROL SYSTEM SUPPORT

All modifications of the hydrogen control system required to support Reactor Building purge were completed on Merch 15. Final system testing began on Merch 31. All initial operator training to support the Reactor Building purge was completed on Merch 4. Final training can only be completed when NRC approval of the purge procedure is obtained.

2.2 REACTOR BUILDING ENTRY SUPPORT

All modifications to the ante-room area in support of Reactor Building entry were completed on March 20. Final estimates of dose rates expected in the Reactor Building have been calculated and are shown in Tables 6-1 and 6-2. Training of the initial entry crew and testing of equipment to be used during the initial entry were completed on March 20. This training included dry run/rehearsal of the entry in the TMI Unit 1 Reactor Building. All equipment tested satisfactorily. A request for permission to enter the Reactor Building was submitted to the NRC on March 17.

2.3 REACTOR BUILDING PERSONNEL AIRLOCK RADIATION SURVEY

Entry into and survey of the Reactor Building personnel airlock number 2 was completed on March 14. Prior to airlock entry, airborne activity was 3 x 10⁻³u Ci/ml krypton 85 and 2 x 10⁻⁹u Ci/ml particulate. This activity was purged into the plant ventilation system. The maximum surface contamination level found in the airlock was 460 dpm/100 cm². General area radiation levels at the inner door of the airlock were 40 mR/hr. Calculations of general area dose rate (based on inner airlock door readings) on the 305' elevation of the Reactor Building, and final analysis of the Ge(Li) scan of the inner door have not yet been completed.

2.4 RADIATION INSTRUMENT AND WEARING APPAREL STUDIES

Experiments were conducted in penetration R626 to determine the response of various gamma and beta/gamma survey instruments in a krypton atmosphere. Based on these experiments, the instruments to be used by the Reactor Building entry team are a teletector (gamma detection) and an R0-7 (beta detection). Experiments were also conducted to determine the rate of krypton diffusion through a Viking dry suit (to be worn during initial Reactor Building entry). The experiment showed that less than 10% diffusion can be expected during the twenty minute entry into the Reactor Building.

LOCATION	WITHOUT PURGE OF REACTOR BUILDING (RAD/HR)	WITH PURGE OF REACTOR BUILDING (RAD/HR)
305' ELEVATION		
- Rrypton	0.900	
- Plateout	0.2	0.2
- Sump Water	1.500	1.5
TOTAL	2.6	1.7
347' ELEVATION		
- Krypton	1.2	
- Plateout	0.4	0.4
TOTAL	1.6	0.4
STAIR NUMBERS 1 and 2		
- Rrypton	1.15	
- Plateout	0.2	0.2
- Sump Water	9.0	9.0
TOTAL	10.35	9.2
AIRLOCK (DURING ENTRY)		
- Krypton	0.941	0
NTE-ROOM (DURING EXIT)		
- Krypton	0.101	0
(a) General Axes Only	- Does not Include H	ot Spots

LOCATION	WITHOUT PURGE OF REACTOR BUILDING (RAD/HR)	WITH PURGE OF REACTOR BUILDING (RAD/HR)
305' ELEVATION		
- Krypton	9.0	0 -
- Plateout	1.0	1.0
TOTAL	10.0	1.0
347' ELEVATION		
- Krypton	9.0	0
- Plateout	1.5	1.5
TOTAL	10.5	1.5
STAIR NUMBERS 1 and 2		
- Krypton	9.0	0
- Plateout	1.0	1.0
TOTAL	10.0	1.0

SECTION 7 ENVIRONMENTAL MONITORING

1.0 SCOPE

The stated objective of the Environment Impact Assessment Group is to establish and maintain environmental surveillance programs (radiological and nonradiological) necessary to minimize effects on the general population and the environment due to TMI-2 recovery activities. Specifically, the following programs apply:

- Determine procedures and technical specifications
 necessary to monitor and maintain effluent concentrations
 as low as practicable in accordance with existing regulations.
- Identify and monitor critical radionuclides and their potential pathways to the population.
- Report results of environmental surveillance in accordance with technical specifications, federal and state regulations and permits and company agreements.
- 4. Review, follow and upgrade the existing surveillance programs.
- 5. Specify radioactivity source terms.
- 6. Coordinate environmental surveillance activities.

2.0 CURRENT ACTIVITIES

2.1 ENVIRONMENTAL IMPACT STATEMENTS

2.1.1 SYSTEM REVIEWS

Engineering systems designed for TMT-2 recovery operation, that warrant assessment of potential off-site impacts, were reviewed and commented on as needed. The review process is intended to assure system compliance with unit Technical Specification as well as regulatory statutes, with a stated overall purpose of protecting the health and safety of the general public.

During this period environmental reviews were prepared for the following recovery systema:

<u>SYSTEM</u>	PRIMARY AREAS OF REVIEW	
Submerged Demineralization System	Nonradiological environmental	
(SDS)	impacts Off -site dose calculations.	
Interim Waste Storage Facility	Potential off-site radiation dose	
	levels.	
Evaporator Crystallizer System	Nonradiological environmental impacts.	
	Potential off-site radiation dose	
	levels,	
Process Water Storage Tanks	Potential off-site radiation levels.	
Groundwater Monitoring	Groundwater radionuclide content.	

2.2 ENVIRONMENTAL MONITORING PROGRAMS

Radiation environmental monitoring programs were upgraded and expanded to insure adequate off-site radiation detection capabilities in response to TMI-2 recovery operations.

Several environmental programs were upgraded in response to recovery operation. The environmental Thermo Luminescent Dosimetry (TLD) program was expanded to include sevanty-three (73) sites, from the original twenty (20), along with infield placement of new TLD monitors with an expanded detection capability for β radiation.

The entire environmental TLD program was upgraded with the acquisition of on-site readout and data processing. In addition to the expanded TLD programs, monitoring equipment has been obtained to permit direct sampling of air, in both a continuous and grab mode, and direct readout of radiation levels in the field.

The need for increased environmental monitoring with respect to TMI-2 recovery operation was greatly enhanced by the acquisition of a mobile monitoring van. The van is being equipped with instrumentation for infield monitoring and sampling.

A groundwater monitoring program has been initiated around TMI-2 containment with an established sampling regime to be followed throughout the recovery phase.

2.3 SUMMARY OF ACCOMPLISHMENTS

The overall effort expended during this period was directed toward improving, upgrading, and providing input for environmental monitoring programs. Equipment acquisitions were directed toward increasing the on-site capabilities for environmental radiation monitoring during and after TMI-2 recovery. Inputs into recovery system design were made to insure the health and safety of the general public and compliance with radiological technical specifications and regulatory statutes.

Section 8 Project operations

1.0 SCOPE

The scope of work for the Project Operations organization includes all activities carried out by Bechtel Power Corporation. Included is engineering design, procurement, construction, construction management and associated support activities required for containment decontamination, defueling, plant reconstruction, and the associated systems and facilities required to support these activities. Project Operations' tasks include such activities as preparation of drawings and specifications, various engineering planning studies, preparation of coat and schedule estimates, purchasing and contracting for equipment and services required to support TMI-2 recovery, management of construction and decontamination and other technical publications, and assistance in the acquisition and analysis of radiochemical data regarding the status of TMI-2.

2.0 CURRENT ACTIVITIES

Estimates of gamma and beta dose rates for use by re-entry teams have been completed and drawings depicting isodose profiles have been prepared for use by the initial entry teams.

A baseline engineering package for an interim waste staging facility to accompose 55 gallon drums and LSA boxes has been completed and is under review by the General Public Utility Service Corporation (GPUSC). General arrangement drawings and a material handling study for the containment recovery service building have been completed and are being reviewed by GPUSC.

The ground water monitoring well system has been completed and is now undergoing pre-operational testing. An evaluation directed to optimizing the Engineering Change Memorandum procedure has been completed and is now undergoing internal review.

A supplement to the July 1979 report on containment decontamination has been issued in draft form for internal review. In addition, an overall radwaste management study, a study on alternate methods for the disposal of tritiated water, and a preliminary evaluation of radwaste volume reduction techniques have been completed.

Cost and schedule estimates have been prepared for potential alternates to the submerged demineralizer system, the equipment decontamination system building, the fluorocarbon adsorption system alternate to containment purge, a new sewage collection and treatment system for the TMI-2 site, and the EPICOR II resin additional facility.

A set of survey control monuments has been installed at various locations around the TMI-2 site. Land has been cleared, graded, and compacted for a new laydown yard south of the dike on the TMI-2 site. Scrap metal and miscellaneous tankage has been relocated to allow for future expansion of the TMI-2 parking lot.

A contract for the new TMI-2 administration building was awarded on February 27, 1980. Preliminary construction activities for this new building are new underway.

SECTION 9 QUALITY ASSURANCE

1.0 SCOPE

The Quality Assurance Department provides quality assurance and quality related services in support of the recovery effort for all items and activities identified by engineering as "important to safety". The department provides and maintains the QA plan which describes the QA program on a project-wide basis and reviews "important-to-safety" implementing procedures from other departments to assure overall program compliance with regulatory requirements and commitments. The department also conducts an independent audit program to assess program adequacy and to verify compliance.

During the design process, quality engineering reviews of specifications are performed to assure that appropriate quality requirements have been incorporated. During shop manufacturing and modification or construction on site, the department provides inspection to verify compliance with specification and regulatory requirements and independently monitors the "important to safety" activities of the recovery staff to assure compliance with approved procedures, administrative controls and regulatory requirements. The Quality Assurance Organization has the authority to stop work or discontinue further processing when nuclear safety considerations warrant this action. Periodic reports are issued to upper management regarding the implementation and effectiveness of the Quality Assurance Program during this recovery effort.

2.0 CURRENT ACTIVITIES

2.1 PROGRAM DEVELOPMENT

The quality assurance department has been working closely with other TMI-2 organizations to prepare and issue the TMI-2 Recovery Plan. When issued, this plan will be the basic document which describes the overall approach to quality being implemented at TMI-2. A primary consideration during preparation has been to produce a workable, useful document which meets all applicable regulatory requirements. The plan is organized by functional area to facilitate its utilization.

The scope of the QA Program as described in the new Plan has been enlarged beyond the existing "safety-related" concept. The new Program will encompass all items and activities "important to safety". Engineering has the responsibility for classification and the Quality Assurance Department has worked with engineering to define and clarify the new concept.

A project-wide effort to update the procedures necessary to implement the QA Program is underway and is being assisted by the Quality Assurance Organizations.

2.2 DESIGN AND PROCUREMENT.

Quality Assurance Department personnel have participated, to a limited extent, in the design and procurement activities necessary to support recovery. During this period, the department has been active in review of design and procurement documents pertaining to the submerged demineralizer and the radvaste evaporation systems. It is expected that implementation of the Recovery QA Plan and issuance of the New Quality Classification List will lead to greater participation of the department due to the increased scope under the quality program. Shop inspection of vendor activities is also expected to increase as production of additional Unit 2 facilities increases to support recovery.

2.3 SITE OC INSPECTION

Quality Assurance personnel perform inspection of modification

and construction activities within the scope of the QA program. All work authorization documents are reviewed to ensure inclusion of applicable inspection and notification requirements. During this period, inspection activities on Unit 2 continued at levels up to 200 inspections per month including receipt inspection and inspections of maintenance activities.

2.4 MONITORING SITE ACTIVITIES

During this period, the existing QA surveillance program on site is being restructured. The new program is based on an independent monitoring by QAD personnel of activities "important to safety". The program is designed to provide management with an adequate confidence level that activities are being conducted in accordance with regulatory and administrative requirements. Program development is continuing, including procedure preparation and indoctrination of personnel to the new concept. Surveillance activities have continued in support of TMI-2 Recovery during this period. Operation of EPICOR II, construction of radwaste facilities and special projects such as initial entry of the airlock have been subjects of recent surveillances. Increased activity is expected in future months under the new monitoring program.

2.5 ALDITS

The Quality Assurance Department audit program has remained on schedule, with both on-site and off-site audits being conducted. Attention has been focused on reducing the backlog of open audit findings and ensuring timely response for corrective actions. Additional audit emphasis during this period was applied to the Radiological Controls Programs.

SECTION 10 TRAINING

1.0 SUBTASK A. OPERATOR TRAINING

1.1 SCOPE

1.1.1 AUXILIARY OPERATOR TRAINING

This program is applicable to all personnel who successfully bid or are hired as an Auxiliary Operator. Program objectives are to:

- Provide training to Auxiliary Operators to progress from new hire, Auxiliary C, to Auxiliary A.
- Provide a qualified Auxiliary Operator as an input to the replacement operator program as vacancies dictate.

The training program for Auxiliary Operator progression consists of a two year program of classroom instruction, in-plant training and experience, and written and practical examinations. Successful completion of the first year results in automatic promotion from Auxiliary 100 Auxiliary B; successful completion of the second-100 auxiliary B; successful completion to Auxiliary A, and as open auxiliary period of performing as an Auxiliary A, and as open auxiliary into the Control Room Operator training program.

1.1.2 LICENSED REACTOR OPERATOR TRAINING

This program is applicable to all Auxiliary Operators A. The objectives of the courses are:

- Prepare an Auxiliary Operator A to achieve the position of Control Room Operator.
- Prepare a candidate to successfully complete the NRC License Examination.

The training program consists of the following:

- a. Specific study assignments
- b. Oral checkouts in practical factors
- c. Written teats
- d. Oral comprehensive examinations
- e. Classroom lessons
- f. Simulator training

The program is conducted over a period of nine months, with the classroom phase consisting of approximately six weeks.

1.1.3 SENIOR REACTOR OPERATOR TRAINING

This program is applicable to all Shift Foreman candidates who are licensed TMI Control Room Operators.

The objectives of the program are to provide the following:

- 1. Senior Reactor Operator License
- 2. Supervisory Development

The program consists of the following:

- a. SRO License training program
- PWR simulator S/U certification course (if not completed during Operator Licensing Program)
- c. Licensed operator requalification program
- d. FWR simulator refresher training
- e. Supervisory training
- f. First eid
- g. Fire fighting

- h. Switching and Tagging
- i. Safety for Supervisors
- j. SRO Decision Analysis
- k. Other Related Training

1.1.4 RO/SRO REQUALIFICATION TRAINING

This program is applicable to all Licensed Reactor Operators and Senior Reactor Operators.

The objective of the program is to maintain the qualification of Licensed Reactor Operators and Senior Reactor Operators.

The requalification Program consists of four interrelated segments which run concurrently. These segments are:

- 1. Operational Review Lecture Series (OR)
- 2. Fundamentals and System Review Program (FSRP)
- 3. On-The-Job Training
- 4. Annual Evaluation Examinations

The OR Series is a classroom lecture presentation which provides licensed personnel with the details of operational information related to the Three Mile Island Station. As part of the OR Series, selected PSR topics are presented. PSR topics are selected in areas where annual operator and senior operator written examinations indicate that emphasis in scope and coverage is needed. OR lectures are scheduled for a minimum of 60 hours per year.

On-the-job training is designed to ensure that all licensed personnel operate reactor controls and participate in major unit evolutions. Records of all on-shift performance are maintained and periodically reviewed by supervisory personnel.

The annual evaluation examinations almulate the written and oral examinations administered by the Nuclear Regulatory Commission. Performance on these annual evaluation examinations

determine the extent of the FSR program during the twelve month requalification period.

1.2 CURRENT ACTIVITIES

1,2,1 AUXILIARY OPERATOR TRAINING ACCOMPLISHMENTS

There are currently ten (10) Auxiliary Operator "B's" enrolled in the program. All training conducted was on-the-job.

1,2,2 LICENSED REACTOR OPERATOR TRAINING ACCOMPLISHMENTS

During this period, one person completed the training which includes simulator certification at B&W Training Center, Lynchburg, Va.; a company administered audit examination, and licensing examination by NRC for a Reactor Operator License. Four other personnel are enrolled in the program. Their training was on-the-job.

1,2,3 SENIOR REACTOR OPERATOR TRAINING ACCOMPLISHMENTS

There are currently four people enrolled in the program. During this period a company audit examination was administered; they attended simulator training at Lynchburg, Va., as part of the Licensed Operator Requalification Program, and they were administered licensing examinations by the NRC.

1.2.4 RO/SRO REQUALIFICATION TRAINING ACCUPALISHED TS

There are nineteen (19) licensed Reactor Operators/Senior Reactor Operators enrolled in the requalification program. Annual requalification examinations were administered and all operators attended simulator training during this period.

2.0 SUBTASK B. MAINTENANCE TRAINING

2.1 SCOPE

Maintenance training is provided in the following four phases, each for a six month duration:

1. Phase I: General Site and Maintenance Fundamentals Training

2. Phase II: Skills Systems Maintenance Training

3. Phase III: Skills Specialty Training

4. Phase IV: Applications Training

The program is applicable to the following classifications:

a. I&C Technicians

b. Electrical Maintenance Technicians

c. Mechanical Maintenance Technicians

d. Utility Technicians

2.2 CIRRENT ACTIVITIES

During this period, Phase I training was conducted continuously for maintenance personnel. Personnel attendance was by shift rotation, with each shift receiving the training one week out of six weeks. There are 150 individuals enrolled in this program.

3.0 SUBTASK C. HEALTH PHYSICS TECHNICIAN TRAINING

3.1 SOFE

The training for Health Physics Technicians is separated into the following categories:

1. Met-Ed Employees

- a. Newly hired Technician training
- b. Health Physics Technician/Foremen training
- 2. Contractor Personnel Training

TMI Unit 2 is currently utilizing Nuclear Support Services (NSS) contractor Radiological Control Personnel. The report contains the scope of that training. At such time as Het-Ed system employees are hired by Unit 2 for Radiological Control Positions, the training program for them will be described. The contractor personnel training consists of:

- a. Training of personnel in TMI-2 procedures
- b. Qualification Testing

3.2 CURRENT ACTIVITIES

During this period, the program has been conducted continuously in order to provide training to the incumbent NSS Technicians. Approximately 50 NSS personnel were qualified to perform duties in Unit 2 Radiological Control Positions.

4.0 SUBTASK D. GENERAL EMPLOYEE TRAINING

4.1 SCOPE

This program is applicable to all personnel on site. In addition, the program was expanded to include practical factors training during this period.

4.2 OURRENT ACTIVITIES

All new personnel reporting to the site during this period received this training. The new employees who will be permitted to enter

Radiological Control areas unescorted, began the expanded training commencing February 18, 1980. Approximately 18 people per day who received the radiological control training prior to February 18, are being retrained in the new practical factors training. It is anticipated that all personnel will have received the additional training prior to June 1, 1980.

5.0 SUBTASK E. RADHASTE MANAGEMENT TRAINING

5.1 SCOPE

5.1.1 RADWASTE ADMINISTRATION TRAINING

This program is applicable to all personnel who control and prepare radwaste for shipment. Its objective is to train personnel in the regulations for radwaste shipment.

5.1.2 RADWASTE REDUCTION TRAINING

This program is applicable to all personnel who operate radwaste systems or who are involved through their work in the production of radwaste.

The primary objective of the program is reduction in the amount of the radioactive waste produced.

5.2 CUPRENT ACTIVITIES

5,2,1 RADWASTE ADMINISTRATION TRAINING ACCOMPLISHMENTS

A series of four lectures were conducted during this period, in order to train all personnel involved in radwaste shipment.

Approximately twenty-seven (27) supervisory personnel attended these lectures. Fifty-seven (57) technicians were trained during this period.

5.2.2 RADWASTE REDUCTION TRAINING ACCOMPLISHMENTS

The principle of radwaste reduction has been incorporated in the General Employee Training which was conducted after February 18, 1980. In addition, a backfit program is being conducted continuously to indoctrinate all personnel in the principles of radwaste reduction. This will continue until all personnel on site receive this training; completion is estimated to be June 1, 1980. Approximately 18 individuals each day receive this indoctrination as part of radiological controls practical factors training program.

6.0 SUBTASK F. SPECIAL TRAINING

6.1 SCOPE

6.1.1 REACTOR BUILDING RE-ENTRY TEAM TRAINING

This training is applicable to the personnel forming the Reactor Building Re-entry Team and to the management personnel involved in the control of the re-entry. Training consists of the following:

- 1. Radiological fundamental
- 2. Equipment familiarization
- 3. Task fsmiliarizations and practices
- 4. Physical and psychological examinations and preparations
- 5. Radiological condition
- 6. Communications familiarizations
- 7. Management Briefings

6.1.2 REACTOR BUILDING PURGE SYSTEM TRAINING

This training is applicable to all TMI-2 personnel who operate the system. The objectives are to familiarize operators with the system construction, controls, and operations.

6.1.3 EMERGENCY PLAN TRAINING

This program is applicable to all Unit 2 personnel. It provides indoctrination in the emergency plan, and provides for drill in the various casualties that require implementation of the plan.

6,1,4 SUPERVISORY INDOCTRINATION IN CONTROLLED SUBSTANCE TRAINING

This program is applicable to all supervisors. The training consisted of a lecture on a Description of Controlled Substances and recognition of the use of controlled substances by personnel.

6.2 CURRENT ACTIVITIES

6.2.1 REACTOR BUILDING RE-ENTRY TEAM TRAINING ACCOMPLISHMENTS

During this period, Items 1 through 7 were completed and Item 1 was repeated to account for newly assigned personnel.

6,2,2 REACTOR BUILDING PURGE SYSTEM TRAINING ACCOMPLISHMENTS

During this period, a total of six (6) lectures were conducted to provide training for the operation shifts. In addition, one makeup lesson was given for personnel missing any shift lecture.

6.2.3 EMERGENCY PLAN TRAINING ACCOMPLISHMENTS

During this period, a series of six drills were conducted on specific casualities. The various emergency plans response personnel were provided training prior to conducting these drills. A station-wide drill was conducted in March. Three Radiological Control Drills were conducted for Radiological Control Personnel.

6.2.4 SUPERVISORY INDOCTRINATION IN CONTROLLED SUBSTANCE TRAINING ACCOMPLISHMENTS

The training was provided three times during March. Approximately 50 supervisors attended.

7.0 SUBTASK G. CHEMISTRY TECHNICIAN TRAINING

7.1 CURPENT ACTIVITIES

This program is under development and will be included in subsequent reports.

SECTION 11 SECURITY

1.0 SCOPE

The scope of the Security Department of TMI Unit II is to institute a Security system separate from TMI Unit I to enable the Security Force to address the unique security requirements in connection with Recovery Operations. The department must be able to allow the flow of employees necessary for a recovery and at the same time provide high assurance that unauthorized personnel and/or equipment will be denied acceas into the protected/vital areas. The department must also be able, in the event of intrusion into the protected area, to neutralize the intruders or deny them entry to vital areas until assistance arrives.

2.0 CURPENT ACTIVITIES

2.1 ORGANIZATION

The organization of the security department for TMI Unit II became effective January 1, 1980. The department consists of a security supervisor, a site protection serges in the capacity of administration/training, site protection sergeants in the capacity of shift commanders (Duty Sergeants), an administrative assistant and sufficient site protection officers to man the necessary posts.

2.2 SECURITY SYSTEM

A new system for access control into the protected/vital area went into effect the latter part of January, 1980. This is a computerized system that simplifies record keeping and expedites the entry of authorized personnel. It also asaiats the security department in exercising positive access control into the vital/protected area.

2,3 SECURITY PROCEDURES

New Security procedures for TMI Unit II have been ninety percent completed and are now in the review and approval cycle.

2.4 BADGING SYSTEM

A new and separate badging system for TMI Unit II employees is being implemented and upon completion will assist the employee in needed access, and enable the Security Department to have more positive control of the personnel entering the vital/protected area.

APPENDIX 1 - ANNOTATED SEQUENCE OF EVENTS

SECTION

Narrative

Figures 1 thru 65

PAGE

2 thru 99

100 thru 162

TOR 044, Rev 2 April 3, 1980

TARAS OF CONTESTS

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Reactor heliding Temperatures and Frestree (-) to 20 hours) Bactor Cooleat System Pakeup Temb Lavel (0 to 30 adoutem) Bactor Cooleat System Pakeup Temb Lavel (0 to 30 hours) Bactor Cooleat System Pakeup Temb Lavel (0 to 30 hours) Bactor Cooleat System Pakeup Temb Lavel (0 to 30 hours) Incormediate Bange and Source Range Monitors (0 to 4 hours) Intermediate Bange and Source Range Monitors (0 to 4 hours) Intermediate Bange and Source Range Monitors (-1 to 20 hours) Campusor Alors Frieter Lag Time (-) to 20 hours) Designacy Productor Pampe Discharge Produces (0 to 14 adoutem) INI Date 2 Pump Operating Bistory (-) to 20 hours) Freshariaer Spray Valve (BC-VI) Profition (0 to 30 elemen) Freshariaer Spray Valve (BC-VI) Profition (0 to 20 hours) Electromatic Baling Black Valve (BC-VZ) Profition (0 to 20 hours) Electromatic Relief Black Valve (BC-VZ) Profition (0 to 20 hours)		Raccior Coslast Brein Terestre (-2 to 20 bours)	
Heactor building Temperatures at Sirvations 310, 330 and 353 feat (0 to 20 bours) Heactor Coaleat System Nahrup Teak Level (0 to 30 mioutem) Heactor Coaleat System Nahrup Teak Level (0 to 30 mioutem) Reactor Coaleat System Nahrup Teak Level (0 to 20 bours) Intermediate Lemps and Source Range Memitars (0 to 4 bours) Intermediate Lemps and Source Range Memitars (-1 to 20 bours) Computer Alara Printer Lag Time (-1 to 20 bours) Descriptory Productor Pumps Discharge Proseures (0 to 14 mioutem) The Balt 2 Pump Operating Bistory (-1 to 20 bours) Presentiate Apery Valve (RC-VI) Position (0 to 20 bours) Freshow isser Syroy Valve (RC-VI) Position (0 to 20 bours) Electromatic Railed Shock Valve (RC-V2) Position (0 to 20 bours) Electromatic Railed Shock Laybut (RC-V2) Position (0 to 20 bours)		Reactor Daliding Temperature and Pressure (-1 to 20 hours)	2
Heactor Coolest System Pakeup Took Lavel (0 to 30 adoutes) Reactor Coolest System Pakeup Took Lavel (0 to 8 hours) Reactor Coolest System Pakeup Took Lavel (0 to 8 hours) Recreadiste Range and Source Range Monitors (0 to 4 hours) Intermediate Range and Source Range Monitors (-1 to 20 hours) Campaier Alors Printer Lag Time (-1 to 20 hours) Emergency Productor Pamps Discharge Presentes (0 to 14 adoutes) Int Dait 2 hamp Operating Bistory (-1 to 20 hours) Presentiant April Valve (RC-VI) Profition (0 to 10 elemtes) Freedminer Sprey Valve (RC-VI) Profition (0 to 20 hours) Siscremants Relief Biech Valve (RC-V2) Profition (0 to 20 hours) Electromatic Relief Biech Valve (RC-V2) Profition (0 to 20 hours)		Reactor Daliding Temporatures or Slavetions 310, 330 and 353 feet (0 to 20 bours)	33
Heactor Coolant System Nakeup Teak Lavel (O to 20 hours) Rascter Coolant System Nakeup Teak Lavel (O to 20 hours) Intermediate Range and Source Range Monitors (O to 4 hours) Intermediate Europe and Source Lange Monitors (-1 to 20 hours) Campaier Alors Printer Lag Time (-1 to 20 hours) Emergency Preductor Pumpe Discharge Presentes (O to 14 mioutom) This Dait 2 Pump Operating Bistory (-1 to 20 hours) Presentiant Apray Valve (RC-FI) Position (O to 30 minutes) Presentiant Spreay Valve (RC-FI) Position (O to 20 hours) Electromatic Relief Black Valve (RC-FI) Position (O to 20 hours) Electromatic Relief Black Valve (RC-FI) Position (O to 20 hours) Electromatic Relief Black Valve (RC-FI) Position (O to 20 hours)		Esector Coolest System Makaup Tork Lavel (0 to 30 mioutae)	
Intermediate Lange and Source Range Monitors (0 to 4 bours) Intermediate Lange and Source Range Monitors (0 to 4 bours) Intermediate Lange and Source Range Monitors (-1 to 20 hours) Camputer Alors Printer Lag Time (-1 to 20 hours) Camputer Alors Printer Lag Time (-1 to 20 hours) Emergency Peochaster Pumpe Discharge Presentes (0 to 14 adoutes) This Dait 2 Pump Operating Bistory (-1 to 20 hours) Threshort Sorey Valve (BC-VI) Profition (0 to 20 hours) Freedomiaes Sprey Valve (BC-VI) Profition (0 to 20 hours) Electromatic Relief Black Valve (BC-V2) Profition (0 to 20 hours) Electromatic Relief Black Valve (BC-V2) Profition (0 to 20 hours) Electromatic Relief Black Valve (BC-V2) Profition (0 to 20 hours)		Esector Costant System Nahemp Tenk Lavel (O to 8 hours)	
		Ractor Coolant System Pahrup Tonk Level (O to 20 hours)	
		Intermediate Large and Source Large Monitors (O to 4 hours)	
		laterimediate Luge and Source Luge Meditors (-1 to 20 hours)	
		Computer Alors Printer Lag 71so (-1 to 20 hours)	я
		Dergancy Predenter Pumpe Discharge Presentes (O to 14 adoutes)	8
		Thi Dait 2 Pamp Operating Statesy (-1 to 20 hours)	
		Presentiant Spray Valve (RC-VI) Position (O to 30 minutes)	
		Presentiant Spray Valve (RC-VI) Position (O to 20 hours)	
		Electromatic Rolls Black Valve (RC-V2) Position (O to 10 hours)	1,70,15,40
		Electromatic Relief Black Valve (RC-V2) Position (O to 20 hours)	1,24,33,40
		DE Duit 2 Coursel Ross Lyper	3

3.0 LIST OF REFERENCES

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- 2. Dil Dait 2 Computer Date
 - a. Alara Summery
 - b. Sequence of Prents Beview
 - e. Drility Printer
 - 4. DE Station LOE
 - e. Post Trie Review
- 3. THI Pleat Stripcharte
 - e. Ares Came Houltons (RP-UR-1901)
 - b. Area Came Honitors (RF-UR-1902)
 - c. Atmospheric Radiation Monitors (RF-UR-2900)
 - d. Liguid Radiation Monitors (EP-UR-3264)
 - e. Atmospheric Radiation Monitors (HP-UR-3236)
 - f. Atmospheric Radiation Monitors (MP-UR-1907)
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 - b. Poel Sendling Building Air Flow (AE-FR-5709 and AE-FR-5659)
 - 1. Reactor Building Temperatura and Pressure
 - b. Intermediate Range and Source Barge Monitors
 - w. Turbine Reader Pressure Long & Stem Pressure
 - Beacter Coolant System Vide Range Prossure
 - Seactor Coolant System Loop A and B, Wide Range Not Leg Temperatures (YM-TR-7167)
 - Condemate Polisher Flows
 - . Self Power Beutron Detector Backup Incore Recorders
 - n. Condenser Not Well Level
 - t. Atmospheric Radiotion Monitors (RN-R-4)
 - w. Atmospheric Radiation Monitors (RM-R-3)
 - V Control Room Air Flow (AE-FE-5191 and AE-FE-5192)
- 4. Dil Plant Loge
 - a. DC Dult 1 Shift Supervisor/Control Room Operator Loge
 - b. DC Unit 2 Shift Supervisor/Control Room Operator Logs
 - c. DC Dait 2 Emergency Control Station Log
 - d. Dil Dait 2 Primary Redweste Auxiliary Operator Log
 - e. DC Unit 2 Chemistry Log/Sample Results
 - f. THI Dait 2 Emergency Control Center Log
 - g. HRC Region | Response Center Topes
 - b. IRC Region 1 Incident Hesage forms
 - j Dait 2 Hand Recorded Exit Fuel Assembly Temperatures
- 5. Technical Date Reports with General Public Utility Service Corporation (1)
 - a. Accident Translant Modeling Analysis, TDR 045
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- 6. Technical Manuals
 - e. Dil Dait 2 Technical Specification
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- (1) This information was not available to the Operator on March 28, 1979.

- T. Tan Mithach memorandum regarding THE Unit 2 Operating Staff and PORC Sequence of Events Review Penting (1)
- Staff Interviews Conducted By Net-Ed/GPU (1)
 - Res Bryan dated April 26, 1979 Joe Deman dated April 25, 1979
- Craig Faust dated March 30, 1979 and April 6, 1979
 Bd Frederick dated March 30, 1979 and April 6, 1979
 John Filmt dated April 20, 1979
 Craig Faust and Ed Frederick dated March 29, 1979
- Jim Floyd dated April 20, 1979
 Den Miller dated March 30, 1979
 Jumitz Gingrich dated March 30, 1979
 Dale Landermilch dated March 30, 1979
 Balle Landermilch dated March 30, 1979
 Brian Webler dated April 25, 1979
 Stere Mall dated March 30, 1979

- Frederick Scheimann dated March 30, 1979 Hill Zawe dated March 30, 1979 and April 6, 1979
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- THE Staff Interviews Conducted by HRC (1) .
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 C. M. Frederick Scheisam dated April 23, 1979

 C. M. Frederick Scheisam dated April 23, 1979

 E. M. Frederick dated April 23, 1979

 E. John Flint dated April 24, 1979

 E. John Flint dated April 24, 1979

 Dick Dobini dated April 24, 1979

 E. Scheige Kunder dated April 25, 1979 and Hay 19, 1979

 File Boos dated April 25, 1979 and Hay 19, 1979

 E. Scheige Kunder dated April 26, 1979

 E. M. Boos dated April 26, 1979

 E. Scheige Kunder dated Hay 2, 1979

 E. Scheige Kunder May 2, 1979

 E. Thomer Leach dated Hay 3, 1979

- Lee Roger dated May 4, 1979
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 Gary Miller dated Nay 7, 1979
 Kichard Benner and Michael Kuhn dated Nay 8, 1979
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- Lynn Wright dated Nay 9, 1979 Joe Logan dated Nay 9, 1979 Jack Herbein dated Nay 10, 1979
- Rem Byram dated Nay 16, 1979 and July 11, 1979 Tom Davis, Jr. dated Nay 16, 1979
 - Scott Wilherson dated May 16, 1979 Walter Marshall dated May 17, 1979 Erian Mehlen dated May 17, 1979 John Donnachie dated May 17, 1979
- This information was not available to the Operator on March 28, 1979.

THE Staff Interviews Conducted by NRC (1) (cont'd)

Rounld Pountain deted Nay 17, 1979 Carl Guthefe dated Nay 18, 1979 Dale Leadermilch dated Nay 18, 1979

Exercit Shamone dated May 18, 1979

Exercit Shamone dated May 19, 1979

Exercit Shamone dated May 19, 1979

Frank Telecho dated May 21, 1979

Frank Telecho dated May 21, 1979

Frank Postor, Jr. dated May 21, 1979

Frank Postor, Jr. dated May 21, 1979

G. Stewn Miller dated May 22, 1979

F. Marchitch, Craig Faust, Fred Schelmann, Mill Zeve and Mike Rose dated May 29, 1979

F. Marchitch, Craig Faust, Fred Schelmann, Mill Zeve and Mike Rose dated May 29, 1979

F. Marchitch, Craig Faust, Fred Schelmann, Mill Zeve and Mike Rose dated May 29, 1979

F. Marchitch, Craig Faust, Fred Schelmann and Mill Zeve dated June 28, 1979

F. Marchitch, Craig Faust, Fred Schelmann and Mill Zeve dated June 28, 1979

F. Marchitch Farst dated July 13, 1979

C. Charles Mell dated July 13, 1979

Sequence of Events prepared by THI Staff and Onelto EkW Resident Engineer titled: (1) "THE Station, March 28, 1979 Events Unit Humber 2, G. P. Hiller Station Manager." 9

4.0 LIST OF STIGOLS

Indicactons

Electrical Status Light	Neter	Stripchart Recorder	Asmusciator	Control Rome Panel	Alars Printer	Maltipoint Recorder	Utility Printer
		*		2	2		40

Parameters

Temperature	Pressure	Level	710w	Amperage	Wibration
				4	

Plant Identifiers

	Reactor Coolant	Pressurizer	Loop Cold Leg	Loop Not Leg	Steam Generator	Nata Steam	Resctor Building	Reactor Coolant Drain Tank	Letdown	Engineered Safety Festures	Daergency Feedwater	Source Range Monitor	Intermediate Range Monitor	Intermediate Range Monitor	Reactor Coolent Pump	Makeup Pump	Foodwater Pump	Decay Beat Pump	Beergency Feeduater Pump
-	35	17			28		2	ROT	2	153	0	1-11	81-3	718	10°	10-P	14.7	4-80	4-13

This table is conjunction with Figure 65 "full that 2 Central Rom Layret", is provided as a gaide to understanding the entries under the "information Assilable to the Operator" calum in the Americaed Sequence of Brents.

S.O APPOTATED SEQUENCE OF EVENTS

Reference

Information Available to the Operator

turbles trip, 0400137, defined as alspeed time equal to more. The sispeed time of clock. Per example, 1:52:43 p.m. on March 28 would be written 9:52:06 (1352:43). Nor this chromology, so elapsed time clock was setablished with the time of the each event in the sequence to given as the masher of bours, mirates and occords ralative to 0400137, followed in percethents by the real time noing a 24-hour Depending upon the accuracy of the seerce of date for each event, the times appear alone or with the extetion "approximate."

periodic assessments of the plant status, represent input culled from interviews denotations included with the chroselogy of events, in addition to providing with the operating steff. In cases where direct action was taken by the piene operating staff the term "the operator or the shift supervisor" is used in the sequence of events.

borm coccentration we appendinately 1000 parts per militon. The vator level in paig. Reactor Coolent Makeup Pump 13 (MU-P-18) was in service supplying makeup Integrated Control System in full estematic. And groups one through five were oight was 27% outhdraws. Reactor Coolest System total flow was approximately 138 million pounds per bour and the Beactor Coolset System pressure was 2155 and Reactor Coolant Nump seal injection flow. Normal Reactor Coolant System Pakeup flos una apprunimately 70 gelloss per misste. Asactor Coolest System Prior to the accident Three Hills Island Cult Two was at 972 persor with the fully etthicisms, red groups six and seves were 952 withdraws sed and group

TES ONA Ber 2 April 3, 1980

Information Available to the Operator

the borstad water storage task was appreniantely 55 feet. The Presentiant Sproy Valve (SC-61) and Mesters, encayt group 8 and 7, were is semial control while optoying reactor coslast into the Presentiant to equality bare commentative fractions between the Presentiant and the remaindir of the Bestier Coslast System. The Presentiant Relief Valves discharge through one of the three Presentiant Mellef Valves (SC-RIA or RC-RIB). As RC-RIB high temperators alors had been received at -2137 (0123) and was reset at -2138 (0132). Temperatures

The following table lists Steen Concretor parameters prior to the eccident.

Table of Steam Cenerator Parameters

	Steam Cenerator A	from Cenerator D
Las Preduter	5.7458 HP78*	5.7003 KPFB*
Operating Level	342	57.42
Startey Level	198.8 Inches	163.4 toches
Stam Presents	910 pelg	BB9.6 pelg
Pedater Taperetere	462.77	442.79
Steam Twaps rates	3937	3947

^{*} The differences between Steam Generator A and B persenters are typical of normal operation.

Beester Pumpe 2A and 23 (CD-P-2A and CD-P-23) and Condinuants Pumpe 1A and 18 (CD-P-3A and CD-P-23) and Condinuants Pumpe 1A and 18 (CD-P-1A and CD-P-23) and CO-P-1A and CD-P-1B) were in service. Two beater deals pumps were so line to

TE 044, Bry 2

Poference

Information Available to the Operator

recovering heater deals water and supplementing usin feedwater pump suction requirements. The mate/menual evitch which provides certain start/stop feetwes to the condensate, condensate beauter and main feedwater pump central effectivy was in the same! made. An attempt was being and to them a clouged reals transfer like in an isolated attendby dealerralizer of the Condensate Pullshing Bystem.

The Puel Randling Building supply faus (AB-E-9A and AB-E-99) and exhoust fees (AB-E-10A and AB-E-10B or AB-E-10C and AB-E-10D) were in service. The Ammiliary Building exhaunt faus (AB-E-6C and AB-E-6D) were in service. The Ammiliary Building supply faus (AB-E-7A and AB-E-7B) were not of service.

Time	Event	April Information Available to the Operator	April 3, 1980
-00:00:05 (0400:32) Appr oximate	Companies Politaber autiet valves uset shut siguitamoously. The common of their sadden cleaves has out yet hom firmly established.	Local indicative of the confemate Polishers Poss).	N.X.8 8.8
-00:00:91 (0400:34) Approvimte	Condensate Booster Pumps 2A and 28 (CO-P-2A and CO-P-2B) tripped on low suttles pressure. No computer pristout occurred because	Assemblator visitor (AE) of Pauli 17 (FLE?), mater (FE) tadicoling mater emperage (A) and observised states	*
	the outs/manuel oritch for the condensate eystem was in the manuel position.	Mights (ST) or Pees) 5 (PLS).	
-00:00:01	Condensate Pump 1A (CD-P-1A) tripped. This was the result of a	AN ot PLI7, Ma(A) and ST at Planslers printer (AP) out-	20,25,54
(04-00-38)	witing error is the 4160 wolt switchgear bus control circuit	pet of bors/trip and on/off (delay time between alarm	
	which tripped condensate pump IA (OO-P-IA) when condensate booster	printer output and real time appreciations 0 seconds).	
	pump 2A (CO-P-2A) tripped Ath the suto/marmal switch is the manual		
	position. Condensate pump 18 (CO-F-18) apparently remained on line.		
90:00:00	Producter Pumps IA and IB (FE-F-IA and FI-F-IB) tripped we los out-	All at PLIS and PLIY, apond and throttle valve pool-	28,25,85
115 10000	tion presents caused by the loss of condensate booster pumps	tion attigebort recorders (BC) at FLI7, speed Hi at	
	2A and 28 (CO-F-2A and CO-P-2B). This sended in a loss of	PLA, pump discharge pressure (Ppiscus) im at PLS.	
	feedwater flow to both stoom poneratoro.	AP norm/trip (Delay 2 0 necombs)	
00100100	The Main Turbian and This Generator tripped in occordance with	Turbine: Al of FLS and PLI7, various IR and ST at PLS,	20,25,6c
	plant design.	Companies A at Fills, various M and ST at Fills, A norm/telp (Delay 2 0 seconds)	
00:00:00 (0400:37)	All three Darponcy Peeduator Pumps 1, 2A and 28 (EF-P-1, EF-P-2A and EF-P-28) storted.	All E7-P's: 37 and Mi(P _{B1SCR}) at PLA E7-P's 24 and 23: 78(A) at PLA,	# #
		AP de/off (Delay 2 O exceeds	
00:00:04 (0400:41) Approximate	The Electromatic Relief Valva (GC-62) opened at the catpoint of 2255 paig.	2:0	-

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200	84
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			April 3, 1980
Time	Frent	Information Available to the Operator	Reference
(0400:41)	The fazzior Calont Brain Test Presente began to increase.	10 at 7:44	•
00:00:05 (0400:42) Approximate	Turbine Dypose Valvas (163-7234, 163-7235, 165-72164 and 165-7216) opered at 1810 ± 18 paig to central stem greatator presents, (Pigure 34).	NS-V23A/26At 100 and 5T at PL3 NS-V258/268t 100 and 5T at PL3	-
(0400:45)	The courter tripped on high Leactor Coolant System processes or 2365 paig. The estpoint is 1355 paig.	AM (Red/Green/Blue/Fellow) Two out of Fear Logic at FLS, SI and MR at FLIA, Meutron Flux SC and MR at FLA. AF Two out of Four Logic (Delay 2 0 seconds)	å
00:00:08 (04:00:45) Approximates	The operator shat Leidows Isolation Valve (MD-V3 6 o stop lat- down flow in anticipation of the emported pressurings level decrease which follows the initial increase in presentizer level after a loss of feedwater flow incident (Figure 31).	ST at 763, lations flow 18 at 763	4. 4.
00:00:04 (04:00:43) Appr certainte	The operator placed the Pressuriser Spray Valve (RC-V1) and Pressuriser Bester under automatic control. Pressuriser Bester Groups I through 3 were de-energised as a result of this action. The setpoint at which the pressuriser heater de-energized is 2125 psig for Groups I through 3 and 2140 psig for Groups 4 and 5 under increasing pressure. Bets: There are a total of 13 Pressurisor Bester Groups. Bester Group 6 and 7 were set grellable as March 28, 1979.	Speny Taiwa: ST at FLA Bastores: ST at FLA, AP mores/trip (Dolay 2 0 seconds)	
(91:0010)	Steam Generator levels were approximately 120 inches (Figure 34). Steam pressure had increased to 1053 psig is Steam Generator B and	SC L: MR (Startup Lauge) ot PLA, MR (Wide Range) ot PLA BC (Operate Lauge) at PLA and PLS	4

M at PA. St at PLI7

2 3

Generator Safety Valves opened within the specified setpoints range,

1074 paig in Steam Generator & (Figure 34). Assuming the Steam

then four of the Steam Generator & Safety Valves and eight of the

Steam Cenerator A Safety Valves opened.

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	3)
1 044.	*
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Reference

- Ine	Event	Information Available to the Operator
00,00110	The speciator warified that all control and safety rade were tripped	ST at Puls,
Approximate	and fully inserted in the laster corn.	AP sorn/trip and yes/no (belog 2 0 seconds)
00:00:13	The operator attempted to start facetor Colone Rakoup Pump A	48 or 71J, 57 and 18(A) at 71J,
Approximente	(NE-P-IA); Inwrest, he released the central switch before the re-	AP secu/trip (beloy = 0
	quired 2.5 seconds and the pump tripped.	
00:00:13	The Cordenser Berwill les lovel alors was received. The level	18 at 75, 49 low (22.5 taches)/norm/high (36 taches)
19610046	me identified to be 21.72 techns or this time.	(belay 2.0 seconds)

2. 2. x. k.

2

PLAST STATUS

Control System setpoint of 30 inches for the programmed opening of the Emergency peaks of 2345 paig and 236 inches respectively. The Electromatic Belief Valva The Steam Generators steam presentes were about 1060 :aig and decreasing of 32 started. The Steam Generators water levels had not yet reached the Integrated paig per second. The Turbine Sypass Valves and a number of Main Steam Ralind Steam Cenerators. In addition, the Emergency Peaduater Block Valves (EF-V12A System presence and Presentiant level were decreasing rapidly after reaching (MC-R2) was open and was passing reactor conlant from the steam space at the decreasing as was expected after a reactor trip. The Steam Camerators water lavals uers at about 96 inches and decreasing at about 4 inches per second. and EF-7123) were shut which also prevented feedwater flow until they were Peadwater Valves (EF-Vill and EP-Vill) which would adult feedwater to the top of the Pressuriser. Based on Control Room indications, the Reactor Coolest System pressure and Pressuriser lavel were trending together and Values were open and relieving steam. All Emergency Peeduster Pumps had The plant had just experienced a turbine/reactor trip. Reactor Coolant

The	Post	Information Available to the Operator	Meta 3. 1980
1	spend ought minutes ofter the start of the tressiont. The reason for the		
bleck w	black value bring shut is not bown. The list documented operation of these		
	calvas mas during the performance of servettlance tenting of the Bengoncy		
70.00	Feedwater System on the norming of North 26, 1979.		
41 100 100 17 100 100	The Emergency feedwater Pumpe (EF-F-1, EF-F-2A and EF-F-2B)	M (Pataca) or riv.	A
(AC18040)	nermal discharge pressure alors was received (Figure 59).	AP les (estpoint - 875 poig.)/born (Boloy : 15 occurds)	
00:00:14	Presention Bester Groups & through 5 estonetically energised no	ST of PLA, At norm/cety (Doloy 2 1,3 nocembs)	A
(1610000)	e trault of teactor coolest presents decreaing below the energise		
	netpotate of 2105 paig for Groups I through 3 and 2120 paig for		
00:00:15	The Leantor Coolant System Prosentier lavel neached a prok of	SC of FLA, M. (uncomponented) of FLS	-
(0400132)	approminately 236 inches (Pigure 31).		
00:00:13	Steam Cenerator levels us to appreciantaly 07 factors (Figure 60).	ME L: M (Blemtop Lange) or FLA, 18 (Vide Lange) or FLA.	-
Approximete	Steam presents, was 1018 paig to Steem Concretor B and 1042 paig.	SC (Operating Range) ot PLA and PL3	
	in Otoma Cenerator A (Pigure 31).	SC Pt. 18 at 744, SC at 71.17	
00:00	The Dails 2 Shifts Saperviner manaced on the Blent Page System that	Anguactures unde on Plant Page System	•
Apprenters	Dil Onit 2 turbios and reacter had trippeds.		
00:00:115	The Electronatic Relief Valve (EC-E2) should have shut or about	7:5	•••
Appr on less to	this time (closure setpoist of 2303 prig). The Electrometic		
	Relief Valve position indication in the Control Nows to a red long		
	which illustrates when the Electrometic Belief Talvo unionald to		
	scarging. Then the lamp in illuminated, i.e. solenoid scergioned		

of the solemoid and not valve position. The solemoid on the Electrobe in any position as the lamp only indicates the electrical status circumstances the valve should be closed; however, the valve could (0400:52) resulting in an implied "shut" indication in the Control metic Ralise Valve (RC-R2) de-energised at approximately 00:00:15 Room. Although the plant operators did not laws at the time submoder normal circumstances the valve should be open. When the lamp is extinguished, i.e. solenoid de-energized, under normal sequent events showed that the valve had falled to shut.

The Pressuriner Spray Valve (MC-71) shut. (04:00:18

Palves (MS-4-25A, MS-4-25B, MS-7-26A and MS-4-26B) modulated steam The Steam Generator Safety Valves reseated and the Turbine Bypase flow to the Main Condonser to control Steam Generator pressure at 1010 ± 10 petg (71gure 34). Appe on ingto (0400:37)

(CO-P-2A). It also severed as instrument air line which caused reject A "Meter Namest" was noted in the condensate pumps discharge piping 2.5 to 3.0 feet according to the Auxiliary Operator. The pipe moveby an Austilinty Operator. The piping was displaced approximately sent caused a leak in the flange joint on condensate booster pump inhibit valve CO-v57 to fail shut. 00:50:25 (0401:02) Approximete

2 % 2

Turbine Sypans Valvett 16 and 57 or PLS 56 Pr 18 at 724, 90 at 7517 Dait 2 Control Born potified of "Water Romar"

54.88.91.99

TR 044, Br 2

Information Available to the Operator

Polorens

20,34

(00:00:13

25

The combineer betwell normal level alors we received. The beca. After the Policher Datiet Valves and the Laject level use 16-14 luckes and increming repidly.

we speed and the oir supply was restored to the Roject level to increase until the Polisher Sypass Valve CO-912 tank 1A or 13 (CO-T-1& or 13). This coosed the betwell could met be transferred to either condensate etorage labibit salm (@-757) feiled obet, betwill mtor

80:00:X

Inhibit volve (CO-957).

the reactor presence translant. The Presentiant Salety Yelre (BC-315) sture and the though the Electromatic bolled Talve (BC-L2) during Imperators in the discharge lines were a result of the high tempertid and agen place the bacter Coolout System Preserve did not reach MA-218 temperators alons received was due to the back film of etoms is the comme discharge basher shared with the Electromatic Relief (RC-R2) discharge line high temperature alorss ears received and mises of 703.57 and 239.27, competitivity printed ont. The high Presentiant Safety Salva (BC-818) and Electromatic Deline Valva the presentiant selety value lift estpoint of 2450 paig. The falm (BC-82). These alorns were expected by the operator.

Special tanto

(EF-VILA) opens (Figure 40). Productor use not adultted to Steam Concessor & because Sweigeney Productor Black Valve (EF-V12A) was Rom Coursens A level casched the Integrated Control System sexpoint of 30 inches of which the Besponey Fordenter Volve

shee. E7-712A to normally open-

AP los (22.5 teches)/born/high (36 inches) (Deley : 30 seconds) M at 73.

Nº ot PLIO, AP high (2007)/som (Dalay 2 30 security)

2

MG Lt AM (24 Inches) ot PLI7, PR (Stortes Rouge) ot PLA, 1,5c AP 10m (24 lechos)/sore (Delay 2 30 seconds) EF-VIIA and EF-VIIB: IR at PLA CP-Villa and CP-Vills: ST or PLA 9

Tites	Post	Information Available to the Operator	Action 3, 1980
00:00:35	Steam Generator & level reached the Integrated Control System	NG L: AM (24 Inches) at PLI7, NR (Startup Rouge) at PLA	1,8
Approximate	satpaint of 30 inches at which the Darrgoncy Posdwater Valva	AP low (26 Inches)/normal (Delsy 2 30 seconds)	
	(EF-VIIS) opens (Figure 40). Pendwater was not admitted to	EP-VIIA and EF-VIIB: 18 at 714	
	Steam Generator & because Emergency Pesduater Block Valve (EF-9128)	EP-V12A and EP-V12b: ST at FLA	
	was shut. EF-Vith is normally open.		
19:00:00	The operator started Reactor Coolent Makeup Pump A (MD-P-1A).	MI-P-LA: AN or PLO, ST and MI(A) or PLJ.	1,28,54,
(81:18)	and opened High Pressure Injection Valve (HD-F168). With	AP morn/trip (Dolay 2 45 occords)	
	Resetor Coolant Makeup Pumps A and B (MD-P-1A and MD-P-15)	16-Vibl: ST at PL3, injection flow 16 at Pt. 8	
	operating and deliverying approximately 400 gallons per minute,		
	the Pressurisar level rate of decrease slowed (Figure 31).		
09:00:34	The Dearter Conlent System presentions Lovel reached on indicated	DC at PLA, MR (uncompensated) at PLS	-
(0+01:31)	adabase lovel of appreniately 130 inches (Figure 31).		
00:00:57	Pressuriast evel started furrenting (Figure 31). Postier	PZE L: PC at PLA, NR (encompensated) at PLS	-
Approximate	Conlast System het leg and rold leg temperatures reached	No Ter se rec rule	
	appromisately 5779 (Pigure 6). The Bootter Coolset Orein Tenk	PC Tar SC or PLA, NP at PLID and NR at PLA	
	presents us 11 polg and increasing (Figure 47).	MOST PL IN OF PLAN.	
99:01:00	The Presentian belong Talva MC-RIA) discharge lies high respet-	W 7.10	2
(0401:37)	stute alaca was recuived. This alaca was expected and resulted	AP high (2007)/surved (Delay 2 50 seconds)	
	from back flow in the copen , schorge hader chard with the		

PLATE STATES

Clack rematte toling Valva (80-12).

The Descript Coolers System was receiveding from the Initial loss of fordustry flow transfeat. The bactor Coolers System presents use decreasing and the Spector Camlons Presentions level had begun to increase (Figures 1 and 3). The disorgence of Spector Coolers System presents and Presentians forch

Raference

110

Dangang Fooductor Bloch Values (ES-V12A and ES-V123) were whot. The Steam Maction Coalest System pressors, and (2) the raducties is the heat removing these conditions contributed to the expension of the reactor coolant volume Laging Sessed late the Pressurings via the carge line, thoughy increasing Commences presented units being maintained by the integral of Courted System see met myected as Raccter Coalant byatem presence and Presentiaer level should sormally trend together during a loss of feedunter flow translands. the lives of spector couldes to the Prosecution. Stom Courteen A and B capability of the Steam Granteters because of their low levels. Both of The deviation from expected behavior was due to: (i) the failure of the Designing Pondenter was not admitted to the Steam Constitute because the Took presence and temporature were increasing showing the offects of the breaks were it faches and it lackes, respectively (Figure 34); bowver, of approximately too galbons per sincte win the Sigh Presents injection Electromatic Ballad Valva (BC-R2) to resear, which resulted to a lower barness 975 polg and 1620 polg (Pigure 31). The Reactor Coolant Brata castimed discharge of reactor coolean through the Hectronatic Rolled Valve (RC-AZ). Lasettet Coalest Nahoup Pumps (MD-P-1A and MD-P-13) were which forced reactor contact from the floweter Contant System loops and in operation delivering unter to the beactur Coolant Syctom at a rate Walve (ME-Cith) and the spinel Makeup Walve (MU-Sil). Obtability The Comfessor Detwell high level elers was received. The level was (08-01:26)

37.77 teches.

AP los (22.5 inches)/horn/high (36 inches) (Polsy 2 i minute)

THE PLS.

Tipe	frent	Information Available to the Operator	Arti J. 1980
90:01:26	à taottor Coolont Proto Tont temporature mermi alors une	12:-	
(5617040)	received and princed out a temperature of 63.57. This indicated	AP high (1309)/born/low (759) (Belay 2 1 misseld)	
	the Bearing Conlast Drafts Took temperature was increasing and		
	had resulted the normal respe-		
2016	Brem Compression & and I have beiled dry at this time. This	80 Pr. 18 or 714 and 30 or 713	1,38
	use fadicated by a scentily decreasing from Courter prosects	MC To No or MA, NP or Pale and NB or PA	
	(Physics 9) while hearter Chalces Dystem has Ing and cold log		
	temponatures were ingressing (Pigeres 21 and 26).		
96:62:60	The thit 2 shift superviews noted all Condensate Pumps, Condensate	PMLA/ISI AN OF PLIS cod PLIS	54,7,8r,90,91,
the or tweete	Resutst Pumps and Steam Generator Peachwater Pumps were tripped.	CD-1-14/131 M oc PL17	:
	Note: It is believed that condemste pump (CD-P-IB) continued to	CD-P-2A/23 M at PLI7	
	operate throughout the first hour. This is based on a		
	lack of 'ay computer alarm printout for a pump trip or		
	low conference pump discharge bander processes.		
100100100	The before Injection parties of Delinored Safety Peatures trains	GFF112 AF or PLIS, OF or PLS and PLIS	20,70,50,60,60
447 1700	A and 'S attented as Pontor Coaland System processes reached	N men/ectation (beloy 2.2 atmos)	
	Midd potts. Meseries Comless Nahamp Pump S (MC-P-IS) pripped		

AP morn/occumiton (Delay 2.2 minutes)

Ma-f-18: AB of PLB, DT and BB(A) at PLB

AP norm/orig (Delay 2.2 minutes)

AP norm/orig (Delay 2.2 minutes)

DH-f-1A, 18: ST at PLB and PLB, PM(A) at PLB,

NE (P_{B18CR}) at PLB,

AP Norm/low and on/off (Delay 2.2 minutes)

BC-F-1A,18: AB, PM (P_{B18CR}) and ST AT PL 8

AP en/off (Delay 2.2 minutes)

entymentically as a ropult of the actention of Safuty Injection.
The Defineered infety Pertures design in onch that Habery large
A and C are mormally and to deliver a High Pressure Injection
rate of 1006 gellone per state. If Pubray Pump E to reseing.

started extensitingly on Engineered Enforcy Peatures trains A and B

MC-P-137 and the Energency Pinsels (39-2-1A and 19-6-19) alon

he to automatically cripped does Safety Injection actualism excert. Theory Heat Domest Pomps (TG-F-IA and DR-P-IS) Decay Neat Cleand Conting Motor Pomps (DC-P-IA and

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F	,	4	

make and did not injecting worst into the Reactor Coolant System. Occidition Descript Coolant Makes Prays (MP-16) started moremitally. Makes Tile, The Makes Coolant Makes Prays (MP-16) started moremitally. Occidition The Reactor Coolant Makes Prays (MP-16) started moremitally. Makes Tile, The Makes Prays and Transmite Makes Makes Coolant State Tank Occidition The American Coolant Makes Makes Coolant State Tank Produces Coolant Makes Prays and the Makes Ma	Time	Ivent	Information Available to the Operator	Reference
make and did not injecting water into the heatter Coolant System. As Saltharm (Polzy 2 mannin) Massine Canison indeep Pump C (1884-16) started natematically. As annular 2 pulg temperately halited that (Mal-11) lifted at 122 pulg temperately halited the Rester Coolant brain Tank present increase (Tigure 47). The present increase was cassed by the flow of reactor coolant from the Riectonic halited that and be made an annular system of the fine present safety halited that and be made an annular system of the Nature of 123,77 was recorded. The operator coolant between the fight brassors bigitten talens. Both has the flower that flower that the flower that the flower that the flower that flower that the flow		actuation. The Decay Best Resoval Pumps operated in a recirculation	DF-P-IA, 18: AM, ST, NM (Amps, volts, Berts, EU/FTAAS)	
As Pair/Ann (Dairy 2 2 admates) As newtor Conlant Dairy 2 admits) As newtor Conlant Dairy halt mak helder Walve (UDL-EL) litted at 122 paig componently haltes the Reactor Coolent Dairy Table at 122 paig componently haltes the Reactor Coolent Dairy Table at 122 paig componently haltes the Reactor Coolent Dairy Table Valve (MC-EL). The After Malled Table (UDL-EL) discharges to the Reactor Midding Some. The operator annually bypassed the Safety Injection parties of Ma semn'Appins (Dairy 2 3 admates) The operator annually bypassed the Safety Injection parties of Ma semn'Appins (Dairy 2 3 admates) The operator conlant Nakeup Pamps as and C (MC-P-La and MD-P-LE) IIII As newton Coolent Dair Table High temperature alors was recited. The bactor Coolent Epsiam Presentian Dairy Many Pamps (DAIP-LE) IIII As newton Coolent Dairy Many Pamps as and C (MC-P-La and MD-P-LE) IIII As newton Coolent Dairy Many Pamps as and C (MC-P-La and MD-P-LE) IIII As newton Coolent Dairy Many Pamps as and C (MC-P-La and MD-P-LE) As high (ISDE)/news/high (200 inches) As newton Coolent Dairy Many Pamps and Lawranian A level of 266-1 inches was 100 inches and Larranian A level of 266-1 inches Was 100 inches and Larranian A level of 266-1 inches Many Pamps (MD-P-LE) As newfirst Dairy 2 admitss) As new (Many Pamps Many Dairy 2 admitss) As Table MC				
therefore Consists Ballong Pomp C (Bill-1C) started enremablically. As sorm/first (Poling 2.2 admates) The Banctor Consists brain Tank Railed Valve (Bill-11) littled at 122 paig, componently halting the Banctor Consist brain Tank presence increase (Figure 47). The presence increase was caused by the flow of reactor constant from the Riectromatic Ballod Talve (GC-R2). The Arry halted Valve (Wil-R1) discharges to the Banctor halting Song. The operator semanity bypassed the Safety Injection parties of hath Rightnessed Solery Peatures traine is and be gain semand control de the Safety Peatures traine is and be gain semand control de the Safety Peatures traine is and Security injection parties of hath Rightnessed Solery Peatures traine is and Security interes. Both hastor Consists Makeup Pumps as and C (Mil-Lis and Mil-L-Li) IIII special May have a seed of 187-17 was recorded. The beactor Consists Makeup Pumps as and C (Mil-Lis and Mil-L-Li) IIII special Consists Makeup Pumps as and C (Mil-Lis and Mil-L-Li) IIII special May have increased and the Righ Presente Adam was received. A temperature of 187-17 was recorded. A temperature of 187-17 was recorded. A temperature of 256-11 tember are received. A temperature of 256-11 tember are received. As the high (1307)/secultion) at Pla. As now (200 inches) and Mil-Lis and Mil-Li			AZ Falt/morm (Delsy 2 2 minutes)	
The Basetor Coolant Drain Tank Bailed Value (UDL-EI) lifted at 122 paig temporarily haling the Basetor Coolant Drain Tank present electates we caused by the flow of respect Coolant from the Birther Coolant Drain Tank present because the Edery Injection parties of the operator annually hypaned the Edery Injection parties of the operator annually hypaned the Edery Injection parties of the operator annually hypaned the Edery Injection parties of the operator annually hypaned the Edery Injection parties of the operator annually hypaned the Edery Injection parties of the operator annually hypaned the Edery Injection parties of the operator annually hypaned the Edery Injection parties of the operator annually hypaned the Edery Injection parties of the operator annually hypaned the Edery Injection parties of the operator annually hypaned the Edery Injection parties of the operator annually hypaned the Edery Injection parties of the operator annually hypaned the Edery Injection parties of the operator annually hypaned the Edery Injection parties of the operator annually hypaned the Edery Injection parties of the operator conlant Prain Teach High temperature allow was received. At Imperature of 122.77 was received. At Imperature of 122.77 was received. At Interpretated Preserving States Preserving Interpretate Collant Hakang Pung C (Ob-F-IC). At news received of 266.1 technologies in the Annual Interpretation of 266.1 technologies in the Annual Inter	00:02:09	Bearter Caalout Habers Pump C (NE-P-IC) started surcesstitedly.	As at 71.5. 57 and 18(1) at 71.3	28,56
The Rescret Coolant Drain Tank Relief Valve (UDL-RI) lifted at 122 paig temporarily halting the Rescret Coolant Drain Tank present aircrans (figure 42). The present increase was assent by the flow of reactor coolant from the Electromatic Halted Tank (CC-RI). The RCPT Halted Valve (UDL-RI) discharges to the Rescret halting Sump. The operator manually bypassed the Safety Injection parties of the Newton Coolant Makeup Pumps and the Righ Pressure taken A and B to gate manual control that Registered Safety Pressure taken A and B to gate manual control that Registered Safety Pressure taken A and B to gate manual control that Registered Safety Pressure taken A and B to gate manual control that Registered Safety Pressure taken A and B to gate manual control that Registered Safety Pressure taken A and RP-LS; IIII operation of 125.77 was recorded. The Benetor Coolant Safeth Tend Migh Importation along was received. A tumporators of 125.77 was recorded. A tumporators copyed Rescret Coolant Waken Pump Pump C (UD-P-IC). A tumporators copyed Rescret Coolant Waken Pump Pump C (UD-P-IC). A town (TSD blay I a sinces) The operator Coolant Decision Waken Pump Pump C (UD-P-IC). A town (TSD Migh = 315 toches) A tumporator Coolant Waken Pump Pump Pump C (UD-P-IC). A town (TSD Migh = 315 toches) A tumporator Coolant Waken Pump Pump Pump C (UD-P-IC). A town (TSD Migh = 315 toches) The indicated Pressurfact lovel was 380 toches second (Thure 32). At manually S at with Migh = 305 toches) at 714, M (Migh = 305 toches) at 714, M (Migh = 305 toches) at 714, M (Migh = 305 toches) at 715, M (Migh = 305 toches)	(0482:41)		A normitrin (bolay 2.2 admica)	
at 122 paig temporarily halting the Nameter Coolane Drain Tank pressure increase (Figure 47). The pressure increase was caused by the flow of reacter coolant from the Richerges to the Nameter (RC-R2). The NAT haltef value (VBI-R1) discharges to the Nameter (RC-R2). The NAT haltef value (VBI-R1) discharges to the Nameter (RC-R2). The name and its fight researe injection parties of the Nameter Coolant Wakeup Pumps and the High Pressure injection halves. Buth Nameter Coolant Wakeup Pumps and the High Pressure injection halves. Buth Nameter Coolant Wakeup Pumps as one C (RG-P-LA and NG-P-M2) agentified. The Receiver Coolant Wakeup Pumps as one C (RG-P-LA and NG-P-M2) At umporature of 127-77 was recorded. The Receiver Coolant Spring was recorded. At Order 2 3 admosts) At lamporature of 256-11 inches was recorded. At Order 2 3 admosts) At lamporature of 266-11 inches was recorded. At Order 2 3 admosts) The operator Coolant Wakeup Pump C (RG-P-LC). At lamporature of 266-11 inches was recorded. At Order 2 3 admosts) The operator Coolant Wakeup Pumps as and increasely. At onew/trip (Dalay 2 4 admosts) At name(A) at PLA, RT and MA(A) at PLA, The operator recorded resonations takens second (Figure 32). At name(A) at PLA, RT and MA(A) at PLA, The operator of approximatedly one inches accord (Figure 32). At name(A) at PLA, RT and MA(A) at PLA, The operator of approximatedly one inches accord (Figure 32). The Operator Coolant Wakeup Pump C (RG-P-LC) At Nameter Coolant Wakeup Pumps C (RG-P-LC) At Nameter Coolant Wakeup C (RG-P-LC) At Nameter Coolan	00:03:15	The Reactor Cobiant Drain Tank Relief Valve (WDL-R1) lifted	10 or 71.00	-
presence increase (Tigure 4)). The presence increase was assessed by the flow of reactor colonal from the Electromatic halted water (GC-R1) discharges to the Reactor (GC-R1). The Active Presence to Safety Injection parties of the Rekhrap Presence Safety Pesterne trains A and B to gain manual central of the Rekhrap Presence to Safety Pesterne to Patent A and NG-P-15; The special colonal Metrop Prays and the High temporature along was created. At temporature of 12,7F was recorded. The bactor Colonal System Presentiant high level along was received. At temporature of 12,7F was recorded. The bactor Colona System Presentiant high level along was received. At high (1207)/norm/law (757) balay 2.3 admatem) The bactor Colona System Presentiant high level along was received. At high (1207)/norm/law (757) balay 2.3 admatem) The speciation of 256.1 inches was recorded. The speciation of 266.1 inches was 300 inches and increasing tapical Presentiant level was 300 inches and increasing tapically at a rate of approximatedly one inches second (Figure 32). The tulicated Presentiant level was 300 inches accord (Figure 32). At norm/lip (Dalay 2 4 attents) at F13, at the 200 inches) At TA, SC of F14, NG (werepresent) at F13.	Approximate	at 172 paig temporatily halting the Reactor Coolast Drain Tank		
My the flow of reactor coolant from the Riccicumite halted Tabus (NC-RI). The NCYI halted Tabus (NDL-RI) discharges to the Reactor Maiding Somp. The operator manually bypassed the Safety Injection portion of the Nederor South Safety Persons trains A and a to gate manual central of the Nederor South Papes and the High Presents Injection Pales. Both Massics Coolant Nature Pamps A seek C (NDL-P-15 and ND-P-15) ::::: species Coolant Nature Pamps A seek C (NDL-P-15 and ND-P-15) ::::: species Coolant Nature Pamps A seek C (NDL-P-15) and P-15) ::::: species Coolant Nature Pamps A seek C (NDL-P-15) and P-15) interpretion of 127-77 was recorded. The bacator Coolant System Presentiate high lovel alore was recited. The bacator Coolant System Presentiate high lovel alore was recited. At high (1207) Annual) At large I admits and Inches and Increasing At local (NDL-P-15) and PL). The tablicated Presentiate Presentiate Release Habers and Increasing registly at a rest of approximate there are noted (Figure 32). At PLA, PL AN Chigh/high = 113 inches, high = 250 inches) at PLA, PR (companyer) at PLA, At manual PLA, PR (companyer) at PLA, At manual PLA, PR (companyer) at PLA, At more PLA, PR (companyer) at PLA, At manual PLA,		pressure increase (Figure 47). The pressure increase was caused		
(NC-R2). The styr halled Talve (VDL-R1) discharges to the Reactor hallding Sump. The operator samually hypenesed the Sedery Injection partion of both Engineered Sedery Peateress trains A and B to gain samual central of the Nekrop Pumps and the Righ Presence Injection partion of hoth Engineered Sedery Peateress trains A and B to gain samual central of the Nekrop Pumps and the Righ Presence Injection talvas. Both hearter Coolant Makeup Pumps A and C (NC-P-14 and NC-15) ==== specialing. The leastor Coolant System Presenction high level alone was received. A temperature of 120-77 was recorded. A temperature of 120-77 was recorded to reco		by the flow of reactor coolent from the Electromatic Ralief Value		
The operator manually bypassed the Safery Injection partion of the born/hyp.ss (holey 2.3 stantem) of the Neckery Proposed the Safery Injection partion of the Neckery Conject Wash by Present to and No-1: 12 and No-1: 12 stantem) The Assertor Conject Proton Teach bigh temporature along was received. A temporature of 127.77 was recorded. A thigh (1207)/norm/loss (757) balay 2.3 stantem) A temporature of 127.77 was recorded. A temporatur		(RC-R2). The RCPT Belief Valve (WDL-R1) discharges to the Rescrot		
The operator manually bypassed the Safety Injection parties of hoth Ragineered Safety Features trains a and B to gain manual control of the Nokany Pumps and the High Teasure Injection Tales. Buth Asserter Coolent Nokany Pumps a said C DEC-1-12 and NO-1-15; ==== operating. The Reactor Coolent Drain Teach high temporature alorn we received. A temporature of 127-77 was recorded. The Reactor Coolent System Pressurizer high level alorn we received. A temporature of 127-77 was recorded. The Reactor Coolent System Pressurizer high level alorn we received. A temporature of 127-77 was recorded. The Reactor Coolent System Pressurizer high level alorn we received. A thigh = 280 inches) At Pile At Pile At Pile Teach Note (200 inches) A lovel of 266.1 inches we recorded. The Operator stopped Reactor Coolent Nakang Pump C (ND-0-1C). A lovel of 266.1 inches At Pile At Pile Teach Note (200 inches) A lovel of 266.1 inches At Pile At Pile Teach Note (200 inches) A lovel of 266.1 inches At Pile At Pile Teach Note (200 inches) A lovel of 266.1 inches At Pile At Pile Teach Note (200 inches) A lovel of 266.1 inches At Pile At Pile Teach Note (200 inches) A lovel of 266.1 inches At Pile At Pile Teach Note (200 inches) A lovel of 266.1 inches At Pile At Pile Teach Note (200 inches) A lovel of 266.1 inches At Pile At Pile Teach Note (200 inches) A lovel of 266.1 inches At Pile At Pile Teach Note (200 inches) A lovel of 266.1 inches At Pile At Pile Teach Note (200 inches) A lovel of 266.1 inches At Pile At Pile Teach Note (200 inches) A lovel of 266.1 inches At Pile At Pile At Pile Teach Note (200 inches) A lovel of 266.1 inches At Pile At Pile Teach Note (200 inches) A lovel of 266.1 inches At Pile Teach Note (200 inches) A lovel of 266.1 inches At Pile Teach Note (200 inches) A lovel of 266.1 inches At Pile Teach Note (200 inches) A lovel of 266.1 inches At Pile Teach Note (200 inches) A lovel of 266.1 inches At Pile Teach Note (200 inches) A lovel of 266.1 inches At Pile Teach Note (200 inches) A lovel		beliding Sump.		
the Noterny Purpose and the High Presence Injection Values. Both Assertor Coolean Nature Prays a and C (NG-P-1s) and NG-P-15; see operating. The Noterny Purpos and the High temperature alarm was received. At high (1207)/norm/low (737) Dailey 2 3 admices) At temperature of 127,77 was recorded. The Noterno of 127,77 was recorded. At temperature of 127,77 was recorded. The Noterno of 127,77 was recorded. At temperature (137,77 was recorded.) At temperature of 127,77 was recorded. At temperature (137,77 was recorded.) At temperature (137,7	00:03:14		At morn/hyp/as (bulay 2.3 minutes)	20,94,90
of the Noterny Pasps and the High Presence Injection Value. Both Assertor Coolent Nature Pasps A and C (NG-P-14 and NG-P-14) The Reactor Coolent Drate Test high importance alors were received. NR high (1207)/norm/low (757) Dalay 2 3 adments) A temperature of 127.77 was recorded. The Reactor Coolent System Presentiacr high level alors was received. NR (high = 260 inches) At 1207/norm/low (757) Dalay 2 3 adments) A level of 266.1 inches use recorded. The Reactor Coolent System Presentiacr high level alors was received. NR (high = 260 inches) The operator stopped Reactor Coolenn Nahang Pasp C (NG-P-15). The operator stopped Reactor Coolenn Nahang Pasp C (NG-P-15). The indicated Presentiacr level was 360 inches and increasing. At norm/crip (Dalay 2 4 atmetes) regidly at a rate of approximately one inches second (Figure 32). FER Lt M (High/high = 315 inches, high = 280 inches) ex 748, NG orth/high = 315 inches, high = 280 inches)	(0403533)	both Engineered Safety Peatures trains A and B to gain memeal control		
Parector Coolean Nature Pumps A and C (060-P-15 and 160-P-15) The fonctor Coolean Drain Test Nigh temporature alarm was recoved. A temporature of 127-77 was recorded. A temporature of 127-77 was recorded to temporature of 127-77 was rec		of the Nekaup Pumps and the High Pressure Injection Talwas. Both		
The function Conlost Brain Teach Migh temperature alors was received. NR act PLAA, A temperature of 127.77 was recorded. The function Conlost System Presentions high level alors was received. NR Onlyh = 280 inches) At PLA A loral of 266.1 inches was recorded. A low (200 inches) At PLA A low (200 inches) The indicated Presentiant level was 380 inches and increasing A norm/trip (Dainy 2 4 atteres) A norm/trip (Dainy 2 5 atteres) A norm/trip (Dainy 2 5 atteres) A norm/trip (Dainy 2 5 atteres)		Reactor Coolant Nakeup Pumps & and C ONG-P-1& and NO-P-10:		
The Sector Coolont Prais Tesh high temporature alone was recoved. M at PLAA, A temporature of 127-77 use recorded. The Sector Coolont System Pressurizar Lar high level alone was received. M (high = 250 inches) /sorn/high (250 inches) A lovel of 266.1 inches was recorded. A lovel of 266.1 inches was recorded. A love (200 inches) /sorn/high (250 inches) The operator stopped Rescree Coolons Hakeup Pump C (ND-P-IC). The indicated Pressurizar level was 360 inches and increasing. A sorn/krip (Delay 2 4 atmetes) regidly at a rate of approximately one inches accord (Figure 32). PER Lt. M (high/high = 315 inches, high = 250 inches) at PLA, NC (uncomponented) at PLA,				
A temperature of 127.77 was recorded. The Beactor Coolant System Freeseriler high level alors was recoived. At Chigh = 260 inches) At FLB At low (200 inches) Assert/high (250 inches) At low (200 inches) Assert/high (250 inches) The operator stopped Reactor Coolant Hakeup Fump C (ND-P-IC). The indicated Pressuriaer level was 350 inches and increasing At norm/trip (Delay 2 4 minutes) at a rate of approximately one inches accord (Figure 32). PER L. At Chigh/high = 315 inches, high = 250 inches) at FLB, SC or FLA, ME (uncomponented) at FLB,	00:03:26	The heariest Coolest Prata Tach high temperature alarm was received.	***	A
The facetor Coolant System Presention high level alors was received. At Chigh - 260 inches) At PLS A lovel of 266.1 imches was recorded. (Delay 2.3 admits) The operator stopped Restor Coolant Nakeup Pump C (NE-P-IC). (Delay 2.3 admits) The operator stopped Restor Coolant Nakeup Pump C (NE-P-IC). (M-P-IC: As or PLS, ST and NE(A) at PLS, The indicated Presentiant level was 360 inches and increasing rayidly at a rate of approximately one inches second (Figure 32). (The indicated Presentiant level was 360 inches and increasing AP now (200 inches) at PLS,	(0000:03)		AF high (120F)/norm/low (75F) belay 2 3 admine)	
A lored of 266.1 imchas was excepted. (Delay 2.3 admucas) The operator stopped Basetes Coolean Haleup Pump C (OD-P-IC). (Delay 2.3 admucas) (A) core/trip (Delay 2.4 admucas)	00:03:28	The Boarton Coulont System Presentiaer bigh level slore use received.	AB (high - 260 inches) At FLB	A
The operator stopped Reactor Coolant Nahaup Pump C (ND-P-IC). The indicated Pressurisar level was 360 inches and increasing. AP norm/trip (Delay 2 4 minutes) rapidly at a rate of approximately one inches second (Figure 32). RZB L: AB (high/high = 315 inches, high = 280 inches) at Fig. SC or Fid. NB (encompensated) at Fid.	(colsoed)	A lovel of 266.1 turbes we recorded.	AF low (200 inches)/mors/high (260 inches)	
The operator stopped Beatrat Coolene Habeup Pump C (ND-P-1C). The indicated Pressurisar level was 360 inches and increasing. As norm/trip (Delay 2 4 minutes) rapidly at a rate of approximately one inches second (Figure 32). PZR L: AR (high/high = 315 inches, high = 250 inches) at Pla. SC of Pla. NE (encompensated) at Pla.			(Dolor 2 3 admices)	
The indicated Presentiast level was 360 inches and incressing. AP norm/trip (Delay 2 4 atmates) rapidly at a rate of approximately one inches second (Figure 32). PZR L: AR (high/high = 315 inches, high = 250 inches) at Pla. SC or Fish, M. (uncompensated) at Pls.	00:04:38	The operator stopped Asacter Coolent Makeup Pump C (MD-9-1C).	NU-F-IC: AS or PLS, ST and NR(A) at PLS,	1,26,30.
rate of approximately one inches second (Figure 32).	(0003143)	The indicated Pressuriser level was 360 inches and incressing	AP norm/trip (Delay 2 4 minutes)	l
et 715, SC at 714, M (uncompanied) at 715,			FZR Lt. AM (htgh/htgh = 315 inches, htgh = 260 inches)	
			at PLA, SC at PLA, MR (uncompensated) at PLS,	

Mary Committee

Informetion Available to the Operator

PR OF PLB

Reference

86,94,50

to an extense to gain control of the repidity incressing pressurtant level the operator threctled the High Presents Injection Induction Palens (18-0144 and 18-17148). type on fast s (0405:15)

PLANT STATES

brain tank Relief Valve (40%-21) had opened at 120 paig and a high temperature and not take the Pressurtsar "solid" (Pigures 3 and 31). The Beartar Coolest celd leg temperatures increased (Figures 21, 26 and 35). This was due to the specator did not realize EP-VI2A and EP-VI2B were shut. The Steam Cenerators Pressurizer level continued to increase, the operator stopped Reactor Coolent alars had been received as the tesperature and pressure of the tesk continued festures, which actuated High Pressure Injection when pressure reached 1640 Makeup Pass C (MD-P-EC) and throttled the High Pressure Injection Isolation to increase. The Steam Constators had boiled dry as indicated by a contin-Essergency Feeduater Sinck Values (EF-V12A) and EF-V12B) being closed. The halves (MD-168 and MD-F168) in an attempt to control the Pressurizer level was due to the failure of the Electromatic Belief Valve (MC-A2) to resent, unually decreasing steam pressure while Reactor Coolent System but leg and The Reactor Conlant System pressure was 1420 paig and atsadily decreasing to the asteration pressure of the Reactor Coolest System hot leg temperastarrup level inditation remained at approximately 10 to 14 inches. In ture (Figure 3). The continued Reactor Coolent System depressurization paig, had been bypassed by the operator to permit manual control of the and reduction in Righ Pressure Injection flow rate. Ingineered Safety Makeup Perps and the Sigh Pressure Injection Teolation Valves. As the secondance with operating procedures a level of 8 inches or less in a Stans Centrator was considered indicative of a dry Steem Cenerator.

Event	Information Available to the Operator	Reference
The operator started Intersediate Closed Cooling Nater Pump &	AS at PLS, ST at PLS and PLI3,	24
(IC-P-IA) in proparation of putting a second Letdown Cooler	MR(PDISCE) and MR(F) ot PLE,	
in service.	AP pa/off (Delay 2 5 minutes)	
The operator initiated letécom flow at a rate greater them 160	MR at 7L3	1,2a,8£,8r,9, 94,9e
gallons per minute in an ettempt to reduce Pressurizer level to	AP (Range 0-160 gps) (Delsy 2 5 minutes)	
the normal range.		
Pressurizer level momentarily stopped its sharp increase at 377	SC at PLA, Mt (uncompensated) at PL5	
inches and began to decrease. It reached a minimum of 373 inches		
end egain started to increase at 00:05:23 (0406:01) (Figure 3)-		
Regimes Presouriser level indication in 400 inches-		
The Unit 2 Shift Supervisor cleared the trip signal from	AN at PLI7, MR(A) and ST at PLS,	2a,54
Condensate Pump 1A (CO-P-1A).	AP more/trip and me/off (Deloy 2 5 minutes)	
The Bait 2 Shift Supervisor storted Condensate Pump 1A (CO-P-1A) is	AM at FLI7, MR(A) and ST at FLS	20,54,91
on attempt to outshiled condennate flow. It was not recognized	AP norm/trip and om/off (Delmy 2 5 minutes)	
that a blockage existed in the condensate to booster pump flow path due		
to the polisher outlet valves baing shut. In addition it was also not		
resized that condensate pump 18 (CO-P-18) was running dead handed.		
The Unit 2 Shift Supervisor ecompted to etert Condensate Deceter	AS at PLI7, MR(A) and ST at PL5	20,54,91,91
Pump 28 (CO-P-28). The pump tripped is mediately due to a low	AP norm/trip (Delay 2 5 minutes)	
Suction pressure.		
The Unit 2 Shift Seperator again attempted to start Condensate	AB ot PL 17, ME(A) and ST at PLS	20,54,92,92
Sounter Pump 28 (CO-F-28). The pump tripped insediately due to a	AP morm/trip (Delay 2 5 minutes)	
law suction pressure.		
	The operator started Intermediate Closed Cooling Nater Pump & (IC-P-IA) in preparation of putting a second Letdown Cooler in service. The operator initiated letdown flow at a rate greater than 160 galloon per minute in an attempt to reduce Pressurizer level to the normal range. Pressurizer level momentarily stopped its oberp increase at 377 inches and began to decrease. It reached a minimum of 373 inches and egain started to increase at 00:05:23 (0406:01) (Figure 3). Pressurines Pressurizer level indication in 400 inches. The Unit 2 Shift Supervisor cleared the trip signal from Condensate Pump IA (CO-P-IA). The Unit 2 Shift Supervisor started Condensate Pump IA (CO-P-IA) in an attempt to establish condensate flow. It was not recognized that a blockage existed in the condensate to booster pump flow path due to the polisher outlet valves being shut. In addition it was also not realized that condensate pump IB (CO-P-IB) was running dead handed. The Unit 2 Shift Supervisor setsupted to start Condensate Docater Pump 28 (CO-P-2B). The pump tripped inordiately due to a lpw sourtion pressure. The Unit 2 Shift Supervisor again attempted to start Condensate Docater Pump 28 (CO-P-2B). The pump tripped inordiately due to a	The operator started intermediate Closed Cooling Natur Pump A (IC-P-IA) in preparation of putting a second Letdown Cooler in service. The operator initiated letdown flow at a rate greater than 160 galloca per minute in se ottempt to reduce Presentinar level to the normal range. Presentinar level momentarily atopped its obserp increase at 377 inches and began to decrease. It reached a minimum of 373 inches and began to decrease. It reached a minimum of 373 inches and again started to increase at 00:05:121 (04:06:01) (Figure 3)- Presentinar level indication in 400 inches. The Unit 2 Shift Supervisor cleared the trip mignal from Condemnate Pump 1A (CO-P-IA). An over/trip and on/off (Delay 2.5 minutes) The Unit 2 Shift Supervisor atorted Condemnate flow. It was not recognised that a blockage existed in the condemnate to booster pump flow path due to the polisher outlet values baing shut. In addition it was also not realized that condemnate pump 1B (CO-P-IB) was running dead headed. The Unit 2 Shift Supervisor extempted to start Condemnate Booster Pump 2B (CO-P-2B). The pump tripped inardiately due to a law succion pressure. The Unit 2 Shift Supervisor again attempted to start Condemnate The Unit 2 Shift Supervisor again attempted to start Condemnate An of FL 17, ME(A) and ST at FL5 AP norm/trip (Delay 2.5 minutes) AB of FL 17, ME(A) and ST at FL5 AP norm/trip (Delay 2.5 minutes)

T. .

Cooler 14 high temperature alors and less feartur Coolent Prop-

ones. The Landons flow recuired to sevent. A flow rate of

W. a gallons per nimere une recorded.

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TDN 044, New 2 April 3, 1980 Referen
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Section.

1.28. Fc. 9a. 9a. 8 AP on/off (Dalay 2 6 admits) U-9124,8: ST at FLA which had been open for approximately 4 adoutes. The Reactor Building The operator discovered the Emergency Feeducier Black Walves (EF-Ville Machanga from the Beactor Coolast brata Tenk Relief Valve (Mil-Mi) Samp Punps generally exarted shout once per shift. For this reason approximately 140 gallons per minute when there discharge is the pusp start would not have been considered extraordinary by the Motes. Each Resertor Building Sump Pump has a measured capacity of directed to the Pilerellaneous Waste Holdup Tank (WBL-2-2). Reactor Building Sump Pump & (MCL-F-1A) started on a high Reactor Sailding Sump level. The increased cump level was due to the JB2 (18:06 (0468:37) (0408104)

mergency feedwater to the Stoom Generators. Indicated Stoom Cenerator terels were appearingently 10 inches just prior to feedwarer eddition observed when fection's was admitted to the Steus Generators (Figure 11). Addition of feedwates was also conficmed by a decrease in the mergency fooduater Pumps discharge pressure and by "hummering" and (Figure 35). A rapli rise in Steam Generator A and B pressure was and EP-7125) were shut. EP-912A and EP-912B was opened admitting "crackling" heard from the Loose Part Nonitoring System which was silgned to sendtor Steam Generator A (Figure 59).

AP Iow (24 inches) fnorm (Delay 2 6 minutes) AP low (860 pelg) /norm/high (960 pelg) 36 L: Me at Pl.A (startup level), NC at M at E4, SC (Pag) at Fill? PLA nod PLS (operating). (Delay 2 6 minutes) DP P: NR (PBISQE) At PLA 2 3

SC -- IN at 75.3

Reactor to delement beliefing pressure bages to factuseing slouly

frem a nalue of -6.5 poig (Pigure 31).

08:08:12 (0408:49) Approximate

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1		Information Available to the Operator	April 3, 1980
06166133	The Reactor Castant System hos leg and cold leg temperatures began to	NO TO SO OF PLA, WE AS PLID AND SE PLA	3
(61¢66)	decrease as a result of the farebatter added to the Steam Centrators (Figure 5). Steam Centrator steaming Sectioned as the Steam Central	SG Pt 100 at PLA, SG (P _{MS}) at PLL? £7 low (860 psig)/horsu/high (960 psig)	
	franct fo	Oh tay : 6 adoutes)	
	Officers D.		
00)-28:33 (0409:10) hpprex3mes-	The Reacter Coolant System prosours bagan to decrease, reflecting the decrease in Reactor Conlant System temperature (Figures 3 and 5).	2 2 2	1
(36) (36) (36)	Condensate Pump 1A (CO-P-1A) tripped, It is believed this pump trip was the result of an unsuccessful strompt to start Condensate Booster Pump 2A (CO-P-1A).	Me ar 19,37, 192(3) and 5% or 75. Me absortetty and suboff (Delay ; 7 adoutes)	1
00:09:05 (04:09:05) kppr 00:09:05	The operator recognitive the condensate reject flow pack was blocked and empirical the condensate pollubing desirentiation to be the sweeter of blockage. In attempted to occiditate the condensate flow by opening the resistance pollubers bypone valve (60-412). The value that not compand.		
(05 140m0) (1140 100	The condensate booster from metter bander tor presence clera was excepted.	AP mores/low (15 paig) (Deloy 2.7 minutes)	•
06:19:06 (04:0:3) Approximate	As Assilian's Operator discovered a locking liange in the Monater Pung Suction piping. After reporting this to the Control Boom, he thus closed Section Valve (CD-V27k) for Conference Booster Pung 28 (CD-V-2k).	Units 2 Commissed Russa mentificed of leadings Flange	1
600 101 100 (24101 101)	The descript Contone System Processorisor Local Indication came on series.	M. he play MR (uncompensated) at PLS	

Raf er ence

200

Bresst

PLANT CANA

edutical to both from localuzions skiels repeited to increased stom presented is but us removed from the factor Coolest System, temperature and present cold bay temperators (Pigures 6 and 9). Stem presents were controlled by ross and the robused Map Presents Injection flow rate resulted to a decrease decreased. The decreasing temperature is conjunction with the becken flow latter the rate, remain 91st Present Injection the rate and morphory to reactor cooless values. The Presencious lared indication uses so exula, features addition to the Bress Constitute. Bargerry features fire une atubo as chann by the decrease in both Seacter Conland System bes ing and and the exempery of both bless Constatts so learter Conlast System band Smeater Conlant Saleny Purp 14 (SE-P-14) was operating providing Sector the languaged Coursel System then pulation of the Barbins bypass talends. Gonlant Pump and uniter and undersp flow. Nearton Conlock System lettlers No hanter Conlast dyttes Pesseil's no cast the satelettes protoute of result of the Cleatremetic failed Taire (IC-LI) resolating apen, high the reactive analyse hat has temperature (Pigure 5). This use the flow rate me appreciately 70 , ollows per sinte.

1 (ma)

marger helder, [22] Juny 28 (ML-9-13) clasted. To purp easer mapping to 1.416 (cot from the battom of the Resistor Contolorement in building large. The Resistor balleting has been declared to the Resistor balleting large (ML-1-1).

2.

No maloft (beleg : 0 adment)

(6473:6)) A value of 123.79 was recorded.

A workly (135) Goley : 8 dates)

2

			TOR 044, Rev 2 April 3, 1980
7386	State Commission of the Commis	Information Available to the Operator	Reference
(0411:01)	The operator stopped, teaterist and agala stopped Reactor Casless Hakeup Famp 18 (ME-E-1A) during the seat four seconds.	AF worm/trip (belop : 8 almess)	ž
(0411/25)	The Bassier heliding has high loved alone we received. Beyold in 1.59 from from the bassier de the Bassier heliding has.	le mornefligh (6.65 foot) (holing 2 8 mfooton)	
30:11:43	The sporter started beautier Conless thoughter 18 (TD-4-18) offer a most constituted (Collective Conless).	All or Filb, ST and ME(A) at PL3 All corn/tely (Doloy ; 0 admitted)	A
00:12:05 (04:12:37) Approximate	Combanner Cotwell break indirection twerwared of Cocale high (greater than 90 inches).	8 D.)	*
(0413130)	The operators stupped Occary Neat Removal Pumps LA and 18 (DM-P-10.	ff at FLLS and PLS, WHIP_DISCH) on FLD AP coluff and norm/refs (Delsy 2 11 educes)	2 Å
(9614196)	Configurate Bonness Pump contiton header presings (7,10,000 to Giral). A presume of 13.0 ping was recorded.	AF worm/low (15 poig) (beloy 2. 7 educes)	
44.500 44.500 44.500	The Taueror Condess Darks Tead Popture Displaces (ONL-278) being on some 187 peing (Figure 47). Design bean promines to 180 g. 15 peing. The connects of the Desictor Conlant Drain Tead were religious to the Lunctor Containment Design on Confederate. The promite is a rept interfease in Reservor Containment Design.	100 per 20 mm (125 per 20), 10 mm mm	
(941417) (941417) (941 m (941 c	The operator stopped the twn operating Bester Brain Fumps. These pumps had been maintaining the pressure in the condensate system.	All or Palty, 87 or Pals	* *
(6415:15)	The condensate fronter Pump Ion discharge pressure slare use received. A pressure of 307 palg use recorded.	N man, flow (316 pring) (belong 2 13 actuaries)	
(3418136)	The Peeduater Pung Irm metiton bender pressure alarm was received. A pressure of 259.4 paig was recorded.	A) conclus (Polay ; 11 clustes)	

Time	TOTAL STATE OF THE PROPERTY OF	Information Assisable to the Operator	Reference
50:19:54	The operator tonet Contenants Pray 1A (Ch-0-1A) telp eterata.	HB(A) and ST at FLS,	2,4
-		AF norm/trip and on/off (Delay 2 13 minutes)	
00116:12	The confenence femelor Purp surifica beatar for pressure alers was	AF norm/low (15 peig) (Delay 2 13 afmice)	A
	consisted. A process of 14.8 pddg was recorded.		
00:19:23	The Reactor Suilding Purgo air Laboust Burt A radiotion united	1 and 10 an 19.2	K'N
Approximent	# (MP-N-733) recorded tearness in rediscentivity level. The		
	lared increased from 1 m 102 comming per minute to 3 m 102		
	comits per afeata on the particulate channel. Additionally,		
	there were slight redissectivity level increases indicated		
	(a) Bearing building burge Air Echanot Sunt B (HF-8-236) -		
	perticulate maitee		
	(b) Control building Proge Air Exhaust Dant B (SP-8-124) - ges		
	eattor		
	(e) Auxiliary Pullding Purgs Air Cohomes Duct (badare filter)		
	(RP-8-222) - gas monitor		
	(4) Auxiliary Building Purge Air Exhaust Dect (molter filter)		
	(WF-1-222) - particulate monitor		
90121159	Smactor Goolant Pump 2A (RC-F-2A) full opend alarm use	AP meral/see (Belog 2 10 admica)	
1007 (1) 7001	teceived interacting.		
00:22:17	The special of depresent the reactor telp purchastes to confirm	Descree trip better of 714	
10442134	that the reaction tripped.	A worderly (beloy 2 to whereat	
09:22:44	The steam Concretes A loss larvel alarm cleared. A lovel of 26-4		2
10473171	Lackes was recorded.	AP corn/low (23.8 teches) (Delay 2 20 admscan)	

following the base of the control of the following that the detail that the control of the contr	6	Mont	Information Available to the Operator	- Inferent
COMPLETED and burst. This conclusions are based on the existing. The first importance and low presence to the decis time (majes with a low distance and low presence to the decis time (majes with a low distance and low presence to the decis time (majes with a low distance and low presence to print the emiliar (majes with the majes wit	80,261	The Bale 2 Maife Superviews continued the Seaster Contact Trafe Trade	1077 71 M and 48 (125 perig) on FLAM	W.W.W
The first temperature and low presence to the deric tank complet with a law function with a law presence in the deric tank complet with a law function of the formation function function of the function function function (MC-T-M end function). The first is filled functioned requested the complete to prince the entire TP (Folloy 2 0 admits) improvement (MC-T-M end function). The first is filled function without the Presentation function of the Minester and MC-M end 173.17 were indicated. The spectrum of MC-M end the Presentation function for the entered of the Mannes and MC-M end 173.17 were indicated the impossibility function of the entered of the Mannes function for the entered of the function of the func	-	promises and completes that the deals tent raprare dispirage	NOT It IS NO FLAM	
The fait is Shift Emperions and the presence in the deria team complete with a The fait is Shift Emperions requested the computer to print the entire TP (Doloy 2 0 educes) The fait is Shift Emperions requested the computer to print the entire TP (Doloy 2 0 educes) The fait is Shift Emperions requested the computer to print the entire TP (Doloy 2 0 educes) The fait is Shift Emperions requested the Computer Shift Shift and TP (TP (TP (TP (TP (TP (TP (TP (TP (TP		(Me. 470) bad bernt. Die emelusten me band m the entering		
The fight is thick Emperiment requested the computer to princ the entire By (Dolley 2 0 chances) temperature (DC-10-TE), NC-10-TE) and NC-10-TE) of the Electromatic AP 10ph (7007)/vers (Dolley 2 21 adomnes) halter Waite (DC-12) and the Presention Enterty Malves (MC-12) and the Presention of the Presention of the Presention of the Present and 199-46, 201-79 and 179-18 and 279-18 and an entertainment of the discharge Lader (MC-12) and believed the Electromatic Malves of the Grant Malves (MC-12) and believed the Electromatic Malves (MC-12) and believed the Miles (MC-12), MC-12, MC-12), MC-12,		Migh temperature and low presence to the drain tank coupled with a		
The Bait I Shift Department requested the competent to print the mailet TP (Delay 2 0 admins) requested: (DC-10-TE) and NO-10-TE) of the Electromatic to high (7007)/come (Delay 2 21 admins) belief white (DC-11) and the Frenchiser fadicety Delay (SC-11) and the Fallo SP-803). Respective values of 203-40, 203-47 and 273-17 are indicated. The approximation of the impostance basis to the main) and and of the Fallo The approximation basis (DC-12) and believed the Electromatic ballot And operation basis (DC-12) and believed the Electromatic ballot And operation placed the Tention Dypon Tallot (TM-750, TM-9235). The approximation basis to the control the collection to the Third Spine to the Californy are to TM-724/750; TM and ST on FL)		les étachesys presero es the besite lades franter Pep(s) 94		
The Mair I Shift Emperators requested the computer to print the entlate TP (Dollay 2.0 admins) compares (Mc-16-TE) and the Proceedant Solves (Mc-114 and Proceedant Solves (Mc-114 and Proceedant Solves). Note that the Proceedant Solves Solves (Mc-114 and Proceedant Solves). Note that the Compares Solves		mad/or 99 (NEC-9-06 out/or 98).		
Address (RC-10-TI), NO-10-TIS and NO-10-TIS) of the Distirumnia of high (1987)/corn (Polzy I 21 adores) Maint Wairs (RC-13) and the Presentant Endory Maint (NO-111 and No-111) Maint Wairs (RC-13) and the Presentant Endory Maint (NO-111 and No-111) The approxes anti-Darie (NO-12) and Maint (NO-111 and Adores) condems of the Maintenant Endors (NO-111) and Maintenant Endors (NO-111) and Maintenant Endors (NO-111) and Maintenant Endors (NO-111) Maintenant placed the Turkien Dypmes Talvos (NA-TIA, NA-TIA). Maintenant NA-TIAS) is seemed and created them selliphity upon to NA-TIA/TIA; NA and ST or TIA	06124100	The finite 5 Shift Experience enquested the competer to print the milest		26,50,00,00
Matter Walter (MC-12) and the Proceedings Salves (MC-11A and NF or Pale). Specially, Respective values of 187-84, 283-87 and 173-17 were indicated. The specials anticonducta the impossible beside to the mine) confidence of the discharge burder following the indicate beside and charles of the discharge burder following the indicate the Electrometha Balled to the Matter (MC-12) and believed the Electrometha Balled to the Matter (MC-12) to be show. The operation placed the Turkion Dypane Talves (MC-72A, MC-773A, MC-77A) as each FT or PLA MC-774A, MC-774A) is secural and created then eligibilly upon to MC-774A/790; MC and FT or PLA MC-774A/790; MC and FT or PLA	(ONE) IND	response (Belevill, Belevill on Belevill) of the Destructs	ab high (restr)/horn (bolay 2.25 atomics)	
The spectrum without the impossible to the match confidence. The spectrum attributed the impossible to the match confidence. The spectrum attributed the indicate development to Charles and closing of the Charles build think (MC-M2) and believed the Charles and closing of the spectrum that the theory is to share. The spectrum placed the Turkles bypass taken (ML-VSA, ML-VSI). The spectrum placed the Turkles bypass taken (ML-VSA, ML-VSI). The spectrum placed the Turkles bypass taken (ML-VSA, ML-VSI). The spectrum placed the Turkles bypass taken closely the collegety spectrum (ML-VSA) and one of or the Turkles and mL-VSA).		halted Water (96-22) and the free-care fadory balone (20-21A and	# * Nio	
The appropriate attributed the temperature breaks to the matem) confident of the theology burder following the facility approach to Thoursman of the Charles burder follow (BC-R) to be able. The operators placed the further bypane below (Ma-VIIA, Ma-VIIA, Ma-VIIA). The operators placed the further bypane below (Ma-VIIA, Ma-VIIA). The operators placed the further bypane below (Ma-VIIA, Ma-VIIA). The operators placed the further bypane below olightly upon to IM-VIIA/VIA: M and ST or FLA		SP-815). Respective values of 185.4F. 303.9F and 273.1F unvo indicated.		
Chartements hader following the indical species and choice of the Chartements halled the Chartest (NG-NZ) to be shipt. The specialist placed the turbles bypase balone (nd-villa, nd-villa). The specialist placed the turbles bypase balone (nd-villa, nd-villa). The specialist placed the turbles bypase balone (nd-villa, nd-villa). The specialist placed the turbles bypase balone (nd-villa, nd-villa). The specialist placed the turbles bypase balone (nd-villa, nd-villa). The specialist placed the turbles bypase balone (nd-villa, nd-villa) is nearly and one of the real of the rilation of the real of the rilation of the rilation of turbles of the rilation of the ri		The sporters attributed the impossibility houle to the sectal seather o		
Chartenestic halted value (NC-AL) and believed the Chartenestic halted takes (NC-AL) to be share. The operation places the further bypass believe (NL-VCDA, NL-CP)D. The operation places the further bypass believe (NL-VCDA, NL-CP)D. The operation places the further bypass believe (NL-VCDA, NL-CP)D. The operation places the further bypass believe (NL-VCDA, NL-CP)D.		the distincts basics following the tattial quella and choing of the		
theire (80-82) to be ablet. The operators placed the turbles bypane below (16-750, 18-750), 18-750/74s; 18 and 57 or 715 18-750/75s; 18 and 57 or 715		Seatremais halled takes (MC-LE) and balloned the Electromatic halled		
The operators placed the turbles bypass below (na-vide, na-ville). Na-villed in end 87 or 715 Wells and Na-villed in named and created then elliptily upon to NB-Villedor in end 87 or 715		Dalies (BO-R2) to be ablet.		
matte out marked in second and created then slightly spen to	8 77:8	the operator placed the rather byene talues (me-rild, me-rill),	B-TRATES: N and 17 or 74	
			W-724/36: M and ST on FL3	

The Old. Der 2. April. 3, 1980

building Jump. It to ballowed that the alors are the count of increased bachground radiative levels count by the discharge of

mediground rudies too. The Totorrechieto Coultag Lotdore Caulor excited bases of its les elers original and amonthibity to

institution Madtors are physically I occused near to the heart or

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Migh restingtion aboves unite receipted by the hadistion Shaittee Penal

presso delitional coulding of the princey contact.

Sentitors (16-6-199) and 16-8-1992). This above to periodically

from Intermediers Conding Lotdon Conders à and 3 hadlet bes

		Total Control of the	April 3, 1980
7180	Dent	Information Available to the Operator	Reference
	reactor coolast from the Reactor Comises Brain Test to the		
	Passer Palliding sump or a mail cred barat which mustine		
	excompanies a restfor trip.		
(0426:21)	The specialor topped Bergeniy Seminator ham 1 (EF-F-1).	MA (P _{BESCE}) # FLA AP low (setpoint = 875 pdg)/sem (Delay 2 22 minutes)	H.M
(0426:25)	Basetor Conjust Pump 18 (BC-F-18) full opend alarm una resolved intermittently.	AP nore/low (Delay 2 22 extentes)	А
00:26:46 (0427:23)	The Steam Communior B low larvel alors closed. A level of 26-6 inches one recorded.	All at P.17 All march/on (23.7 taches) (Belay 2 25 minutes)	A
00:29:23 (04.30:80) Approximate	The bearies heliding Air Lample Lim menter (UP-L-22)) gas channel same rate betraced from 1 m 10 ³ cames per admits to 5 m 10 ³ counts per minute and thus decreased to 1 m 10 ³ counts per admits. This farrance was not large enough to activate an alarm.		2
00:29:36 (04.30:33)	The operator stopped Blend Generators in and 10 (89-4-14 and 18) by messelly tripping the fuel rocks. They had been continuently result and state the Engineer Safety Postered actualism of 00:02:02 (0402:39).	AM, ST, NR (Amps, Toles, Berts, KW/KVARS) at PL 26 and PL29 AF PALT/worm (Dolay 2 28 ademtem)	1
65 86 86 86	The plant stell requested the computer to printout the Numery Trip beries. The resise comists of male sted plant parameter Mediates prior to and efter the transfert.	FP (Dollay 2 & advanta)	y å
(0431:37)	The plant staff requested the named or to printest the Sequence of Events beview.	UP (Delay 2 0 admics)	N,K

Time		Information Available to the Operator	Beforens
00:32:23 (0433:00) Approximates	the fallowing ralisation andies realisate increased and then beviled		â
	(a) Gas chemnal of the Stories Tenn (AP-4-2'9) sesitor		
	(3) Total dead of the Part Beating billing blood Date		
	(before filter) (MP-M-271A) mentury		
	(c) Perticulate chemal of the Peel Bealing belifting Edwart Det.		
	(hefore filter) (MP-4-21th) medicer		
	(6) folio damai of the Peal Bealing Beliffing Disease Date		
	(ofter filter) (MP-8-2213) medicer.		
	(s) Perticulate chemal of the Peel Smalling Delining Denne Part		
	(efter filter) (MP-0-2218) meatter		
	(6) Gas chemist of the Yest Beauting building Dahmer Dart (after		
	filten) (M-5-2113) smalter		
	(4) Pertiral ers Chammal of the Mydrogen Purps Duct (MP-8-229)		
	and particular to the second s		
	(h) ledies Channel of the Pydrages Party Dar? (ID-6:33) meditor		
96135139	becore charmocouple 1-19 aigned tedication west onl-of-range	W T (beloy 2 In almosa)	A
OT LOCK WALL	Game - 60 to 7007).		
8 × 8 8	The operator stopped Emergency Perduater Pump 29 (EP-P-29)	ST, 1819, 1803) and 18(A) or FLA	£.1
	after filling both Steam Consentors to an indicated level of about 38 inches on the startup reage (Figure 41).	AP eachoff and low (NYS prig)/morn (Paloy 2 74 educton)	
80.38.38	The mailing openier stapped feater beildig to re in	AP en/off (Doloy 2 31 eductoo)	8.8.8
(04.00.47)	(Wife-P-2A) to perved everithering the Histollaneaus Batte		
	Boldes forth (Will-T-2).		

(0438:48)	Event	Information / wailable to the Operator	Reference
	The essiliary operator stopped Reactor Deliding Sump Yump 28	AP on/off (Belay 2 31 minutes)	20,5b,8k,
	(WDL-P-28) to prevent overflowing the Miscellaneous Waste.		
	Boldup Tank (WilT-2).		
	MOTH: The two Reactor Building Sump Pumps had operated for 31 and		
	28 minutes, respectively. Based on the measured capacity of		
	each pump (approximately 140 gallons per minute for mingle		
	pump operation), a maximum of 8260 gallons of water was		
	transferred to the Auxilliary Building.		
00:43:34	The operator requested the computer print pressurizar level differ-	W (Dolby 2 0 effects)	24,8
(0444111)	ential pressure sensors 1, 2 and 3 in an attempt to determine if		
	lavel indication was in error. Besed on the close agreement of		
	these three values the operator believed that the pressurisor level		
	fadication was correct.		
00:46:23	Intermediate Cooling Letions Coulut & menter (IC-4-1092)	M. 12 and 12 at 7112	M,58
Approximate	factorined from 1 s 10 ³ counts per elemto and overstually pembed at		
	2 n 10 ⁴ courts per atlante.		
00:33r 80	The operator almt Bergency Peadmater Value (IF-F113) after	EF-1118: ST et 704	8c,9e,9c
A milate	ottogen to theorila the valve failed to stop the ferreming	MC Lt. M at PlA (atartup remge), 9C at PlA and PLS	
	wier level in Steam Georges B.	(operating range)	
99:35:00	The Amiliory Operator menally opened Polisher Bypass Palve (CD-912).	H at 74.7	54,88,81,88,
Appendance.	The time required to spen the valve one granter than sepected dee-		70,31,37,37
	to the incestion of the valve, a missing hond-deel and difficulty		
	is the actual opening of the valve.		
00:39:12	Confessors femiliar Pump section busher presents returned to	A mention (13 polg) (beloy 2 46 electes)	2
(0459:43)	nermal. A pressure of 89.2 polg was recorded.		

Condensate high temperature alarm was received. A temperature of 18-37 was received. The operator stopped Circulation Mater Pumpe 19, 15, 19 and 18 The operator stopped Circulation Mater Pumpe 19, 15, 19 and 18 The operator stopped Circulation Mater Pumpe 19, 15, 19 and 18 This operator stopped Circulation Mater Pumpe 19, 15, 19 and 18 This operator stopped Circulation Mater Pumpe 19, 15, 19 and 18 This operator stopped Circulation Mater Pumpe 19, 15, 19 and 18 This operator stopped Circulation Mater Pumpe 19, 15, 19 and 18 This operator stopped Circulation Materials Theory of Circulation Materials and 1971-19 and 18-73				April 3, 1980
Condensate high importance alone was received. The operator scopped Circulation Mater Pumps 15, 16, 15 and 18 The operator scopped Circulation Mater Pumps 15, 16, 15 and 18 The operator scopped Circulation Mater Pumps 15, 16, 15 and 18 This was done to represent from the Turbine Sypass This was done to acceptance present from the Turbine Sypass This was done to acceptance present from the Turbine Sypass This was done to acceptance present from the Turbine Sypass This was done to acceptance of March and Mil-1710 and Mil-1710 and Mil-1710 in and ST or FLJ This was done to acceptance to the condenser which was increased material Mil-1710 (Mil-1710) and Mil-1710 and M	Time	Pyrak	Information Available to the Operator	Reference
The operator stopped Circulation Mater Pumps 19, 10, 10 and 18 (CH-P-19, 10, 10 and 18) to extinct Pumps 19, 10, 10 and 18 CH-P-19, 10, 10 and 18) to extinct Pumps 19, 10, 10 and 19 Trains are many secures present from the Turbies bypass Trains (M-TSA, M-TSA, M-TSA) to the Pumps 1, 10, 10 and 19 at 13 Trains (M-TSA, M-TSA, M-TSA) to the Pumps 1, 10, 10 and 19 at 13 This was done to stop stamming to the condenser which was increased from 10 and 19 at 12 This was done to stop stamming to the condenser which was increased from 10 and 19 at 12 This was done to stop stamming to the condenser which was increased from 10 and 19 at 12 This was done to stop stamming to the condenser which was increased from 10 and 19 at 12 This shaded by intermittent use of HE-TSA and 18-TSB and 18-TSB was shaded and metal 18-TSB (0521:00) when Steam Control. A Badietical/Amerity Technicism done a Exercic Coolem Option A Badietical/Amerity Technicism of March 18, 1979 and 18 badieved to 6 badietic and metal of March 18, 1979 and 18 badieved to 6 badietic and metal of March 18, 1979 and 18 badieved to 6 badietic and metal of March 18, 1979 and 18 badieved to 6 badietic and metal of March 18, 1979 and 18 badieved to 6 badietic Coolem Option The operator requested the computer to print the computer range (Day) The operator requested the computer to print the computer of March 18, 1979 and 18 badieved of March 18, 1979 and 18 badieved of March 18, 1979 and 18 badieved of March 18	(0459:38)	Conference high temperature alarm was received. A temper- ature of 118.37 was recorded.	A norn/bigh (belsy 2 48 admoten)	
Therefore a team and the contract of team the Truther Mypass 18-725/214; 18 and 57 or 72) This was done to close the Contract of team the Truther Mypass 18-725/214; 18 and 57 or 72) This was done to crop scenario from the Truther Mypass 18-725/215; 18 and 57 or 72) This was done to crop scenario from the Truther Mypass 18-725/215; 18 and 57 or 72) This was done to crop scenario from the Truther Mypass 18-725 and 18-725 an	(0501:24)	The operator stopped Circulation Water Pumpe 19, 16, 19 and 12	Main and 37 are 1927	Za, Bc, 9a,9
Twinse (162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234, 162-7234		(CV-F-19, U., ID and 18) to activate a logic circuit which transferred steam generator pressure from the Turbine Bypass	Nove of the library . An analogo . HR-235A/25At HR and ST at PLA	
Operated Energency this Steam Damp Valves (1957-2)A and 1957-21D This was done to stop steaming to the condensor which was increased as since to stop steaming to the condensor which was increased the standard by intermittent as of 1927-30 and 1927-30 was share at 120-131 (0527-00) whos Steam Concretor France Steam Steam Steam Steam Steam Concretor France Steam Concretor France Steam Steam Steam Steam Steam Steam Concretor France Steam Concretor Steam		Valves (MS-725A, MS-725B, MS-726A and MS-727B) to the Power		
ing formall Leval. Steam Concreter Pressure Control was thereased to the steam Concrete and 192-738 until 1937-29 was share at 128133 (0527:00) when Steam Concrete Transure Control was there at 128133 (0527:00) when Steam Concrete S etcam line was tasked and wattl 1937-30 was share at 02134:30 (0635:27) after captured and wattl 1937-31 was share at 02134:30 (0635:27) after captured to be break control control. A hadistical/hamility Technician drew a facetor Coolant Gyatem Control Loan control captured control control control captured to berna contentration of clightly over 700 perte por willies berna. The facetor Hailding Air Cooling Coil 2 facetory Discharge Tranger. The facetor Hailding Air Cooling Coil 2 facetory Discharge Tranger. The facetor Hailding Air Cooling Coil 2 facetory Discharge Tranger. The facetory within the 3D exceed scen time. This trend continued interesticanly for the remainer of Nerch 28, 1979 and is believed to be attributed to a periodic millimetion is the complete inque signal. The operator requested the computer to print the complete inque signal. The operator requested the computer to print the complete inque signal. The following alarma ware received.		Operated Emergency Sain Steam Dump Valves (NSV-3A and NSV-3B)		
ing Notwell Level. Steam Concreter Presents Control was then maintained by intermittent use of NE-TAM and NE-TBM until NSY-38 was shart at 1:28433 (0527:00) when Steam Concreter 3 steam libe was familiated by intermittent use of NE-TAM and NE-TBM until NSY-38 was shall need a settl NSY-AM was about at 02:34430 (0639:27) after regaining condensor botwall level control. A badiutinal/Damining Yaddanting Tendinitium dorm a bactor Coolest Gyutem ample for borns malpain put procedural requirement after a reactor frightly over 700 ports por dillies berea. The Nasctor Maidting Air Cooling Coil 3 Manyancy Discharge Temper- frightly over 700 ports por dillies berea. The Nasctor Maidting Air Cooling Coil 3 Manyancy Discharge Temper- frightly over 700 ports por dillies berea. The Nasctor Maidting Air Cooling Coil 3 Manyancy Discharge Temper- frightly over 700 ports por dillies berea. The Nasctor Maidting Air Cooling Coil 3 Manyancy Discharge Temper- frightly over 700 ports por dillies berea disparator requested the computer to print the correct factorised to a periodic malfameties is the complete Input. The operator requested the computer to print the current factorised alarma varia received. The following alarma varia received. The following alarma varia received.		This was done to stop steaming to the condenser which was increas-		
aministical by intermittant ass of MS-T3A and MS-T3B watti MSP-39 was shar at 128:13 (0527:00) when Steam Generator 8 steam line was familiar to control. A hadistical and eatil MSP-3A was about at 02:54:30 (0633:27) after regaining condensor botull level control. A hadistical/Charisty Technician dree a Bactor Coolest Gyutem cample for borns malysis received a percentral requirement after a reactor trip. The borns malysis received a latent of conputer range (Bange Temper- 100 ports per william beton.) The Rescart Haliding Air Cooling Coll 8 Margency Discharge Temper- 100 port spaced for and most of computer range (Bange 100 port) within the 3D second scene time. This trend continued factorized to a parted to a parted to maninar of Narch 20, 1979 and is believed to be attributed to a parted to the remainer of Narch 20, 1979 and is believed to be attributed to a parted to the computer to print the computer to print the computer to print the computer to print the contral family alone were received. The following alone were received.				
shut at 128:23 (0527:00) when Steam Cenerator B steam is the was isolated and watil MST-34 was abut at 02:34:30 (0653:27) after regaining condensor betwell level central. A hadistica/Charisty Technicism drew a Bactor Calact System ample for borne medysts proper procedural requirement after a reactor trip. The borne medysts proper procedural requirement after a reactor trip. The borne medysts produce ladicated a borne concentration of alightly over 700 ports per willten borne. The Reactor Milding Air Cooling Coil B Bacquery Discharge Temper- stury signal indication cycled in and out of computer range (lange of to 2007) within the 30 second aces time. This treed continued intermittently for the remainst of North 20, 1979 and is believed to be attributed to a portable mildenten in the computer toput signal. The operator requested the computer to print the cerrent the operator requested the computer to print the cerrent the following alarma ware received.		maintained by intermittent use of MS-V3A and MS-V3B until NSV-3B was		
insident and until NEV-3A was shar at 02154150 (0655127) after regaining condensor botamil lared control. A Endiction/Charistry Technicism drow a Bacter Caslom System cample for herm modyles procedural regalement after a reactor crip. The boren modyles procedura indicated a heren concentration of slightly over 700 ports per utilize boron. The Reserver Doubles indication cycled in and out of computer range (Range OF to 2007) within the 30 second scen time. This tread continued intermittently for the rankshar of Narch 28, 1979 and is believed to be attributed to a periodic molfunction in the current The operator requested the computer to print the current The following alarms were received. The following alarms were received.		shat at 1:26:23 (0527:00) whem Steam Generator B steam line was		
statisting condensor betwell level control. A Endiction/Charistry Technicism dear a Bostor Cooles System cample for borns ensiys per procedural requirement after a reactor trip. The borns analysis per procedural requirement after a reactor trip. The borns analysis received indicated a borns contentration of alightly core 700 ports per adilion beron. The Reactor Milding Air Cooling Coil & Benryon; Discharge Temper— The Reactor Milding Air Cooling Coil & Benryon; Discharge Temper— The Reactor Milding Air Cooling Coil & Benryon; Discharge Temper— The Reactor Milding Air Cooling Coil & Benryon; Discharge Temper— The Associat Milding Air Cooling Coil & Benryon; Discharge Temper— The Association of March 28, 1979 and is believed to the operator requested the computer to grint the current The operator requested the computer to grint the current The following alarms were received. The following alarms were received.		iselated and until HSF-3A was shut at 02:54:50 (0655:27) after		
a Endiation/Chamierry Technician drew a Lacetor Coolean Gystem ample for borne melysis per procedural requirement elter a rester trip. The borne melysis results indicated a borne concentration of alightly over 700 ports per utilion borne. The Reserver Mildrey Air Cooling Coil 2 Resigney Discharge Temper— the Reserver Mildrey Air Cooling Coil 2 Resigney Discharge Temper— the Reserver Mildrey Air Cooling Coil 2 Resigney Discharge Temper— the Reserver Mildrey Air Cooling Coil 3 Resigney Discharge Temper— the Reserver Mildrey Air Cooling Coil 3 Resigney Discharge Temper— the State of Mildrey Air Cooling Coil 3 Resigney Discharge Temper— the state Mildrey Air Cooling Coil 3 Resigney Discharge Temper— the signal indication cycled in and out of computer range (Range the state Mildrey Air Cooling Coil 3 Resigney Discharge Temper— the signal indication the 30 second accention in the computer temper— the state Mildrey Coil 4 Resigney Collant Pumps. The operator requested the computer temperator Coolant Pumps. The following alarma ware received.		regaining condensor botwell level control.		
comple for berms malysts per procedural requirement after a reactor trip. The berms malysts receiped a berms concentration of alightly over 700 perts per dillion beron. The Beactor Building Air Cooling Coil 2 Beargescy Discharge Temper- five signal indication cycled in and cut of computer temps (Range OF to 2007) within the 30 second scan time. This tread continued intermittently for the remainer of Narch 28, 1979 and is balleved to be attributed to a periodic unifunction in the complete toput signal. The operator requested the computer to print the current the operator requested the computer to print the current the following alarms were received.	61100113	à kadiminas/Ameletry Tathaikim drow à banctor Coolant Oyston	Only 2 Control Lone actified of bores englysis	94,59
elightly over 700 parts per militar beron. The Rescier Building Air Cooling Coll & Resignacy Discharge Temper— MR(F) or FL35 stude signal indication cycled in and out of computer range (Range AP bad/horm (OF to 2007) (Bolzy 2 39 admocra) Of to 2007) within the 30 second seas time. This tread continued in the continued interestitently for the remainer of Narch 28, 1979 and is beliaved to be attributed to a pariodic malfunction in the complete input signal. The operator requested the computer to print the current the operator requested the computer to print the current the fallowing alarms were received.	Apprentace	sample for horse easignis per procedural requirement after a reactor		
The Rescript over 700 ports par willies becom. The Rescript Mailding Air Cooling Coil B Responsy Discharge Temper— sture signal indication cycled in and out of computer range (Range Of to 2007) within the 30 second scan time. This trend continued intermittently for the remainer of Narch 28, 1979 and is believed to be attributed to a partodic malfunction in the complete input signal. The operator requested the computer to print the current alarm conditions relative to the Rancer Coolant Pamps. The following slarms were received.		trip. The borne molysic route infected a born concentration of		
The Rescier Building Air Cooling Coil B Teargemey Discharge Temper- ME(F) or PL35 sture signal indication cycled in and cut of computer range (Range AF bad/horm (OF to 1007) (Doloy 2 39 admess) OF to 2007) within the 30 second scen time. This trend continued intermittantly for the remainer of March 28, 1979 and is beliaved to be attributed to a pariodic multimetion in the complete input signal. The operator requested the computer to print the current alarm conditions relative to the Rancter Coolant Pamps. The following slarms were received.		alightly over 700 parts per skillion berom.		
stute signal indication cycled in and out of computer range (Range AP bad/horm 10P to 2007) (Polay 2 3P advances) Of to 2007) within the 3D second scentium. This trend continued interesticantly for the remainer of Narch 20, 1979 and is believed to be attributed to a pariodic unifunction in the complete input signal. The operator requested the computer to print the current the operator requested the computer to print the current the fallowing alarma were received.	61:19:54		18(F) or FLAS	2
Of to 2007) within the 30 second scan time. This trend continued intermittantly for the remainer of March 28, 1979 and in beliaved to be attributed to a partodic unifunction in the complete input signal. The operator requested the computer to print the current alors conditions relative to the Rantor Coolant Pumps. The following alarma were received.	(0311131)	sture aignal indication cycled in and out of computer range (Range	AP bad/horn (09 to 2007) (Delay 2 59 admess)	
intermittently for the rumainst of Narch 28, 1979 and is beliaved to be attributed to a pariodic malfunction is the complete input signal. The operator requested the computer to print the cerrent alars conditions relative to the Reactor Coolant Pumps. The following slarms were received.				
be attributed to a pariodic malfunction in the complete input signal. The operator requested the computer to print the current alors conditions relative to the Ractor Codant Pumps. The following alarms were received.		intermittently for the remainer of Narch 28, 1979 and is beliaved to		
The operator requested the computer to print the current alone conditions relative to the Reactor Coolent Pumps. The following slarms were received.		be attributed to a periodic unifunction in the complete input signal.		
	01:12:11	The operator requested the computer to print the current	UP (belay : 0 admitted)	*
The following starms were received.	(0)17140)	alars coeditions relative to the Reactor Coolant Pumps.		
		The following starms were received.		

MC-P-lår Oil Lift Pusp Discharge Pressute

Pull Speed

Backstop Oll Flow

MC-P-2A: Seal Leak Tank Level

Oil Lift Pump Discharge Pressure

Pall speed

Backstop Oil Flow

RC-P-IB: Oil Lift Pump Discharge Pressure

Pull Spend

Sackstop 011 Flow

MC-F-28: Oil Lift Pump Discharge Pressure

Backstop Oil Flow

PLANT STATUS

Both Reactor Coolant System bot leg temperatures and pressures had decreased until they stabilized at a saturation temperature-pressure relationship of 3427 and 1050 paig. The Reactor Coolant System loop flow rates had decreased from about 69 million pounds per hour to approximately 47 million pounds per hour and continued to decrease (Figure 17). Beactor Coolant Makeup Pump 1A (MD-P-1A) was operating. Latdown flow was in the normal range. Pressuriaer level was approximately 352 inches. The Electromatic Halied Valve (MC-P-1A) was open releasing reactor coolant to the Neactor Containment Building vie the Reactor Coolant Drain Tank (MDL-T-3). The Containment Building pressure and temperature (Point 13) had increased from -0.5 paig and 1207 to 2.5 paig and 1707, as a result of releasing the contents of the Reactor Coolant Drain Tank to the Reactor Containment Building atmosphere (Pigure 31). The operator was having diffiners Residing the level of Steam Cenerator B and had short Emergency

...

+

Poloronce

Parameter Salva (19-7118). Stom Generator Pressure Control we buing excemplished noing power operated Bergency Hain Stem Desp talves MILK OF MET-11. The Bate 2 thift Coperature ecopied beacter Coolent Pup 28 (BC-P-28) to preclade the possibility of design to the lowter Coolent Pamp from eporation ener the minimus not positive section hand limits. Militianal factors which custributed to the operator's decision care high pay wibration and erratic reactor contant flow rate. (814:84)

The Balt 2 Shift Separator atopped Boctor Coulout Pump 18 (BC-P-18) to preclade the possibility of design to the hourter Coalout Pump from specution mor the adolars not positive outlies bend limits. Additional focuses which contributed to the sportter's decision were high pury utbraction and errutte rescior coolest flos rate. (B) (413)

Rom Concreter & stem prosents replifty decreased from appronlowed in Steam Generator & stores to rice. It is believed that the ries is enter lovel in Stone Couractor & was the result of metedy 930 paig to opproximenty 145 paig mer the mer 28 Lang B as a result of atopping reactor coolest pumpe is and as imbalance in heat files between Steam Constructors A and B. studen. This was in response to reduced heat tression in 29 (BC-F-18 and BC-F-28). Owcorrent with this the union (1511)(6)

BC-9-23: 67, 19(4) and 19(7) or 114, A3 or 11.0

AP norm/trilp (Delay 2 . admetes)

A ot 7.5. At on M ot 72 ot 7.10 20

N and 3C ot 724 200

M ot 726. 4 od 18 ot 720 EC-P-28: ST, M(8) and M(7) or FLA. AN or FLA AP norm/trip (Deley 2 . admetes) M and 50 at 174 14 CM BC 7:

NO L: NR (Startup Borge) of PLA 56 P: No ot 174, SC ot 1117

1.30.6

"See estry at the 02:47:31 (0648:00)

Polorones

malysis which indicated that the borne concentration in the Boactor The Batt & Shift Seperatest received the results of the first bottom Cooleat System was alightly over 700 parts per million. This value merans of 1000 parts per million horse prior to the trip and high we felt to be questimeble since the berse concentration we in presence injection had been from the bereted enter eterage tank. based on these fectors eacher beron malysts was requested.

Bote: The actes! Seres concentration in the Reactor Conlant System

ballowed to have been diluted by distillative to the Latdom

one in manne of 1000 parts per million. The sample to

System. This hourset, we see those by the Plant Operators

estil several bours later.

EP-V128: ST oc PLA

The operator cloud Bergenry Postmice Velve (EF-V128) to halt the ries is Steam Generator & unter level which had reached 90 inches. on those indications the operator suspected that a hazater feelant As level continued to gradually treas openie, the operator also closed Bargency Foshwiter Cronoceseut Tolve (U-158). Land alde to Postenter elde lask night mint in Stone Generator D. (0317:37) Approximate

The Unit 1 Shift Supervious requested the competer print the metlet temperature (1.C-10-TE, 1.C-10-TE, and 1.C-10-TE) of the Electro-(MC-BiA and MC-Ris). The recorded values mays 283.09, 211.39, mutic Ralled Valve (BC-R2) and the Presentiner Safety Velves and 218.67, respectively. The specator continued to believe that the Electrometic halled Talms (RC-E2) use duc.

(0521:06)

Information Available to the Operator

Wit 2 Control Lows notified of borne analysis.

02,40,76,5p.

1.84.90.90

SC Lt Me (Restup Longs) ot 714 UP (Delay : 0 mintes) EP-TOB: ST OF PLA

AP high (2007)/sorm (Delay 2 a mimtes) W .. P. 10

2c.98

"See entry at time 02:47:31 (0648:06)

Men. 2. 198

MS-448 and MS-478). Se suspected a Stems Cenerator B to Reactor The operator shet Stem Cenerator & Main Stam Incintion Valve (0527:00)

beliding leak based on the large difference in stam presente of

approximately 300 pelg between the two Steam Generators, the

variations of flow and level experienced while controlling Steam

temperature. Stam Generator B was implated completely at this

Generator B and the increased Reactor Building pressure and

Information Available to the Operator M-TUNZE IN and ST or PL 18-V41/70: 57 ot 71.15

#. R. R. R.

Peterrance

teproxisate (0530:00)

t fase.

energize Core Flood Task 1A and 18 (CP-T-1A and CP-T-18) Breaker valves (CF-VIA and CF-VIB). There are no records which indicate tendency was therefore to letdows as such as possible and not to The Unit 1 Shift Supervisor directed an auxilliary operator to the Resetor core by depressuring the Resetor Coolant System at the Core Flood Tanks were ever isolated. It was felt that the system was solld since the pressurizer level was high and the sed makeup water. The Core Flood Tanks were later floated on to give the control room the capability to close isolation 07:36:57 (1139:34).

CF-VIA/18 Breaker Stetuet 57 ot PLS

P. P. P. P.

01:30:00 (0530:37)

increased from a minimum detectable indication of less than 1.0 x 10-11 H1-41 H2 and SC at FLA The reactor out-of-core Intermediate Range Channel (MI-4) indication spondingly, the out-of-core Source Range Channel (WI-1) indication mperes to approximately 1.6 x 10-11 asperes (Figure 56). Correincressed from about 1.6 x 10° to approximately 2.0 x 10° counts reactor core neutros flux level increases but rather as increases per second (Pigure 36). The indicated increase was not dee to is seutron leakage from the reactor core as a result of the fermation of steam in the reactor vessel.

FT-11 NE ned SC or FLA

31.50

*See entry at time 02:47:31 (0648:08)

		17-4-17-17-17-17-17-17-17-17-17-17-17-17-17-	April 3, 1980
Titase	Event	Information desirable to the Operator	Reference
01:32:63	Steam Generator B Water Lavel tapidly increased from 67 to 113	SG Lt. 18 (Startup Range) of FLA	1,86
Agproximate	inches on the startup range in approximately three adoutes. It is		
	believed that the Steam Generator B unter level increase was due to		
	operator action and not the Besult of a Reactor Coolsat side to		
	Passbutter eide loab.		*
01:32:03	Steam Generator A boiled dry (Pigure 11). This was indicated by a	NO Pt. 100 at. PLA and SC at. Pt. 17	1,50,97
Approximate	steadily decreasing steam generator pressure while Reactor Coolank	SC Lt. HB (Starfup Range) at FLA	
	Loop A bot leg and cold leg temperatures were increasing.	AP Low (23.8 toches) faors (Delay 2 0)	
01134162	The operator commenced raising Steam Generator A level from 8 inches	SG L: 18. (Startup Range) at PLA, 18. (Vide Range)	1,8c,8r,9a
103×149	on the startup range to 50% on the operating range in preparation	at PLA, SC (Operate Lange) at PLA and PLS	
	for establishing of natural circulation (Figures 41 and 44). This	RC Tc: NP at FLIO	
	was indicated by a rapid pressure increase in Steam Generator A		
	with a corresponding decrease in Reactor Coolant Loop A hot leg.		
	and cold log temperatures.		
01:40:37	The Operator stopped the hearter Coolant Pump 2A (RC-P-2A) to	MC-P-28: St. Nr(a) and M(P) at PLA, All at PLS	Zb.4g.8c.9
(6341:14)	preclude the possibility of damage to the Reactor Coolent Pump	AP morn/trip (Doloy 2 * mimates)	76.75
	from operation near the miniatum net positive suction head limits.	NCP Vs AM at PLA, IV and HB at PLAD	
	Additional factors which contributed to the Operator's decision	NC 71: HB and 9C at PLA	
	were high pump vibration and erratic reactor coolsast flow rate.		
01:40:45	The Operator atopped Reactor Coolant Pump 1A (RC-P-1A) to preclude	0C-P-38: 51. fft(A) and WR(P) at PLA, AR at FLS	28.48.80.9
(0541:22)	the possibility of damage to the Reactor Coolant Pump from operation.	AP morm/trip (Delay 2 * minutes)	E.S.
	near the minimum not positive suction head limits. Additional	NCP Vt. All at PLE, All and NR at PLIO	
	factors which contributed to the Operator's decision were	NC Ft. 18 and NC at PLA	
	high pump wibration and erratic reactor coolant flow rate.		
01:41:00	The sperator semaily initiated the Safety Tojection postions of	SEr As of P.13, ST of P.3 and P.13	7,84,94
Appendante.	Engineered Safety Peature trains A and B to supply additional	Af more/extention (Belsy ? * eductes)	
		"See eetry at time 02:47:31 (0648:06)	

AP norm/trip (Delay 2 * minutes)

MO-P-IC: AM at PLB, ST and MB(A) at PL3

Reference

cooling water to the reactor core. Makeup Pump C (MU-P-1C) started automatically. Makeup Pumps A and C (NU-P-lA and MD-P-IC) are now operating.

known because of the loss of alarm printer data during the However based on the sequence of events printout Makeup period from 01:13:22 (0513:29) to 02:47:31 (0648:08). Note: The duration of this meanel Safety Injection is not Pump 1C was stopped prior to 02:28:41 (0629:28). WI-1: Me and SC at FLA WI-4: We and SC at PLA

01:41:00 (0541:37) Approximate

The reactor out-of-core latermediste Range Channel (MI-4) indication then rapidly decreased to a minimum detectable indicatato -" 1.0 m decreasing to 1.5 m 103 counts per second the Resctor Out-of-Core These responses are attributed to changes in moderation density rapidly incressed from 1.6 x 10"11 to 2.3 x 10"11 asperes and Range Channel (HI-1) indication showed a corresponding rapid then rapid decreased to 1.5 x 10 counts per second. After Source Range Channel (NI-1) immediately started increasing. 10-11 saperes (Figure 56). The Reactor Out-of-Core Source increase from 2.0 x 10 to 5.2 x 10 counts per second and

A Radiation/Chestetry Technician took a condenser vacuus pump exhaust caused by liquid displacing steam in the reactor vessel.

(0542:00)

sample for Cermentum Lithium analysis per procedural requiements activity levels were not shows background. The results of the after a reactor trip. The Cermanium Lithium indicated radioanalysis are listed below.

Unit 2 Control Room notified of Condenses Vaccuum pump results.

44.97

4.840 E-06 1.555 E-06 1.836 E-07 6.585 E-05 Potassium 40 Cobelt 30 Zenon 135 Total:

*See entry at time 02:47:31 (0648:08)

היאה מוצופ

The Leactor Cooleat System bad on farred Leactor Cooleat System floe. All Generator A presence and level aure 730 poly and 107 inches respectively. Coolant System everuge temperature and pressure were apprentimtely SMP the decision to atop the laseter Coolast Punys were high puny wibration and 1000 paig, respectively (Figures 13 and 27). Laidons flow rate was is the serest range. Presenting level one 354 inches. Rescier Cooless positive section band limite. Additional factors which contributed to inches respectively. Itsm Comrator A was steming to the streeghers boator Conlant Pumps (RC-F-IA, RC-P-IA, RC-F-IS and RC-P-23) had been high Presence injection mote. The operator was attempting to setablish via the power operated Dargemy Hain Steam Dump Walve (MS-43A). Steam netural circulation flow to coal the reactor corm. Stem Commeter B olds fach. Steam Constator & pressure and level were 190 paig and 95 staying to preclude the possibility of desage from operation mear set was inslated bacause of a suspected bactor Coolsat side to Foodwater and an arrestle teactor resist (low rate. (Figure 17). The Reactor Shakeng Peage 1A and 1C (90-9-1A and 16-9-1C) were operating to the

Olithii) The Unit 2 Separateredent of Technical Support Exquented that a sample (0345:00)
Approximate to taken of the Restor Containment Saliding atmosphere. The sermal approximate to Colt 2 is from radiation consists EP-R-227.

Open remarks the charces, filter to obtain the sample, unter parried out of the canter. The Radiotics Technical immediately replaced the filter. The sample could not be taken under these conditions. It was operalated that a steam envirament existed in Dait 2 Restrac Containent building.

Outs 2 Course how confided of difficulty to obtaining a Bacter Containment building atmosphera-

8c, 55, Fh. 92.5p

		82	TDR 044, Pev 2
138	Event	Information Available to the Operator	Peterone
01:64:23	A fadfatton/Omtotry Tocholeles dres o renter emlast eyetm emplo	Unit 2 Control Low settiind of bores sealysis	94,98
Approximate.	for emalysis of the bores concentration per the course of	readte.	
	the Unit 1 Shift Supervisor. The Boron emelysis yielded a value		
	of appreciately 600 ports per utilion forms. The chariet		
	questioned this result and soled the other chanist on shift to		
	tes es indepredint analysis es esother semplo. This chanist		
	also obtained similar results. The two values recorded were 402		
	and 407 perts per silling Soum.		
72:15:10	Moctor Coolset System Loop A bet ing temperature begen to	SC ot FIA, 19 ot FLIO and 18 ot FLA	
Appendient	increases, reflecting stem formation to the upper reactor core		
	Vegles (Pigura 22).		
91154100	The reactor ant-of-core laterwediste Range Cammel (01-4) indication	Hi-li 18 and SC or PLA	3.4
Approximates:	factooned from loss than 1.0 m 10-11 appears to appreciately	M1-31 18 and 3C at PLA	
	1.0 x 10-10 experss (Figure 54). A corresponding increasing trees	17-4: M and MC or PLA	
	we recorded on the faction ont-of-core fornce hage Chamal		
	(WI-1) indication (Pigure 34). The indicated increase we not		
	dus to incore metres flux level increases but rather am increases		
	in moutres boolings from the reactor core on a result of the		
	stem formed in the reactor vessel. The formation of stem was		
	contributed to (1) increased reactor core tempetatures, (3)		
	threetisd Resetry Coolant Makaup Pump flow , (3) the sheems of		
	Bactor Coolant System (low, and (4) the decreased Reactor		
	Coolent System presents which resulted from the agen Electromatic		

Soliof Volve (SC-R2) and the increased Reselec Costant System cold by density crossed by filling Stem Goorator A. After the

The O44, her 2 April 3, 1980	Leference
	Information Available to the Operator

oppositatedy 2.5 m 10-11 appres the other reactor aut-of-core reactor out-of-cere intermediate range channel (HI-4) reached intermediate range d'amen (MI-3) tecressed frem 1.0 m 10-11 mores to appendently 4.0 z :0-11 mores. Event

control cabin. Upon entering the area, the operator encountered het and humid conditions which he attributed to tripped wentilapressurizer heater and found four of the thirty-nine breakers tripped which he then resst. The pressurizer heater breakers had a history of tripping which made it necessary to normally tion fans. After restarting these fans he then inspected the The reliefing Unit 2 Shift Supervisor directed an operator to inspect the pressurisar beater breaks locally at their check breaker status each shift. 01159123 (0600100). Appr extents

A talephone conference call was made between Unit 2 Superintendent Technical Support (Unit 2 control room) and the Manager-Generating Station Nuclear, the Metropolitan Edison Company Vine President of Generation and the Sabcock and Wilcox Resident Engineer. The talephone conversation lasted approximately 20 minutes. 02:00:00 (0600:37) Approximate

A Radiotion/Chumintry Technicism dres a reactor coolest system 0.153 ppm respectively. A gross bets games analysis performed semple for Cormanies Lithies sealysts efter observing as in-Hovever, a Cermenius Lithium analysis of this sample was not creasing radiation level in the chemistry sampling room. A gross beta-gasse and sedius analysis yielded 4.0 sci/cc and prior to the reactor trip yielded a value of 0.4 mCL/cc. (0602:00)

AP norm/trip (Dalay 2 a minutes) Beaterns 57 at 7.4

94.94.97

Conference call combeted in Unit 2 Castrol Bom.

7.7.9E.10

40.94.9c.9B Unit 2 Courted Ross settfied of green boto-game and sedies saalyste results.

			April 3, 1980
Time	Prest,	Information Available to the Operator	Maria
(0602:37)	Combanness Decreated Love; dedications came both on ocale (less than 50 technol).		
02:02:1X (00:02:1X (00:02:1X	Deartor Coalout System Loop 3 hot log temperature began increasing (Pigers 28).	SC at FLA, NP at PLIO and NB at PLA	•
(904:19)	Steam Gractator A lovel indication teached 505 on the operating comps (Pigora 45). This level and established by the operator to induce natural circulation.	20 or 714 and 71.3	÷.
(00.1017) Per co Lenies (22.10.42) (00.11.13)	The thift I Shift Superviews directed the operator to initiate emergency biration of the Rector Coolant System via both maken addition value (MG-910 and MU-912) ming both baric and itemselve purposed and 48 (CA-P-42 and CA-P-43). This was done in response to an increment emerce flux indication on the enemy and intermed an entre of the bear and pain and a sequentian with the results of two beres analysis which indicated the beres conceptration. Based on these indications it was believed that a resorter restort one is progress. Based on these are restored the continual if was it contact and is progress. Based on the discission (0727:37). Macrier Coolant System Loop A hot long temperature tedication is second offends, greater than \$200 (Finer 23).	CA-P-44/48: ST at PLJ CA-P-44/48: ST at PLJ Poration: Butch Controller at PLJ MT at PLJ (high oc 6)7P), BC at PLA, NP at PLIO and NB at PLA	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
(2013) (0013) (0013)	The Basetar building Air Emple (NP-A-727) porterainte channel Secresand. It eventmily man off scale, at 02:34:33 (0635:06).	40. M and 19 at 71.12	*

"See matery at time 07:47:31 (0448:08)

	Green
Manu 3, 1980	1
	Information Available to the Operator
	Pest

10015153 The Dail 2 Endirolny Solid Reportains requested the compacts prize by Chilary 2 O adminst) 100 End Encentain Bailed bulbs (E-C-E) and the Fronce Last Safety 100 End Encentain Bailed bulbs (E-C-E) and the Fronce Last Safety 100 End Encentain Bailed bulbs (E-C-E) and the Fronce Last Safety 100 End Encentain Bailed bulbs (E-C-E) and the Fronce Last Safety 100 End Encentain Bailed bulbs (E-C-E) and the Fronce Last Safety 100 End Encentain Bailed bulbs (E-C-E) and the Safety Safety 100 End Encentain Bailed bulbs (E-C-E) and the Safety Safety 100 End Encentain Bailed bulbs (E-C-E) and the Safety Safety 100 End Encentain Bailed bulbs (E-C-E) and the Safety Safety 100 End Encentain Bailed bulbs (E-C-E) Safety 100 End Encentain Bailed bulbs (E-C-E) 100 End Encentain Bailed Bail	Tie.	Peer	Information Available to the Operator	- Manne
the unitar comperators (SC-10-TE), SC-10-TE) and the Personnians latery the Entercomments bailed below (SC-42) and the Personnians latery that we calculate bailed below (SC-42) and the Personnians latery that we calculate bailed below (SC-42) and the Personnians latery the Baile 2 paintering Baile Emperators (SC-42), which eropod the conserve costant landage through the Electromatic hailed bailed the personne decreased repidity (Figure 31) the parties maind that the Basetor Bailding presence decreased repidity (Figure 31) basetor Costant System presence increased term \$600 paig to TE-421. The operators maind that the Basetor Bailding presence decreased repidity (Figure 31) basetor Costant System presence increased the companyor print The Baile 2 healtering Baile Department requested the companyor print The Baile 2 healtering Baile Department requested the companyor print The Baile 2 healtering Baile Department requested to the admirent requested to the admirent printer for the problem (Delay 2 or admiren) The Baile 2 healtery (CAC-21) that a decreased the companyor print The Alarm printer mailware bended to lagging date (Figure 55). The alarm printer mailware bended to lagging date (Figure 55). The alarm printer mailware bended to lagging date (Figure 55).	02:17:53	The Balt 2 kelieving Maift Supervines requested the competer print	By (bolsy : 0 admiss)	22. Ba.98
the Electromatic Pained Value (EC-42) and the Personnians Safety Habits Paines and 194.72, respectively. The Paint 2 Paines and Hotalia and Hotalia. The recorded values were 720.77, The Paint 2 Paines and Hotalia Siech Value (EC-72), which cropped the reserve coolean landage through the Electromatic Entit Value The Paint 2 Paintering Paint Enqualment and Architecture (EC-72), which cropped the reserve coolean landage through the Electromatic Entit Value (EC-42). The operator mated that the Bastor Maiding preserve decreased repulaty (Figure 3.) Master Coolean System preserve increased form ADD paint to the American Coolean System Preserve were than ministed at 2.130 paint. The Bastor Coolean System theorem The recorded values were 223.48 pct. The Daint 2 Painter Maines. The recorded values were 223.48 pct. The Bastor Maines Wall Coolean System (EC-42) that the theorem Coolean System (EC-42) that the American States than a state of seals of 0.137.23 (OAC4.09). The American Dainter mailtance through the language date (Figure 5.5). The above princer mailtance behind to language date (Figure 5.5). The above princer mailtance behind to language date (Figure 5.5).	(96.181.30)	the outlat temperatures (RC-10-TE), BC-10-TE2 and RC-10-TE3) of	AP bigh (2007)/escs (Delay 2 * mission)	
The Bait 2 Reliceing Edit Superviews directed waless were 720.77, The Bait 2 Reliceing Edit Superviews directed the special to abate The Bait 2 Reliceing Edit Superviews directed the special teacher the special teacher through the Electromatic Relief Table The Bait 2 Reliceing Edit Side Side Wales (EG-T2), which stopped the EG-H2: 57 specials cannot be formed the Electromatic Relief Table The Bait 2 Reliceing Edit Side Side Side Side Side Side Side Side		the Chettematic baliaf Yalva (18-42) and the Presentiant Safety	10 at 7210	
The Balt 2 Relicating Balts Experience directed the operator to abust the Balts Re-721 ST open/abast or PA. The Balt 2 Relicating Balts Experience directed the operator to abust the Electromatic Balts Experience (EC-22), which etopped the reserve coalest landage through the Electromatic Balts Balts Balts and that the Bactor Balts Bal		Talwas (AC-AlA and AC-AlB). The recorded values were 228-37,		
The Dait 2 Reliceing Shift Emperium directed the species to abust the Unit 2 Reliceing Shift Emperium directed the species to abust the Endis ST speciable of PLA to Electromatic Endis State Plan (EC-42), which etopod the EC-42: ST speciable command of PLA teactor colors taining the Electromatic Relice State Sta				
the Electrometic falled filed balw (8C-73), which stopped the freedrance coalest landage through the Electrometic haiding presence decreased randage through the Electrometic haiding presence decreased randage through the Electrometic haiding presence decreased randage through the Electrometic haiding presence decreased translation presence increased from 600 paig to an increased randal presence increased from 600 paig to an increased randam presence increased from 600 paig to an increased randam at a manual from the manufacture of the decreased randam requester print. 1310 paig decing the near 41 adminson became from 600 paig to an increased at 2130 paig. The fall of the site of the decreased randam requester print is the near throughout the compared randam and 220-17 at the near throat	6018170	The Buit 2 Relieving Shift Supervions directed the operator to abut	MC-72: ST open/almt of FLA	2c,33,3e.B
Totally. The operator mated that the Bactor bailding prosect decreased rapidly (Figure 31) Decreased rapidly (Figure 31) Description present increased from \$50 paig to an (Lee-203) paig and Low/Low - 1900 paig) or FLA and prince and streamed from \$50 paig to an an EC or FLA decreased rapidly (Figure 31) Description from the annual decreased from \$50 paig to an EC or FLA decreased and the annual compared paids The Baig decreased and the annual compared paids and EC or FLA decreased and the annual compared paids and EC or FLA decreased and the annual compared paids and 220-17 et annual compared and annual compared and an annual compared and contained and an annual compared and an annual compared and contained and an annual compared	STATE STATE	the Liectrometic Raisef Slock Valve (86-92), which stopped the	MC-82: ST open/obst commad at 75A	No.
decreased repidly (Figure 31) hastor Coolast System presents incremed from 650 paig to 2130 paig decing the mart 41 advance. Bastor Coolast System Promote was them minetained at 2130 paig. The Unit 2 Relieving Solit Departume incremed from 650 paig to The Unit 2 Relieving Solit Departume requested the comparer print The Unit 2 Relieving Solit Departume requested the comparer print The Unit 2 Relieving Solit Departume requested the comparer print The Unit 2 Relieving Solit Departume requested the comparer print The Unit 2 Relieving Solit Departume requested the adecrement requester requested uniter was 220-17 at G218139 (0420136), 226-47 at 02:20:34 (042113) and 220-17 at G218139 (0420136), 236-47 at 02:20:34 (042013) and 220-17 at G218139 (0420136), 236-47 at 02:20:34 (042013) and 220-17 at G218139 (0420136), 236-47 at 02:20:34 (042013) and 220-17 at G218139 (0420136), 236-47 at 02:20:34 (042013) and 220-17 at G218139 (0420136), 236-47 at 02:20:34 (042013) and 220-17 at G218139 (0420136), 236-47 at 02:20:34 (042013) and 220-17 at G218139 (0420136), 236-47 at 02:20:37 (0420136) The Remeter Delifing Air Empla (UD-P-227) indice themsel incremed The alone printer walteneries at 02:37:23 (0420106) The alone printer walteneries at 02:37:23 (0420106) The alone printer walteneries and 10 and		creater coolest lashage through the Electromatic halfol Valva	Br scarus	
descreed repidly (Figure 31) beacter Cealest System presence Secremed from 500 paig to a 2130 paig design the mark 41 advances. Beacter Cealest System Presence was them maintained at 2130 paig. The Daix 2 helicular Shift Department requested the comparer print The Daix 2 helicular Shift Department requested the comparer print The Daix 2 helicular Shift Department requested the comparer print The Daix 2 helicular Shift Department requested the comparer print The Daix 2 helicular Shift Department requested the comparer print The Daix 2 helicular Shift Department requested the comparer print The Daix 2 helicular Shift Department requested the comparer print The Reserver Desiriting Air Emplo (NP-P-237) Sedion channel increment The Alexa printer maifunctioned. The alone printer function The alone printer maifunctioned. The alone printer function The alone printer maifunctioned. The alone printer function The man new 2 menture behind to lugging date (Figure 55). The man new 2 menture behind to lugging date (Figure 55).		(BC-42). The operator sound that the bactor building prosesses		
Applies from the same Al advance. Bactor Coolent System Fromto we then maletoined at 2130 paig to The Bait 2 hollowing Shift Department requested the comparer print The Bait 2 hollowing Shift Department requested the comparer print The Bait 2 hollowing Shift Department requested the comparer print The Bait 2 hollowing Shift Department requested the comparer print The Bait 2 hollowing Shift Department requested the comparer print The Bait 2 hollowing Shift Department requested the comparer print The Bait 2 hollowing Shift Department requested the comparer print GRISSIS (0424:09). The Account in this imple (NF-P-277) indice channel increment An in and MP at Phil The alone printer emiferationed. The alone printer function The alone printer emiferationed. The alone printer function The alone printer emiferationed. The alone printer function The alone printer emiferationed the inguine date (Pigure 58).		decreased repidly (Pigure 51)		
System Frances was then maintained at 2130 paig. The Dait 2 Relieving Shift Experient requested the companies print the outlet temperature (EC-10-TE) of the electrometic relief which (EC-E) three there. The recorded makes were 221.00 mt Relief (G-E) three there. The recorded makes were 221.00 mt Relief (G-E) three there. The recorded makes were 221.00 mt Relief (G-E) three there. The recorded makes were 221.00 mt Relief (G-E) three there. The recorded makes were 221.00 mt Relief (G-E) three there. The recorded makes were 221.00 mt Relief (G-E) three there (BC-10-TE) of the electrometic relief (G-E) three there is a contact (G-E) three there is a contact (G-E) three thr	02119180	beater Cooleat System presents incremed from 680 paig to	AN (Low-2055 parks and Low/Low - 1900 paig) at FLA	4
Spriess Pressure use these maintained at 2130 paig. The Unit 2 holiecting Shift Department requested the computer print (the certain temperature (SC-10-TE)) of the electrometric relief value (SC-ED) three these. The recorded univer were 227-49 at GRISHIPS (0420-19), 224-48 at 02:20-36 (0421-13) and 220-19 at GRISHIPS (0420-19), 224-48 at 02:20-36 (0421-13) and 220-19 at GRISHIPS (0420-19), The shore printer walker the shore printer function The shore printer walker the alone printer function AP (Polog 2 0 admits) The shore the veility printer. The shore printer can AP (Polog 2 0 admits) Lead and 23 admits behind to leging date (Figure 55).	Apprentate	2130 pelg des	M and SC or PLA	
The Smit 2 Relicating Smitt Superviews requested the companies print The swilet temperature (RC-10-TEI) of the electrometic relication. Whigh (2007)/sers (Doing 2 o minutes) Whigh (2007)/sers (Doing 2 o minutes) Religious (0420:38), 225.6F at 02:20:36 (0421:33) and 220:3F at Religious (0420:38), 225.6F at 02:20:36 (0421:33) and 220:3F at Religious (0420:38), 225.6F at 02:20:36 (0421:33) and 220:3F at Religious (0420:38), 225.6F at 02:20:36 (0421:33) and 220:3F at Religious (0420:38), 225.6F at 02:20:36 (0421:33) and 220:3F at Religious (0420:38), 225.6F at 02:20:36 (0421:33) and 220:3F at Religious (0420:38), 225.6F at 02:20:38 (0421:33) and 220:3F at Religious (0420:38), 225.6F at 02:20:38 at 02:37:32 (0420:00). The alone printer malfunctioned, The alone printer function Residenced to the weility printer. The alone printer one Leasing force and 23 advances behind to longing date (71gere 58).		System Presente was them entertained at 2130 paig.		
the swellet temperature (RC-10-TH) of the electrometic relief water (RC-E3) three times. The recorded univer were 227-69 or GRISH:39 (0420:39), 226-6F at 02:20:36 (0421:13) and 220:1F or GRISH:39 (0420:39), 226-6F at 02:20:36 (0421:13) and 220:1F or GRISH:39 (0420:39), 226-6F at 02:20:36 (0421:13) and 220:1F or GRISH:39 (0420:39), 226-6F at 02:20:36 (0421:13) and 220:1F or GRISH:39 (0420:39), 226-6F at 02:20:36 (0421:13) and 220:1F or The Reservor Building Air Emple (RP-P-227) indice chancel increased As He and MF or Fill? The alone printer colfenctioned, The alone printer function treesferred to the weility printer. The alone printer one treesferred to the weility printer. The alone printer one l been and 25 admits behind in Ingiles date (Figure 58).	02:19:50	The Bait 2 Relieving Shift Departmen requested the competer print	SP (Delay 2 0 of mice)	26.98
Wiles (MC-L2) three times. The recorded walker were 227-67 or MF or FLIO Wiles (Od20136), 226-67 at Diriola (Od2113) and 220-17 or Wiles (Od20136), 226-67 at Diriola (MC-P-227) (edites themsel incremed Mr. MR and MF or FLI2 and eventually even off scale at D2137-123 (D430:00). The alone printer malturetioned. The alone printer function (Considered to the weility printer. The alone printer and (Figure 58).	(or increa)	the outlet temperature (RC-10-TEI) of the electrometic relief	AP high (2009)/acre (bolay 2 o mimtes)	
Offilities (0620136), 256-6F at 02:20:36 (0621:13) and 220:1F at Offilities (024:00). The Reactor Building Air Lample (ND-P-227) indice chancel incremed AM, NM and MF at Pall? and eventually even off scale at 02:37:23 (0638:00). The alors printer colling frictor. The alors printer function transferred to the utility printer. The alors printer one AP (Dolsy 2 0 admitted) 1 bear and 25 admitted to Ingales date (Figure 58).		value (EC-EJ) three times. The recorded meluse were 227.6F at	NP at PL10	
The Reservor Bailding Air Lampia (ND-P-277) indice chancel increased Ms. Ms and MF at Fill? and evantually over off scale at 02:37:23 (04)6:00). The alone printer colfenctioned. The alone printer function transferred to the utility printer. The alone printer over 1 been and 25 admine behind to implied data (Figure 58).		42:19:59 (0620:36), 226.6F at 02:20:36 (0621:13) and 220:1F at		
The Newton Dailding Air Emple (ND-9-227) indice channel incremed 40. M and MP or Fill and eventually over off scale at 02:37:23 (0430:00). The alone printer colfunctional. The alone printer function Paper food problem is typowritor transferred to the wrillty printer. The alone printer one 17 (Dolsy 2 0 admits) I have end 25 admits behind in Ingiles date (Figure 58).		(B123132 (0424109) -		
the alors printer californithms. The alors printer function The alors printer californithms. The alors printer function transferred to the utility printer. The alors printer was AP (Dolay 2.0 aloutes) I have seed 25 alontes behind to implies date (Figure 58).	02:24:23	The Reservor Building Air Sample (NY-7-177) fedice channel facromed	4. n of w a. 7.12	8.4
The alors printer coliumctional. The alors printer function transferred to the utility printer. The alors printer one leaders and 23 admits behind to lagging date (Pigure 58).	(derring)	and eventually over off scale at 02:37:23 (0430:09).		
transferred to the willity printer. The alors printer one I have end 25 admitted behind in Ingging date (Figure 55).	02:17:33	The alone printer collectioned. The alone printer function	Paper feed problem in typortices	24,25,54
		transferred to the stillty printer. The slore printer one	AP (Polay 2 0 attenta)	

1		Information Available to the Operator	Beference
*******		As at 718 (high at 6127). IC at 714. IF or 710 and 18	
(0629158)	crossed officeals, present thm 6707 (Pigers 28).	2:	
02130100 (0630137)	Sail powered sestres desectors resding on backup incore detector	NP at Pal4 AF bad/sorm (0 to 2000mA) (Delay 2 o minutes)	*
	These recorders smaller 36 of the 364 inters detectors evallable.		
02:31:33 (06:32:00) Approximate	The Incore Instrument Peech Area Mesitor (MF-16-213) resulting larges to increase.	6. N W .: 7112	1
(0633:39)		IN (Blustop Bongs) of FLA, IN (Filds Longs) at FLA	4.
	(Piger e 45).		
021.38123 (04.79100) Approximen	The Landonn Contor A wantron (IC-0-1097) indicated radiation larvel terrenaed officeate. The larvela indicated on the fullon-	F. H . T. 7.12	¥, X, 3
	(a) Washoup Tank Area Nomitor (NF-N-106) (b) Fuel Handling Building S. (NF-N-110) (c) Essertor Building Dome (NF-N-114)		
87: 30: 73 (196-0-8)	The Unit 1 hot mathine stop area monitor (29-C4) reached the	that 2 Coolene Reas Perffied of terresting Rediction tennis, as made 2 cannot been	Sa. Ph. 59.10
	Madiation/Chemistry Technicians revealed that the Unit 2 Reactor confast system sample lines were the source of the increased redistion levels. It takes approximately forty sinutes for a representive sample on Unit 2 to reach this area due to the		
62:44:23	ample line length and flow rates amployed. Incore justrament Pacal Area Smalter (W-5-113) indication in-	M. H and 10 or 71.12	36,36,38,58
(D445:00) Approximate	ercound officele high. The levels indicated on the following	*See extry at the #2:47:31 (0648:08)	

*See eetry at time #2:47:31 (0648:08)

Time	Prest	Information Available to the Operator	Reference
	radication meditors began to increase.		
	(a) bancist beliding burgs Air Enhance Duct (HP-E-125)-particulate		
	(h) Laurtor Bellding burge Air Dabmer Duct & (W-b-226)-porticulate		
	(c) Amilliary ballding Purps Air Dames (IP-3-223)-particulote, gen,		
	ond todies		
	(4) Amelifary building Besting & Pestilotion meature gas channel		
	(indication was off scale within 30 mission).		
	(a) Seactor but ding Air semple (ID-2-227) gas chemni (indication		
	was off scale within 10 micerces).		
02:45:00	Several rediction alarms were retained at the Control Low	Mr. 10 and 30 at 71.12	84,94,94
Approximate	hadistics fewlier Possi.		
62:45:23	A badicting/Chamistry Technician tenk a tractor conless ample. A	Bait 2 Coutrol hom certified of green bate-game	•
(0644100)	Cormulus Lithies sealysts was done or 02:51:23 (9632:00) and	emalysis results	
	indicated a total grees between activity of 149.7 act/all. The		
	treates of the sanipsis are like " "thur.		
	1.437 b+41 7.847 8+00 6.277 8-02		
	1.731 [40]		
	3.302 E-01		
	2.147 8401		
	Zemme 135 5.807 E+00 mc2/m2		
	Contam 136 2.854 E-01 mCL/mL		
	5.121 K+00 1.407 K+02		
02:45:23 (0646:00) Approximete	Yeal Resiling Building Monitor (MF-A-218) began to increase.	B and 30 at 7012	8.4
02:44:23	The operator attempted to start leater Cooleat Pap IA (RCP-IA).	67, 18(4), 18(F) and 5C(F) or PLA, AN or PLB.	Br. 9r. 9a
Approximete	The pump would not start.	AP morm/trip (Bolky " a)	
		"See every at time \$2:47:31 (0649:00)	

			April 3, 1980
Time	Prest	Information Available to the Operator	Beforence
02:47:33	The operator initialized the slars summary function to obtain	W (bells) 2 0 atmitted)	
	outcome alors data. As a result the alarm commany data from \$1133122 (05133139) to 02:47:31 (0648:08) was deleted.	Outrast Alarm station printed out.	
(901999)	The certrent alarm status indicated many of the self-powered meetrom detactors were going offscale between levels 3 through 7 (i.e. approximately 3 feet to the top of the core). This has been ettributed to the high temperatures experienced in the core.	# bad/teen (8 to 1880 al.) (ballay : 0 at metal)	
(06.95.00) Approximate	The following radiation scattery indication were increasing standily and by 03:34:23 (0735:00) all ware orther off scale or cycling case that's upper range. (a) Gos chemnal of the Station Vest (NP-R-219) souttor (b) Peel Bendiing Daliding Echemne Doct (NP-R-221,4 & B) (c) Hydroges Forge Doct (NP-R-229) particulate 6 lodium channels.		
05: 45: 23 (06:50: 08) Appr offsets	The Dair 2 Shift Supervisor declared a Sit. Emergency upon receiving high level radiation alores from the Reactor Polising Memitor (MP-M-214). Metification of affaits methorities and organizations was intrinced.		
00.50 (06.00) (06.00.37) pproximate	The air empiry was restored to condemnte reject velve (CO-TS) which has peretonely failed closed or OO:OO:IS (0000:S2) when its fastrament air line was severed due to a "water hasmar" is the condemnta piping. This was done to allow unter in the Butuell to be transferred to condemnate storage tasks IA and IB (CO-T-IA and IB). A regid decrease in hetwell level to experienced.		
02152157 (0652194)	The operator attempted to start Easter Coolent Pump 18 (RC-P-28). The pump would not clert.	FT, ME(A), ME(F) and SC(F) at PLA, AN or PLA, AP norm/trip (Delay 2 5 ofentes)	26,86,58

Condenses hereall level indication coursed to marmal. A level of RR(1) at FLA, 40 leve (15.3 inches)/sermal/high M. A inches was indicated. The species stronginal to start beacter Coolant Pump 19 (EC-0-18). The species stronginal bacter Coolant Pump 20 (EC-0-18). A station The species stronginal bacter Coolant Pump 20 (EC-0-18). A station The species strong the start beacter Coolant Pump 20 (EC-0-18). A station The species strong located bacter Coolant Pump 20 (EC-0-18). A station The species strong the start beacter Coolant Pump 20 (EC-0-18). A station The species strong located bacter Coolant Pump 20 (EC-0-18). A station The species strong the strong to make the start bacter coolant to beacter Coolant to Bacter Coolant Co	Ties	- Creat		Information Available to the Operator	April 3, 198
The species stampted to start heater Conicas Pump 15 (GC-15). The species stampted to start heater Conicas Pump 15 (GC-15). The species stampted to start. The species stampted for start heater Conicas Pump 15 (GC-15). A remoter of the GCO, wid(7) and GCO) at Tab. An or Pid, the species started face of 10 dillium promed per four was a servicing (Dalay 2.5 admina) superiorn started for approximately 3 sec. 4. Neam formation for approximately 3 sec. 4. Neam formation for approximately 3 sec. 4. No secularity (Dalay 2.5 admina) superiorn species for approximately 2 sec. 4. No secularity (Dalay 2.5 admina) ind pulp to approximately 720 pulg in the same two admina. The species for approximately 20 pulg in the same two admina. Ind pulp to approximately 720 pulg in the same two admina. The species for approximately 20 pulg in the same two admina. Ind pulp to approximately 720 pulg in the same two admina. The species formation of 250 fc. The species formation of 250 fc. The following forces Thermocouple Temperatures decreased to less at the conformation of 250 fc. The following forces Thermocouple Temperatures decreased to less at the conformation of 250 fc. The following forces Thermocouple Temperatures decreased to less at the conformation of 250 fc. The following forces Thermocouple Temperatures decreased to less at the conformation of 250 fc. The following forces Thermocouple Temperatures decreased to less at the conformation of 250 fc. The following forces Thermocouple Temperatures decreased to less at the conformation of 250 fc. The following forces Thermocouple Temperatures decreased to less at the conformation of 250 fc. The following forces Thermocouple Temperatures decreased to less at the conformation of 250 fc. The following forces Thermocouple Temperatures decreased to less at the conformation of 250 fc. The following forces Thermocouple Temperatures decreased to less at the conformation of 250 fc. The following forces Thermocouple Temperatures fc. The following forces Thermocoup	(0653153)	Condensat bereall level indication returned to on	Iral. A lorel of	ME(L) at FLS, at low (22.5 Suches)/sormal/high	A
The operator strompted to start benefor Conlose Pump 15 ((C-0-15) - ST, ME(2) and ME(7) are Fid, AS at Fid, AS at Fid, AS at Fid, as operator stromp would not start. The operator strong line follows Pump 22 ((C-0-15) - A remeter The operator strong for start (Collose Pump 22 ((C-0-15) - A remeter Means Control for opprominantly 5 secures from premimantly Means Control for opprominantly 5 secures Means Control for opprominantly 6 secures					
The space setting and set setting between Coloret Pany 12 (GC-P-18). A reactor TT, 18(10), 18(17) and 16(17) at TA, 18 of TA, cealing of the specimen of the s	(0453:53)	The operator attempted to atark bearing Conlass P.	10 (00-10)	57, 18(A), 18(F) and SC(F) at FLA, 48 at FLS,	24,84,94
The operator stated baseles Coolean Fung 23 (Bc-D-23). A reservee		The pump would not start.		M norm/trip (balay : 4 minutes)	
temperatured for oppressionally 3 over the three seaso from approximately 100 or 174, 80 or 1717 Indo operator 2 stoom pressure topicly increases from approximately 100 or 174, 80 or 1717 Indo operator de-emplaced 7 reason from two minutes. The operator de-emplaced 7 reason for the season of the size. The operator de-emplaced 7 reason for the season of the size. The operator de finishings bester groups our originals at this time. The operator of 20070. The following finishings bester (4000-0-1400) terromed and wast off male. We need 70 or 1712 The following finishings bester (4000-0-1400) terromed and wast off male. We need 172 or	02:54:09 (0654:46)	The specialist special baselot Coolest Pasp 23 (SC.	-19. A rect	07, 18(1), 18(7) and 16(8) or 715, 48 or 715,	4 47.4
Press Constitute to a companies to a companies of the control of t		experienced for apprehensing 3 example.			
The operator de-conflict Presential Presentation of 1957 0". The following Incore Therecouple Presentation decreased to less the Conflict Office over the next seven minutes. The incore Therecouple Presentation decreased to less the Manual Presentation of Restoc Coolent Presentation (Polory 2 & admits) The 423-77	(0654:15)	New Sections & stem pressure topidly increase 166 paig to appreciate the paig to the next tw	free appraisately e electes.	B . 74. E 717	•
Eleven presentior heater groups were residable at this time. Man such first the heater (1900-6-1400) increased and want off scale. He and NE at FLAZ Mater This mention of 305'0". Mater i control rows was notified of the able manipung in effect La Bate 2. The following incore Thermocruphe Temperatures decreased to less As norw/hed (mat of temps Protes) than 700F over the nest seven minutes. The increased teactor core conling was a result of Reactor Coolent Pump 28 (RC-P-28) operation. The 423.77 He 596.07 IN = 433.77 IN = 433.77 IN = 433.77 IN = 633.59 IN = 653.69 IN = 556.07 IN = 653.69	91:54:19	The operator de-emergical Presential Batter Gree	: : : : : : : : : : : : : : : : : : :	H . 74	
Decor Complications (MDD-C-1486) increased and want off scale. We as 72.12 Decor This manifest of Decoration in the Amelliansy Deciding of on an element and so proceed to the increased to the state of Decoration of the site americans in effect (Angeorganest English Properties decreased to lease the following factors Thermocrouple Temperatures decreased to lease the factors Thermocrouple Temperatures decreased to leave the factors Thermocrouple Thermocro	(SCIENTED)	Eleres presentier batter groups us re evallable a	e chia tim.	Ar morn/trip (beloy 2 3 minutes)	
Dait 1 control come was confilled of the site amorphory in effect. in Dait 2. The following incore Thermocrouple Traperstures decreased to less than 700% ower the next seven adouts. The increased reactor case conling was a result of Reactor Coolean Pump 28 (EC-P-28) pagestion. 78 - 623.77 18 - 523.77 18 - 523.77 18 - 545.57 19 - 623.09 110 - 626.57 111 - 625.57	02:54:23 (0455:00) pproximits	11			1
The following facors Thermocouple Temperatures decreased to less. than 700F over the next seven alteres. The increased reactor (Deloy 2 6 admices) cere couling was a result of Reactor Coolent Pamp 28 (RC-P-28) speciation. Th. 423.77 IN. 529.09 IN. 623.09 IN. 623.07 IN. 679.77	(0655:00)		poncy in effect	Approximent made on Plont Page System	4.46.8
	02:54:33 (0435:10)	The following Incore Thermorouple Temperatures de-		Af mora/had (mat of range Of to 700F) (Polar 2 & minera)	
		core cooling was a result of Reactor Coolant Pusp	28 (86-9-28)		
		operation.			
			3.04		
			3.00		
			678		

Time.	Prest		Information Available to the Operator	April 3, 1980
	136 + 577.18	W - 695.33		
	11E - 584.0F	37 - 681.97*		
	OTE (*) This Incore there	This lacate Thermotougle Temperature cycled sear 700F		
	ustil Reactor Coolant ?	til Resetor Coclast Pump 28 (RC-P-28) was stopped.		
20 A	Beactor Coclast system pressure rapidly increased	heactor Coolant system pressure rapidly tucressed from approximately 1260 pelg (Figure 4).	All (Low-2035 peig and Lanfitze-1988 peig) on TLA	
02:34:30 (0433:27)	Safesy Injection legic of the	nefery Injection hadio of the Depieme belony Festures trains	Ap ort Pill, 57 at Pil and Pill	A
00:00:150 (13:00:00)	The operator statted Circulati prissure control was automatic	The operator started Circulating Nater Pump 18 (CM-9-18). Steam processes control was automatically transferred from the power	Ap on/off (Dalay 5 & elected)	8.8
	operated Conspency Main Measure the Turbine Dypass Talwe (MS-	the hypers falve (MS-7254, MS-7258, MS-7364 and MS-736B)	074 30 25 pm gs 2/8/24-94	
	which were in memoal.			
	Mores two circulating water ; during the thes period (3648:58) when no alarm	two circulating water pumps had been placed in service daring the time parted from 01:13:22 (0513:29) to 02:47:31 (0648:08) when no alarm printer data was swallable.		
100 M	(970-17). (970-17). (970-17). (970-17).	or faces free fabour fadicism Hasing (N-A-743) Serven- free 1 a 10 ² to 8 a 10 ² counts per adoms at 03:05:40 (9). Name-748 is located in the Parkies Building at an alternation of 231'0".		3
02: 35:00 (0453: 37) (ppc catherra	The reactor aut-of-core laters indications decreased rapidly	The reactor out-of-core latermediate Sange Channels (NI-3 and NI-4) indications decreased repidly to lass than 1.0 x 10 ⁻¹¹ asyeres	Ri-li Ri-mir oc Fla	2

Minter Marie SCore Plat

(atsitum detectable level) (Pigore 54). The reactor eat-of-core

Reference

MC Pt. NR and SC at Plat in Reactor Coolant System pressure. Pressurizer spray flow use sain-The operator initiated pressurizer spray flow to stop the tapid rise tained until 03:13:27 (0714:04) in an effort to cool the Reactor Conlant System down and reduce Reactor Coolant System pressure. (0635:46)

Q2155113 The operator cleared the Safety Injection portion of Engineered (0633150) Safety Pastures trains A and B.

02:55:26 Condenser hot well low treel clars me received. The Lovel was (06:56:03) 21:42 inches.

02:55:48 The sperator started Circulating Water Pump is (CH-P-18). (05:56:15)

(04554.44) The specifier specified being Steam Indiana Values (865-145 and 78) and (04554.44) second to the steam chair and miss steam lines for appreciately 12 accord to atop the rapid (occurs in Steam Constraint P presents.) The Designary Control Station was entablished to Table 1 Builth (04554.09)

728 Sprogram 57 oc 714

1.02.00.00

AN act Fils, ST at Fils and Ft. 13 AP norm/Rypassed (Dalay 2 10 admitse)

2

NR of PLS AF Low (22.5 inches)/sorm/high (34 inches) Onlay 2 11 minutes)

28

M (A and P) and ST on Fill?
A cufoff (Dalay 2 11 adments)

2a, 8a, 9J

24.92

MG-V4M/78: ST at Fil3
SG 7: We at Fil4 and SC at Fil7
AP open/closed (Delay 2 18 at mates)

Unit 2 Control Dom sectified of the Elementary Control Station states.

36.86

Physic Laboratory. Oneito and offsite radiation mentoring tames see formed in proparation to manage radiation locals.

4	. Pearl	Information Available to the Operator	TOR O44, Ear 2 April 3, 1980
02: 59:23 (9790:00) Approximates	bactor beliding Parge Unit Area Meditor (GP-3-3226) and the Pari Bedding Deliding Area Resitor (GP-3-3260) buyen to incress.		
95-90-54 (0701-33)	The Amelilary Operator throating the Inject tooloffill halm (0-40).	M at FLS AP bad (nat of range) (Dolog 2 11 bitmesa)	;
(0701:11)	Condensate Storage Sout 18 norm lovel elers was received. A lovel of 20.3% feet was received.	AP low 120 ft)/norm/high (29 ft) (Delby 2 11 winness)	
83,8238 (8797339	Condenser betwell ion level alone mas received again. The level was	M at P.5 W low (22.5 Inches)/borm/high (36 inches)	•
Objection Opposition	The operator isolated Stamm Consentor B for the second time. Purbles Bypass Inolation Valve (NF-VISE) was shut. Bargamay Pashwater Valves (NF-VISE, NF-VISE, and NF-VISE) were shut. The operator numperind a Remetor Coolant side to Produmter side land. The Condenser Factors From Referent Shilation Monitor (NG-M-)48) indication had increased from 1 x 10 ² to 5 x 10 ³ counts per adims.	6-170 S.	
0):04:03 (0704:42)	The reactor out-of-core intermediate Range Channels (Ni-3 and Ni-4) indications increased from less than 1 x 10 ⁻¹¹ amperes to approximately 1.3 x 10 ⁻¹¹ and 2.5 x 10 ⁻¹¹ amperes respectively (Figure 56). A corresponding increase was recorded on the reactor aut-of-core barnes Channel (Ni-1) indication (Figure 56).		į
182	The Standard Comments of Standard Standard or Street In the Bolt 2 countred over and essential Standard Standard Streets.	Americans and an Flant Page System	1

ļ	No.	Information Available to the Operator	leference
0.02 d d d d d d d d d d d d d d d d d d d	Night Compressor & level todication reaches 466 on the operating tongs (Figure 45). This level on enimalered during the cont. 6.1 hours.	EC (apparation company) and PLA and PLA	•
02-04-00 (03-04-07)	Conference formings fact to less from these claims was received. A lensit of 10.70 form was received.	AP Les (20 (4)/coms/high (29 Et) (Belog 2 13 winesma)	
(9711:06)	The operators adopted berapents becomes they in (SE-P-25). Both Keen Constraints had breakly of chemic 400 on the Operation from Object with.	E7-6-2A: ST, ME(A) and ME(T _{D13GR}) or 744 MC L: SC (Operate Sarge) of 714 and 715	1
(02111.18	Confessor bates) level returned to moral. The lovel was	NR at 715 Ap low (22.5 inches)/foots/Alga (36 inches) (Delay 2.19 minutes)	
05-12:38 (07:3-03) Approximate	The operator operator the Electrometic Relief Block Value (BC-08) to taken control totals, option presents and presention thresh ofter ectomple to token the presents by uning the presention		
03+12+28 (6713+65)	the finetremetic laised below (SC-22) discharge Man Nigh temporature alone may remove at 187.77 me recorded.	S out Mild Ab high (2007)/horn (Delop 2 15 minutes)	
03x12x35 (6913x122 Application14	The reactor out-of-core intermediate Range Chancels (NI-3 and NI-4) indications decreased to less than 1.0 x 10 ⁻¹³ emperes (Figure 56).		
(98.11.59	The operator erupped Featter Conlast Fram 28 (BC-F-28) based on Endicated suco flow and marter running current of less them 100 sapproxisately 500 septrox Coolset Fung operating current is approxisately 500 seperator Coolset and operator of the flow recorder trace indicated a small amount of reacter coolset flow had asisted.	66. M(d), A(d) and M(d) on M(d, M (crip) on PL) A secondario (belog 2 16 admins)	

			W171 3, 1980
Sim	Espair	Information Available to the Operator	Beference
#\$413-3# (#77-4-113)	The fellowing Incore Thermescopie Imageratures increased to greater than 7867 Auring the sent seven admits (140, 120, 148, 136, 136, 136, 136, 136, 148, 136, 148, 136, 148, 136, 148, 136, 148, 136, 148, 136, 148, 136, 148, 148, 148, 148, 148, 148, 148, 148		
931.23556 (971.41.35)	The presentions asfery valves (MO-MiA and MO-MiA) discharge line high temperature alarms were received. Respective temperatures of 102.4F and 205.8F were recorded.	no or 76,300 no bigs (20007)/horne (Dalley I II admitted)	
031144.23 (07135.00) Approximent	Integraphists Conling Pung Ares Hosttor (HF-8-207) Subfrated as increased refinition level and at 03:20:23 (0721:00) the lares at allow of 100 white.		
429 18: 45 (23-18: 45)	The reservor out-of-core intermediate Europe Channel (Ni-1) indica- tion increased from loss than 1.0 x 10 ⁻¹² asperer to shout 3.2 x 10 ⁻¹² asperes (Figure 56). Moment, this increase was not observed on either the Source Europe Channel (Ni-1) or the other Intermediate Europe Channel (Ni-3).	Me and MC or Pla My normalised (not of range 19 ¹³ to 10 ⁻³ maps) Chaley 2 19 admitted)	1
031 124 25 (07 201 003) Appt oxizacto	The first offsite does calculations were completed by Flant Engiosers. The Smittal calculations indicated a total brdy emposure rate of 46 k/he is Galdaboro (1.3 miles west of the place). Based on the Mencine Building pressure being south lower than that assumed in the osescentes dealeding pressure being south lower than that the above value one oneity conservative since it is corporated a higher less trate. Buildinating these calculations, ensite and offsite radiation toms were disputched in the domination direction (west side of the Three Wile takens and Childhoro, Pannaylvenia).	Calculation performed to Onit 2 Control Less by Plane Brillianors and discussed with speciational personnel.	1

Tine.	Fresh	Information Areal soles, so the Sperator	Man
03-19-16 03-19-16	The spendent warmaily takefated the Safety Injection portions	AM ax 71,13, 57 at 71,3 and 13	4.7.4
	of Deglessied Sefery Pasters trains A and S on a result of	Af bypass/test/trip (Delay 2 19 missutes)	3
	her bearing Coolean Spates process (Figure 4). The baloty		
	injustion animatic extention mapping to 1660 paig.		
03:70:23	Restrar Conless Nakeug Evep C (NE-P-IC) started successifically on	ST and Mile) or Pl.3, As or PLB	1.5. W
fb(10710)	the Engineered Sefety Festure train & actuation. Essetur Coulane	A see feely (Statem) 10 of the	
	Bickeus Punge & and C (MI-P-l& and MI-P-IC) were opozating.		
	WOTE: During an Engineered Sefety Fratures actuation Safety		
	Injection stilines Seating Coolest Makeup Pimps IA and		
	IC (NE-F-1A and NE-P-IC).		
Q31.281.23	The following redisting emitters registered increased	S. M and St 19.23	A'X
Approximents	redistion tersias		
	(a) Primary Coniest Leadone 15 (MU-8-720 ST)		
	(b) Primary Conlant Letdom Lo (HD-9-728 LG)		
	(c) intermediate Couling Latdows Coules B (10-2-1091)		
	(4) Intermediate Cooling Latdows Coolar & (3C-R-1092)		
	(a) Intersediate Couling Letdons Choler Outlet (3C-8-1093)		
	(f) Plant Officent that II (WpL-M-1311)		
	(g) Dutay Sees Closed & Long (DC-4-1399)		
	(h) Dezay Boat Closed B Loup (DC-8-3400)		
	(1) Buclear Service Closed Coeling (85-8-3401)		
	(5) Spent Past Cooling (SF-8-3a02)		

5:

The Des, See 2 April 3, 1980

Bufarence

__Information brailable to the Operator

B. 10.18

State of

All marches (ret at range 60-7007) (belog 2, 70 atments)

2

coeling use a result of the sameal high presents injection actuations. HE = 617.99

then 7000 cear want frustrees attained. The increased reactor core

the full-build incore Thermcouple Tesperatutes decreased to loss

(0711110)

78 = 627.27 28 = 630.39 28 = 630.39

26 - 425.39 104 - 425.47 6C -

10 - 421.69 - 40 - 431.79 186 - 424.29 - 78 - 492.79

10 - 17.55

20 - 685.69 30 - 693.59 39 = 445.0F Secon (4) This income Thermocouples Imperature ayeled near 700F until Essector Coules: Makeup Pomp C (755-P-15) was stopped. 2 : H I H 4 : C

(07) first the resector anti-of-core intarmediate Range Channel (NI-4) Approximates to finishes the state out-of-core four Channel state. The finishes about a corresponding method decrease which indicated the the stam to the reactor cessel was displaced by liquid. Noth intermediate lange Channels (NI-3 and NI-4) resulted effects the trace to see the state of section of the state of the state of the state of section of the state of the state of section of the state of the state of the state of the section of the state of the state of the section of the state of the state of the section of the state of the state of the section of the state of the section of the section of the state of the section of the section of the state of the section of the se

The O44, Rev 2 April 3, 1950

A

N.C.

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Reference

W. W

information brailedle to the Operator 4. R . P.12 SC -2 IT at 72 25 The Reactor Swilding Purge Air Exhaust Duct lodine Houitors indicated (4) Auxiliary beliefor Seating & Wentiletion Radiation Hopitor pas I s 19 causts per atosts. The gas channel of the Reactor Building Parl Rendiing Ballding Exheevt Pitter Outlet Redistins Monitor Pact & Endiation Westor indicated 5 z 197 counts per minute. Rescret Pallding Purge Air Exhaust Duck B (82-8-2256) -The following radiation mentions indicated radiation lavels saccessing the montion range, and sessions above range until (a) Reacter Bailding Purge Air Exheust Duct A (SP-8-225) -(c) Auxiliary Building Purge Air Reboust (EF-5-222) the stripchart ended at 1150:00, 4/2/79. Preset Particulate Montton 野衛丁星名名為蓋衛於衛 獨的職業及即罪 (0) Agest oximete をまっままっての (9)25:089

PLABE STATES

The Beacter Coolant System was at minimum forced Beacter coolant flow with all Beacter Coolant Pumps (RC-P-1A, RC-P-2A, RC-P-1B, and RC-P-2B) stragged, After attempts to establish natural circulation felled, the appropriat riseted Reactor Coolant Pump 28 (RC-P-2B). However, besed on a se flow testcarion (Pigers 18) and a pump rounding current of less than 100 amps, Reactor Coolant Pump 28 use stopped after 19 adoutes. Stems was present

(MP-R-2118) and Unit Pant Stack Redistion Munitor (MP-R-219) elected

0): 21: 23 (0722:48) Appr calmete high. As a result the fuel headling building supply fame

(48-8-94 and AB-8-92) stopped astomstically.

Befarence

and eloning the Electromatic helief Slock Daive (MC-F2). This resulted to Generator & was strainfug to the confenser. As attempt was to progress to establish hearter Conlant System Pressurings level (Figure 33) by opening were fill for Long A and 1969 for Long B. Steam Constator B was tenlated des ta a suspected Resotor Conlast aids to Peabater aids leak and Steam a lower leactor Conlant System pressure which prompted the operator to semesity initiate Safety Injection. Consequently, both Beactor Conlant in the Besetne Tuesel hand and Reactor Conlant System hot lage. Both greator them \$2007). The Reactor Coulous System cold beg temperatures beactor C'aleat System bet ing temperature were off scale high (1.6. Wehrup Pengs 1A and 1C (MD-P-1A and MD-P-1C) were operating.

A Safety injection actuation due to low Reactor Cnolsot System presents was received. Safety Injection had proviously been placed in service by the operator. (0723193)

on the Rosster Building Done Radiation Houltor (89-8-212). Metifi-Secretainey as a result of an inclicated redistion level of 8 M/hr cetton of offulte authorities and organizations use initiated. The Hanngar-Caneration Ptol ... see lear duclared a Cemeral 93: 23: 23 (9724: 98) Approximates to

日本 北京 北京

Reactor coolsot side to feeduater side losh to Stees Constitut S chesistry isherstory. The normal sessiting location is the Cait desarator S. We use unable to entablish flow through the Steam 2 secondary chestatry laboratory, but because of the susperted A Redistion/Chesistery Technicism attempted to take a feeduator the valve alignment was elterné an as not to contraducts this arts. The chester was able to obtain a sample from Steam somple on Steam Generators A and 3 from the Plant primary Cenerator A sample line.

AP core/actuation (Belay 2 36 admotes) AR oc PLI3, ST oc PL3 and PLI3

8

Aff. 16 and 10 at 71.12

Unit 2 Control Room notified of stemm generators A and 8 numple results

40.9h.9r

Reference

A Cerusatius Lithius analysis of the Steam Caserstor & sample was levels were note above background. The results of the analysis performed at 03:25:23 (0726:00) and indicated radioactivity is listed below.

act/al aCS/sal 4.840 -06 1.535 -06 1.836 -07 6.585 8-06 21 ma

buit 2 secondary chantetry laboratory and manitoring the number Germanium Lithbian analysis of these samples upra not performed. primary chemistry laboratory were reversed. The detacutionties from each Steam Generator with a (rishlar (Me-14). The results The Createst home personnel questioned these results since they of the lavel of testionities exteriols to both stem grantours we made by re-aligning the cample like discharge back to the felt that Steam Generator B was contaminated. It was latter inflicated thet only from Generator I me contminued. A determined that the ample lines leading over to the Floric

The Bagesor Coalent System bigh presentiant level alors c exted. A level of 130 inches was recorded. (0726:33)

The operator bypround the fafety lajection portion of Inglomenal The Ladientee Lovel indicated on the Amelliary Bailding Access Castrel Corridor Radiation Mesitor (MP-8-232) incressed. Sedery Postures trains A and D. 03:27:23 (0728:06) Approximate (0727:10)

the radiation level at detectors GES and GES. AT 03:45:23 (0746:00) The first ensite radiction amplior team was dispetched to measure

(0)28:00)

AF low (200 inches)/norm/high (260 inches) (Belay 2 37 sdmstes) AB at PLB

2

AF sors/bypassed (Belay 2 37 sdrutes) AB at PLI3, S. at PL3 and PL13

2

AR, HE and NP ot Pt. 12

This 2 Coursel hom sectified of redinties breels on detectors GES and GES.

4

			April 3, 1980
The	Person	Information Available to the Operator	Mercen
	. massers volum of loss than I offer to reported. Detectors G10 and		
	CES ove Located us the most oids of Three Hils laboral between Unit 2		
	and Coldsborn, Pressylvenia. Oneita radiation monitoring contineed		
	during the resolution of March 20, 1979.		
03:30:00	The operator chet the Electromatic belief Bloch valve (EC-V2)	EC-12: 17 : 74	1.33
(0 30:37)	to step the rapid fall in reactor coolent eystem pressure.	723 Lt. 25 of PLA, 18 (uncurposated) of PLS	
	The presention: level use 226 lectes and the Boartor Coolest	No Pr. In and No or PlA	*
	System presents use 1480 paig (Piguron 4 and 14).		
831.304.13	The Bornesd Water Storage Tesk low lowed elarms were recolved on	A No. 17.0	
(81304.38)	33.63 fest and 33.66 fest. The bernted Water Storege Tanb level	AP 1we (55.0 feet)/norm (Boley 2 38 edestee)	
	one reduced by the operation of Reactor Coolant Raboup Pumps dering		
	cormit and Sofety Injection conditions.		
03: 30: 50	Pressention Salony Value (AC-Ala) discharge lies high temperature	W -: 710	
(Strike)	alors reset. A temperature of 192.47 me recorded.	A high (2007)/sorm (Beloy 2 38 eductes)	
03132130	The Resttor Coolent Dyston high presentiest level clare we received.	2 . 5	4
(distribution)	A local of 271 leches me recorded.	W low (200 inches) /bers Aigh (260 inches)	
		(heley : 39 ateries)	
03:34:30	Presention Safety Value (EC-213) high discharge lies temperature		4
(Ca)(Ca)(A)	reset. A temperature of 192.67 we recorded.	At high (rest)/core (belog 2 46 of mice)	
03:33:00	The operator started Smergency Productor Pump 2h (EF-2-2A). Stone	EP-T-28: SY, HB(P _{B18CB}) and HB(A) or PLA.	
Academia .	Competer A lovel had decreased from 452 to 642 of Operating Large	In majorit and Poleca Josephines	
	dusing the previous 45 minutes (Pigure 45).	(belog : 40 edentes)	
		NG Lt. SC (operating range) ot PLA and PLS	

			April 3, 1980
Des	Print	Information Available to the Operator	Reference
03:37:00	The operator otupped flanctor Caalmet Raboup Pamp C (18-2-1C)	MD-P-IC: ST and MM(A) or PL3, AM at PL3	1,24,54
	became presoction level was capidly increasing. Indicated	AP norm/trip (Dolay 2 42 admutes)	
	Presention lavel use 373 lathon (Pigure 4).		
03:30:33	The operator implacted the beacter building air imple like after	W at 7123	*
8	it was reported as blowing air into the Assiliary Building.		
03:40:00	The operator speed the Electromatic Relief Black Valve (BC-92)	RC-72: ST or FLA	1.31.30
	is an attempt to decrees Presentiser level, which had		
	focressed offecale (greater thes 400 leckes).		
03:40:28	The Presentiant Safety Valves (MC-11A and MC-21B) discharge 1100	0 TE 10	
	high temperature alors sare received. Respective temperatures	AP high (2007) /corm (Doloy 2 43 minutes)	
	of 201.6F and 205.3F ware recorded.		
03:44:03	The following Incore Thermocouple Tesperatures increased to greater	AP norm/bad (nut of respe 19-7007) (Bulay 2 43 ad nutes)	
1	than 700F during the next three winutes (5D, 48, 6P°, 50, 9C,		
	Z., 7R, 14N, 9C, 7E, 10H* and 8F). The increase temperatures were		
	in response to stopping Reactor Coolant Nakeup Pump C (NG-P-1C).		
	Notes (*) This Incore Thermocouples Temperature cycled near		
	700F until Safety Injection actuation on high Reactor		
	Duliding pressure.		
03:44:23	The Peel Enailing Building Exhaust Pers (AE-C-10A and AF-C-10B or	Ehener Plant SC and ST at PL35	36,30
Approximente	ad-E-10C and AB-E-100) stopped. Airborns radioactive contemination	Radistics Lovelet HR and MF (Unit 1 Control Room)	
	levels to Unit I Pool Ending Boilding and Antillary Smilding.		
	staffed to increase. The reases for them fame stopping is unknown.		
03:44:23	Thing a resistance bridge and conversion tables, Plant Staff	Measurement performed in Bait 2 Control Loss by	8.4
Approximate	Arominal the Bastos Coults State Inc. Inc. Inc. Inc.	Plane Perference and Affirmment of the Country of t	

R 044

			TDE 044, New 2 April 3, 1980
(date	Frent	Information Available to the Operator	Referenc
	to be 7187. Later on March 28, 1979 en additional resistence		
	bridge was connected to Loop B bot leg ocuser and gave resulte		
	ciatlar to loop A.		
03:49:00 (0743:37)	The following self-powered sentron detectors were going affectle	AP bed/sorm (0 to 2000 mÅ) (pelsy 2 44 minutes)	20
	between levels I through 7 which corresponds to the total length of		
	the core (60, 72, 140, 72, 50, 90, 100, 50, 80, 52, 100, 112, 92 and		
	90). This has been attributed to the high temperatures expe ienced		
	is the cere.		
93:45:00 (8745:37)	The reactor out-of-tore source range channel (NI-1) indication	EI-1: 19 and 9C at PLA	
promise te	increased sharply from about 2.2 s 10 ³ counts per second to 4.9 s	SI-3: 16 and SC at PLA	
	103 counts per second. The reacter out-of-core intermediate range	51-61 18 and SC at PLA	
	channel (NI-3 and NI-4) indications were off scale low and did not		
	respend.		
3:43:27	The operator initiated pressurisar opray flow to assist in lower	FER SPLET: ST ot PLA	1,84,81
0,40,04,	Seactor Coolant System presours which had rapidly Increased from	BC 21 TR and SC at PLA	
	approximately 1400 pais to 1700 pais (Figure 4). Presseries		
	mpray flow was metatelend until 04:21:48 (0822:25).		
73:48:23	Makeop Tanh Area Nomitor (NF-2-206) advanced off scale. Levels	AB, HE and HP at FL12	3e
oximate	in feel Handling Bridge S. (RF-R-210) and Reactor Done (SF-R-214)		
	ecobilised at 1.5 m 10 ² R/hr.		
3:35:39	The tractor Building Isolation and Cooling portion of Engineered	AP ot FLI3, ST ot FL3 and FLI5	20.60
0/201107	Safety Posture train 8 octunted on Searter Building high	AP act/trip (Deley 2 46 mission)	
	procesure. The corpoint is 3.58 pois (Figure 51).		
3135139 0756116)	Intersections Coultry Pump 18 (IG-7-18) tripped automatically by	AN, ST, NR (PDINCE) and MR(F) at PLB	20,60
V/30110/	the Ingineered Safety Festures train & actuation.	AP on/off (Dolay 2 46 minutes)	

1075115 The Description of the State of the Engineer Control of the Engineer Control of the State of the Engineer Control of the State	Ties	Event	Information Available to the Operator	Belerence
The Central Leam ventilation system should have aligned to internal rescincial and upon ectamine of Engineered Salety Pasture (rain B. in the Nationalation made upon ectamine of Engineered Salety Pasture (rain B. in the Nationalation made the Supply flow is reduced to estamble to select on the supply flow in recorder man east of marying a pasture. The universal flow includes to the control team supply flow man east of marying an early in 1979 and this flow divertion can not be unfilled. Morrors a reduction in the control team supply flow man east of marying an include in the control team supply flow man east of marying and reals and Coaling parties of Engineered Salety Pastures train A actuated on Boacter Paidding high processor. The supplies Coaling Pemp is (IC-0-18) tripped managerially by the Engineering Salety Pastures train A octuation. The Engineering Salety Pastures train A octuation. Mances Coalest Makeup Pemp C OUD-10) manter bages to increme from 3 m in ² comes par minute watel it reached 3 m in ² comes par minute watel it reached 3 m in ² comes par minute watel it reached 3 m in ² comes par minute watel it reached 3 m in ² comes par minute watel it reached 3 m in ² comes par minute watel it reached 3 m in ² comes and calling parties of Engineere Asfermed to the Amiliting Inelation and Cealing Portures trains a med 3.	135139	The Leactor Ballding imlated entreatteally on part of the Engi-	All at PLI3, 87 at PLS and PLIS,	A
The Control has weatileties system should have aligned to internal rescincialists under upon ectenties of Engineered Sainty Paintens train B. is the hattecalation made the Control has air sahmost flow is diverted to the hattecalation and the supply flow is reduced to enture in positive resm presents. The exhect flow is reduced to estate in a positive resm presents. The exhect flow is reduced to estate in Marries on March 28, 1979 and this flow diverties can not be writised. Marries on March 28, 1979 and this flow diverties can not be writised. Marries on March 28, 1979 and this flow diverties can not be writised. Marries of reduction is the control resm supply flow and mayorismand (see reference 37). The hazing flow residence 27). The marries Conjung Pump is (10-4-14) tripped maximatically by the Engineering Safety Pastures train A octuation. Marchite Conjung Pump C OUD-9-15) and attribute antematically by the Engineering Safety Pastures train B Actuation. Marchite Gen Task Olechargo A (MGC-8-145) and tor bage to increase from 3 m 10 ² comete per mines with it reached 3 m 10 ² comete per dimete with it reached 3 m 10 ² comete per dimete at approximation of 305 feat. The operators defented the Marchet Building Isolation and Conling Portions of Engineering Safety Pastures trains A and 3 m an	736:14)		AP implation/norm (Dolay 2 46 mimten)	
train B. is the hesisculation and the supply flow is reduced to selectis a the hesisculation and the supply flow is reduced to selectis a positive reme presents. The emboost flow is reduced to selectis a positive reme presents. The emboost flow is reduced to selectis a positive reme presents. The emboost flow is reduced to set if manying the reduction is the coeffol reme supply flow and series and force reference 37). The Bacter heliding implation and Cooling parties of Engineered isfery Pastures train A ectuated on Bacter heliding high presents. The sampoist is 3.38 psig (Figure 33). Intermediate Cooling Pump in (10-0-1A) tripped ancematically by the Engineering Safety Pastures train A octuation. Name to Engineering Safety Fastures train B Actuation. Name Engineering Safety Fastures train B Actuation and Section of Section of Safety Safety and Section Section Section of Section	1331.39	The Control Low westileties system should here aligned to internal	SC and ST ot PL25	a i
train B. in the hetisculation and the Supply flow is reduced to maintain a pasitive rem presents. The exhect flow is reduced to maintain a pasitive rem presents. The exhect flow is reduced to maintain a pasitive rem presents. The exhect flow is reduced to writind. Moments a reduction is the central rem supply flow and majorismond (see reference 37). The Mancter Publishing inclution and Cooling parties of Engiameted infately Pasterns train a actuated on Enector Entiting high presents. The majorism is 3.36 paig (Figure 31). Intermediate Cooling Fump 1A (IC-P-IA) tripped matematically by the Engiameted Enfort Pasterns train a Actuation. Mancto Cooling Fump 1A (IC-P-IA) tripped matematically by the Engiameted Enfort Peatures train a Actuation. Mance Gas Tank Sincharge A (UG-B-IAS) manttor bages to increase from 3 m Id common at spreadont and it tracked 3 m Id common per ulmate at approximately ObicOtOO (UGOO13). But: This member is located to the Amiliary Publishing at a cleration of 303 feat. The operator defeated the Engerter Publishing Isolation and Cooling portions of Engiameted Salary Pasterns trains A and 3.	736:18)			
is directed to the supply flow and the supply flow is reduced to maintain a positive rema presents. The enhance flow recorder was out of marrice on Marrice as described to the control temm supply flow man marrical. Bearing the reduction is the control temm supply flow man amperiamzed (see reference 37). The Baacter heliding inslation and Cooling parties of Englawered Safaty Pasiument train A actualed on Beacter heliding high presents. The marpine heliding inslation and Cooling parties of Englawered Safaty Pasiument train A actualed on Beacter heliding high presents. The marpine La 3-38 polg (Plaura 31). Intermediate Cooling Pump IA (IC-P-IA) tripped macamatically by the Englamering Safaty Pastures train A octuation. Lacetor Cooling Makery Pastures train B Actuation. Masta Eas Tank Discharge A (MOC-B-I455) manitor hegan to increme from 3 m 10 ² comments and increment from 3 m 10 ² committee and parties of approximately OliODOO (ONDO:37). Bute: This menter is located in the Amating Inelation and Cooling portions of Englamered Safaty Pastures trains A and B.		train 8. is the Retinealation ands the Control hom air submast flow		
estudies a positive ross presents. The exhonet flow recorder see out of service on March 28, 1979 and this flow divertion can not be writind. Macros a reduction is the control ross supply flow see seprimental flow section real supply flow see sepriment the lastice billing isolation and Cooling parties of Engineered infery Pastures train A actuated on Locator Bailding high presents. The sequents is 3.38 poig (Pigure 31). Intermediate Cooling Pump IA (IC-P-IA) tripped sectostically by the Engineering Enfety Pastures train A octuation. Lastice Cooling Pump Pump C (OD-P-IC) and stated sutessite ally by the Engineering Enfety Pastures train A octuation. Lastice Cooling Makeup Pump C (OD-P-IC) and stated sutessite ally by the Engineering Enfety Pastures train B Actuation to Secrementers of Section and Secremental Section Section and Section on Section Pastures trains a set hamiliary Building or a clearater of 200 feat. The operator defeated the Bactor Building Indiction and Cooling partices of Engineered Sefery Pastures trains A and B.		to diversed to the supply flow and the supply flow to reduced to		
writind. Bowrer a reduction is the control form supply flow manageriam ded to reference 39). The Baster Building isolation and Cooling parties of Engineered indexy Pasterns train A actualed on Baster Building high presents. The manager is 3.58 paig (Figure 31). Intermediate Cooling Pump IA (IC-P-IA) tripped matematically by the Engineering Safety Pasterns train A actualism. Ascette Cooling Pump C (UG-P-IC) as started sutematically by the Engineering Safety Posterns train B Actualism. Ascette Cooling Pump C (UG-P-IC) as started sutematically by the Engineering Safety Features train B Actualism. Makes Gas Tank Glocharge A (UGC-B-IA45) manitor bages to decreme from 5 m IG* counts per minute with it reached 3 m IG* counts per minute with it reached 3 m IG* counts per minute with it reached 3 m IG* counts per minute at approximately 03:00:00 (00:00:37). Where: This monitor is located in the Ammiliany Building or a cleration of 20% feat. The operators defeated the Baster Puilding Isolation and Cooling portions of Englancema Safety Pasterns trains A and B.		estencia a positive rom presents. The exhant flow recorder as		
warified. Moments a reduction is the control row supply flow and maparisment (see reference 39). The Baneter Ballding isolation and Cooling parties of Engiamered Safety Pastures train A estuated on Baneter Ballding high presents. The emipoist is 3.58 paig (Figure 31). Internalize Cooling Pump is (IC-P-IA) tripped ancematically by the Engiamering Safety Pastures train A estuation. Sector Cooling Fahory Pump C OD-P-IC) are stated sutematically by the Engiamering Safety Pestures train B Actuation. Masta Gas Tank Sincharge A (MOC-B-IAS) master bages to increase from 5 m ight commissed by 1000000 (090013). But: This memiter is located in the Ammiliary Building or a clevation of 300 feat. The operator defented the Sameter Building Inelation and Cooling portions of Englancered Safety Pastures trains A and B.				
The Bearing building implacion and Cooling parties of Engineered Safety Pastures train & actuated on Boartor Bailding high presents. The setpectat is 3.38 poig (Pigure 31). Intermediate Cooling Pump is (IC-P-IA) tripped ancematically by the Engineering Safety Pastures train & octuation. Assetter Cooling Pump C (OG-P-IC) and stated sutematically by the Engineering Safety Pastures train & octuation. Manta Eas Tank Olseharge & (MGC-B-IA45) ansitor bages to iccrommittee in id counts as any or along a set and of counts per minute with it reached 3 m 10 ³ counts per minute with it reached 3 m 10 ³ counts per minute with it reached 3 m 10 ³ counts per minute as approximately O3:00:00 (00:00:3)). Bute: This mosture is located in the Ammiliary Building or a clevation of 20% feat. The operator defeated the Bazeter Building Inolation and Cooling portions of Englancemal Safety Pastures trains & and B.		weified. Sources a reduction in the control ross supply flow and		
The Baseter Beliding isolation and Cooling perties of Engianered Safety Pastern train A actualed on Baseter Beliding high presents. The estpoint is 3.58 paig (Figure 31). Internaliza Cooling Pump is (IC-P-IA) tripped anceantically by the Engiasoring Safety Pasterns train A octuation. Sector Coolent Habony Pump C OUP-P-IC) are stated sutematically by the Engiasoring Safety Pesterns train B Actuation. Whate Gas Tank Sincherpo A (MOC-B-IAS) mentor bages to increase from 3 m IG ² comets per minute will it reached 3 m IG ³ comets per wines as a permainately 05:00:000 (0900:37). Bute: This menter is located in the Ammiliary Building or a clevation of 305 feat. The operator defented the Sameter Building Inelation and Cooling pertions of Englancered Safety Pasterns trains A and B.		mport acced (see reference 39).		
Safety Peatures train A actualed on Bacetor beilding high presents. The emphase is 3.58 paig (Figure 31). Intermediate Cooling Pump is (IC-P-IA) tripped matematically by the Englamering Safety Peatures train A octuation. Assettor Coalest Rabony Pump C (UG-P-IC) are started sutematically by the Englamered Safety Peatures train B Actualism. Whate Gas Tank Gischarge A (UG-B-IA45) mentor bages to increme from 5 x 10 ² counts per minute until it reached 3 x 10 ³ counts per whose as approximately 05:00:00 (00:00:37). Bete: This menitor is located in the Ammiliary Building or a elevation of 205 feat. The operator defeated the Bacetor Building Inelation and Cooling portions of Englancered Safety Peatures trains A and B.	33166	The bearier beliding tenteries and Cooling perties of Englanered	As of Pall, ST or PLS and Palls	28.68
The sespeiat is 3.58 petg (Pigure 31). Intermediate Cooling Pump 1A (IC-P-IA) tripped accountically by the Engineering Safety Postures train A octuation. Seetist Coolint Makery Pump C (UD-P-IC) and stated nuteratically by the Engineering Safety Fastures train 8 Actuation. Whate Cas Tank Discharge A (UDC-B-IA5) ansator bages to increme from 5 m in ² counts per minute until it reached 3 m in ³ counts per minute ac approximately 05:00:00 (0700:37). Bute: This menitor is located in the Ammiliary Building or e- cleration of Engineering the Energic Building Inelation and Cooling portions of Engineering Safety Pastures trains A and 8.	26.13)	Safaty Pastures train & actuated on hourter building high processes.	AP oct/trip (Bolsy 2 46 misstes)	
Intermediate Cooling Pump 14 (IC-P-1A) tripped anceastically by the Engineering Safety Pastures trais & estuation. Bacetor Coalest Nakeup Pump C OUP-IC) are started sutematically by the Engineered Safety Pestures trais & Actuation. Whate Gas Tank Gischarge & (MOC-B-1445) mentor bages to Secreme free 5 x 10 ² coasts per minute until it reached 3 x 10 ³ coasts per admots at approximately 05:00:00 (0700:37). Bate: This mesiter is located in the Amiliary Building or a clevation of 205 feat. The operator defeated the Bacetor Building Isolation and Coalleg portions of Englancered Safety Pestures traise & and S.		The setpoint is 3.58 poig (Pigure 31).		
the Engineering Safety Peatures train & octuation. Leactor Cominst Rahamy Pump C (00-7-10) and started nutematically by the Engineeria Safety Features wrain B Actuation. Whate San Tank Oischarge & (400-8-1445) menitor began to iccreme from 5 m id ² coming per minute until it reached 3 m id ³ comite per minute at approximately 05:00:00 (000:00)). Bute: This monitor is located in the Amiliary Building or a elevation of 200 foot. The operator defented the Bazeter Building Inelation and Conling portions of Englancing Safety Peatures trains & and B.	35144	Intermediate Cooling Pump IA (IC-P-IA) tripped maximatically by	M. H. W (Pasca) and M(F) or FLA	A
Assertor Coulast Raboup Pump C (NG-P-IC) man started sutematically by the Engineered Safety Features stain 8 Actualism. Whate Gas Tank Sincharge A (NGC-B-1455) manitor bages to Secrementres 5 m 10 ² cometo per minute wath it reached 3 m 10 ³ cometo per minute wath it reached 3 m 10 ³ cometo per minute wath it reached 3 m 10 ³ cometo per minute wath it reached 3 m 10 ³ cometo per minute minute wath it reached 3 m 10 ³ cometo per minute wath it reached 3 m 10 ³ cometo per minute wath it is a factor to Ammiliary Building of manitimes of Taglacored Safety Peatures trains A and B.	(1)	the Engineering Safety Peatures train & octuation.	AP endedf (Doloy 2 46 minutes)	
Makes Gas Tank Gischarge & (MCC-8-1445) manitor bages to increase free 5 m 10 ² comets per minute until it reached 3 m 10 ³ comets per minute until it reached 3 m 10 ³ comets per minute until it reached 3 m 10 ³ comets per minute until it reached 3 m 10 ³ comets per minute sprunished by 05:00:000 (0700:37). Makes This menitor is located in the Ammiliary Building of malers of 200 feat. The operator defented the Maxeter Building Inelation and Coming portions of Englandered Safety Peatures trains A and B.	196:04	Special Coolest Rakop Pump C (00-9-16) and started automatically	All or 715, 57 and 18(b) or 713	A
Whate Gas Tank Discharge A (40C-0-1445) manitor began to increase free 5 m id comits per minute wathlift reached 3 m lo ³ comete per winners at approximately 05:00:00 (0000:37). Unter This monitor is incated in the Amiliary Duilding or a clavation of 305 feet. The operator defeated the Lagreer Duilding Isolation and Conling portions of Englandered Safety Peatures tribes A and B.		by the Engineered Selety Features State & Actuation.	AP morm/trip (Delsy 2 46 minutes)	
free 5 m 10 ² comets per minute well it reached 3 m 10 ³ comets par minute at approximately 05:00:00 (0000:37). Unto: This moditor is located in the Amiliary Building or m elevation of 305 feat. The operator defeated the Bancter Building Indiction and Conling portions of Englancered Sefety Peatures trains A and B.	25	Waste Gas Tank Stocharge & (40C-8-1435) menttor bagen to tecreme	Ma and 100 at PL12	38,58
per mineto at appromisately 05:00:00 (0900:37). Unter This seelier to located in the Amiliary Deliding or a cleration of 305 feat. The operator defeated the Samter Deliding Isolation and Cooling portions of Englacered Safety Peatures tribes A and B.		free 5 m 10 courts per missite wetli it reached 3 m 10 courts		
cleration of 305 feat. The opticies defeated the Lagitus building lealettes and Cooling portions of Englesored Sefety Peatures trains A and B.		par missis or appresionisty direction (070013);		
The operator defeated the Santter Building Isolation and Conling portions of Englacered Safety Peatures trains & and B.		elevation of 305 fast.		
portions of Engineered Safety Peatures trains & and B.	511-001	The operator defeated the fazeter building lealettes and Cooling	A or PLIS, ST ot PLS and PLIS	A
	00:00	portions of Engineered Safety Peatures trains & and B.	A corn/defeated (Doloy 2 47 minutes)	

		The Committee of the Co	3, 1980
Time	Event	Information Aveilable to the Operator	Reference
04:00:13 (0000:50)	The operator started Intermediate Cooling Prop 15 (1C-P-18).	AS, ST, ME(FDISCE) and ME(F) at PLS	24
		AP on/off (Delay : 47 misutes)	
04:00:19 (0000:56)	The operator started Intermediate Cooling Pump 1A (IC-P-1A).	AR, ST, MR(P _{DISCR}) and MR(F) at PLS	24
(0000136)		AP on/off (Deloy : 47 minutes)	
04:01:23 (0002:00)	The first offsite tediaties menitor team was dispetched to assess	Unit 2 Control Room notified of Radiation Levels at	6c
	the rediction level at Detector W-11. At 04:31:23 (08:32:00) a	Detection W-11.	
	Researed value of less them 1 mE/hr in reported. Detector W-11 is		
	located to Goldsboro, Fermaylvania. Offsite radiation monitoring		
	continued during the remainder of March 28, 1979.		
04:02:03 (0002:40)	The treed to Incore Thermocouple Temperatures tocressing above	AP sorm/bad (out of range OF-700F)(Delay 2 49 minutes)	2a
(0902140)	7007 stopped. The incressed reactor core cooling was a result		
	of the monual high Pressure Injection ectuation. The following		
	facore Thermocouple Tumperatures decreased below 7007 during the		
	and twelve electes.		
	St - 680.57 (# - 23.77		
	130 - 494.07 34 - 694.77		
	42 - 619.39 10H - 693.29		
	127 = 694.97 127 = 569.59		
04:03:23	The Auxiliary Smilding Enhance Fond (Ag-S-SC and AR-S-SS) tripped	SC and ST at 7L25	38,98
Approximate	open receiving a fire slave in the Amiliary Defiding. As		
	Instrument Foremen was send to the Auntiliary Building to defeat		
	the elem-		
04:06:25	The Hedel Room door which consects the Deit 1 and Ouit 2 Auxiliary	Unit 2 Cretrol Room Netified of Model Form door status	4c,9h,99
(000/100)	Building was shot locally to sateleles the spread of strboms		
	radinactive enteriels to Deit 1.		

			April 3, 1980
Time	\$port.	Information Available to the Operator	Reference
04:07:01	The operator clusted the Reactor Suilding Isolation and cooling	A 713, 67 713 713	
(000/138)	portion of Engineered Safety Peatures train A. Train & remained	AP worm/defeated (Delay 2 52 attentes)	
	defeated.		
04:00:37	The operator started Reactor Coolant Pump 1A (RC-P-1A) to	ST. MA(A), MR(F) and SC(F) at FLA, AR at FLB	24,98
(0000114)	re-establish Leactor Coolant System flow.	AP norm/trip (Delay 2 31 minutes)	
	NOTE: During the previous rum of Reactor Coolant Pump 28		
	(RC-P-2B), due to the flow and current indication observed,		
	it was thought that the pump might not have started. For		
	this reason it was decided to observe the starting		
	current during a Reactor Coolant Pump start. Reactor		
	Coolant Pump IA (RC-P-IA) was started and a correct		
	starting current was observed by the operator. As		
	hefors, the indicated pump current repidly decreased to		
	Jeen this 100 asperse.		
04:09:14	The operator stopped banctor Conlant Pump IA (RC-P-IA) after	57, 18(A), 18(P) and SC(P) at PLA, AN at PLA	20,30
(1616080)	observing a nerge flow indication and a running current loss of	AP morm/trip (Delay 2 51 minutes)	
	tham 100 mps r		
04:10:10	The operator atopped Intormediate Couling Pump 18 (15-P-18).	As, ff. Ma(P _{D19C2}) and Ma(F) or FLA AP on/off (Dolay 2 33 minutes)	4
04:16:23	The Auxiliary Operator started the Fuel Mandiing Building Enhaust	SC and 67 or PL25	X, M, M, M
Approximete	Paps (AR-E-10A and AR-E-10B or AR-E-10C and AR-E-10D) and the		
	Austitiary Building Exhaust fans (AH-E-SC and AH-E-SD). He also		
	placed Control Room Bypass Filter Fan 48 (AR-E-48)in service.		
	MOTE: When the Control Room Bypass Filter Fan is running		
	the Control Rome atmosphere is continuously being		
	(11) ared.		

TOR 044, Rev 2

			₩ril 3, 1980
ise	Event	Information Available to the Operator	Peletones
4:17:17 (0017:54)	The operator etopped Reactor Coalant Makeup Pump IA (MD-P-1A).	ST and NB(A) at PL3, AM at PLB,	20,30,97
		AP sovm/trip (beloy 2 55 misstam)	
4:17:22	The Operator atopped Reactor Coolnet Makeup Pump IC (NS-P-IC).	ST and MR(A) at PL3, AR at PLS,	20,50,90,97
001/1391	Do Reactor Coolest Makeup pumps core sperating.	AP morm/trip (Dolsy 2 55 mismton)	
4:18:17	Pollowing on unsuccessful start attempt, the operator placed	Control switch handle proities	20, 20, 90,80,
04(4134)	Nakoup Pump 1A (NO-P-1A) control owitch in the Pull-to-Lock		Dr.9a
	position to prohibit further use.		
4119102	The operator started intermediate Cooling pump 18 (IC-P-18).	AN, ST, HR(P _{DISCO}) and HR(P) at PLS	
(0019139)		AP on/off (Doloy 2 35 minutus)	
4119105	The Resctor Beilding Isolation and Cooling portion of Engineered	AN at FL3, ST at FL3 and FL15	20,60
0619:423	Safety Features train & estuated on Reactor Building Righ Presours.	AP oct/trip (Doley 2 55 misetes)	
	The metpoint in 3.58 poin, (Figure 51)-		
4:17:06	Succey Root Emercal Pump 1A (OB-P-IA) started automatically by the	AM and HR (PDISCE) at FLE, ST at FLE and FLEE	20
0019143)	Inginsered Sefety Features train & actuation	ME(A) ot PLS	
		AP norm/low and ou/off (Dolay 2 55 misetes)	
4:19:06	Intermediate Cooling rump 1A (IC-P-1A) telpped automatically by the	AS, ST, HR (P _{DISCR}) and HR(P) at PLB	2a
(0819143)	Engineered Safety Features train A ectastica.	AP on/off (Deley 2 55 minutes)	
4119:24	The operator defeated the Seactor Smilding Isolation and Cooling	AN at FLIS, ST at PLS and PLES	20.
0870:01)	perrios of Engineered Safety Features train A.	AP corm/defeated (Deloy, 35 silentes)	
4:19:29	The operator started fatermediate Couling pump 14 (IC-P-14).	AM, ST, HR (PDINCH) and HR(P) at PLB	2n
(9870:04)		AP en/off (Deley 2 55 minutes)	
4:21:53	The operator started Reactor Coelant Haboup Pump 18 (NS-F-18).	ST and HR(A) at FL3, AB at FLB,	2a, 5c,9a,9T
(GET 1:39) ppt on l mate	This Beacter Coolant Habrup Pump con for the remainder of	AF norm/trip (Delay 2 55 mioutes)	
	Perch 29, 1979.		

	200
10	11 3.
Ē	1

		April 3, 1980	086
-		Information Available to the Operator	To la
04123154	The specator occupied Prasserieer Bestar Groupe 1 through 5 by	AB of PLS, ST of PLA,	a
	placing hauter control into mitomitic. Eleves pressuritor beater	AP onfoff (Bolay 2 58 minutes)	
	prespo mere evellable at this time.		
04:28:09	The Beacter Coolest Makery Tach loved increased officed bligh	K • c 73	
(99:92	(greater them 100 tuches) and remained officels for 42 encomes		
	(Figure 54).		
04: 27:03	The sperator started Isoctor Coolont Makeup Pump 1G (NG-P-1G).	57 and M(A) at Pt.). As at Pt.).	24,54,90
Appendince	ofter as mewcoonful attempt to start the pump of Obilbiss	AP marm/trip (bolay 2 38 mimten)	
	(0827136).		
04:30:30	Presentater Heater Group 10 tripped des to a ground feult and	As at 710, 57 at 714,	a
(101101)	compless do-casegited for the reasinder of March 25, 1979. Too	AP morradicity (Dolby 2 58 admitms)	
	presentant baster proups more evallable at this time.		
04:30:45	The operator stapped Candenser Vacuum Pumps IA and IC (YA-P-IA	Pumpe: 57 ot PLIT, At onfolf (Delay 2 60 minutes)	20,00,92.
(221 22 20)	and WA-P-IC) and brake Main Condenser vectors after experiencing	Vacuum AM and SC at PLL?	
	difficulty with the operation of the Amiliary Bollor.		
04:30:45	The operator opened Power Operated Emergency Note Stewn Dump	PR (Valve demas setpoint) at PLS	84.80.9z.10
Approximate	Valve A (WG-T3A) to indece natural circulation in Stone Comerator		
	A. Steam Crosteter B was still femlated.		
04:33:30	The plant staff requested the competer to print the following Incore	re UP (Delay 2 O admetes)	Zc.98.70.
(10197	Thermouple Datlet Temperatures. The following values care recorded.	lad. At secrafted (out of range OF to 700F) (Delay 2 60 mission)	l.
	111 480.97 BC - 440.47		
	IIR - ***. ** B - \$11.7F		
	128 - 440.07		
	132 - ***. op 6C - 441.9P		
	13C = 533.0F		

Tites	Event		Information Available to the Operator	
	117 - 457.19	4.00.1		
	116 - 000,09	37 - 306.79		
	100 - 443-19	8 - 318.79		
	Meten and, e) Indicates that	Meter and, 0) indicates that the signal and extends of the		
	Écrepates pange (Range - 07 to 700f).	- 09 ta 700f).		
(0842:51)	The operator stopped Darges.	stopped Eargesey Featurer Pamp 2A (EF-P-2A).	ST. ME(A) and ME (P _{B11CH}) at PLA AP on/off and low (875 peig)/core (Dalay 2 at adapta)	
(0845:00)	Setermadiate Conling Laidonn Ladication decreesed and orest	Cooling Laidonn Cooler A Redistion Monitor (IC-k-1092) servemed and west off scale. It was assumed the		N,38
	medior felled.			
(0846:07	The plant staff requested the	The plant staff requested the empeter to print the following lacors	UP (Delay 2 0 adoutes) 25 - 90 - 90 - 90 -	
	Thermoreuple Outlet Temperate	Outlot Temperatures. The following values ware recorded.	AF mores/hed (out of range OF to 7007) (Belgy : 52 minutes)	
	139 - *** 47	×		
	1127 - 393.17	10-418-67		
	110 - ***,**	78 = 377.67		
	118 - ***.47	6C = 561.4F		
	100 = 582.77	30 - ***.**		
	100 - 398.99			
	Note: (***.*) indicates that	deficates that the aigned one extends of the		
	computer range (Range - 09 to 7007).	- 09 to 7007).		

AP norm/trip (Delay 2 63 minutes)

AR at PLS, ST at PLA

Presentiar feater Greepe 4 and 5 tripped dus to ground fealte and remained de-energized for the remainder of Barch 28, 1979. Right

(0846:58)

presentiser heater groups unre available at this time.

			April 3, 1980
Tie.	Peak	Information Available to the Operator	- Beforenze
64149133	Contract Various Peny Etherat radiotion menitor (Ma-1-748)	78 and 80 at 75.12	#°#
(9650:00)	decreased to 1 s 10 counts per missio.		
W159123	lacors Thermotraple coodings obtained by the Plant Staff wing	Unit 2 Control form notified of measured feel normally	41. 41.80.90.W.
(0000 B)	a resistance bridge and a corversion table placed feel ecombly	y ante temporaturas	
	unit temperatures in the range of 217F to 2500F (Figure 50).		
04:59:23	A Redistion/Chamistry Technicism drow a reactor coolant system	Dait 2 Central Ross sotified of botus and green	44,45,45,94
(0400:00)	sample. A radiotion lavel of 200 Libr (bets-game) was mesoured	ed beta-game saalysis results	
	at als lathes. A borm coolysis use perferred immediate sed		
	yielded a value of approplestely 246 parts per alilles beres.		
	A Corneasium Lithium analysis was performed later at 07:38:23		
	(1139:00) and indicated a total bato-game activity of		
	1334 act/al. To further amples were taken for the resolution		
	of March 28, 1979. The results of the analysis to linted		
	8-149 E+01		
	1-41m 133 1-42 1-43 1-43 1-43 1-43 1-43 1-43 1-43 1-43		
	2.446		
	20		
04:59:23	intermediate Cooling Pump Area monitor (RF-R-207) and the Reactor	ctor ML and SC at. P12	8.4
(0300:00)	Ballding Emergency Cooling Booster Pump Area monitor (ED-R-204)		
	indications began to increase.		
63:11:23	The Bangoncy Coatrol Station was moved from Dait Realth Physics	potes Dait 2 Control been notify of relocation of the	40,48,80,94
(0012160)	Laboratory to Dait 2 Control Room after experiencing increased	d Lastgency Contral Station	
	lavele in sirbores radioactive materials.		

TDR 044, Rev 2

Time	Event	Information Available to the Operator	Reference
05:17:30 (0010:05)	The clare printer wee returned to service and the elem function wee transferred from the utility printer to the eleme printer.	AP (Delay I O minutem)	2a
03:18:00 (0918:37) Approximate	The operator closed the Electromatic Relief Slock Valve (RG-V2) in an attempt to compress the reactor coolast and condesse the	ST at PLA	35.3m.10
	steem is the Reacter Coulast System.		
05:1-47 (0919:14)	The operator atopped Docay Rest Removal Pump 1A (DH-P-1A). This pump did not start automatically on the nest Engineered Sefety	AN and MR (P _{DISCE}) at PLB, ST at PL3 and FL13 MR(A) at FL3	2a
	Postures train A Actuation, therefore the pump control switch must	AP sorm/low and on/off (Delay 2 86 minutes)	

PLAST STATUS

All Beerror Coolant Pumps (RC-P-1A, RC-P-2A, RC-P-1B and RC-P-2B) were stopped. Seperheated atom and gas were present in the upper Reactor Teesel Bracter Coolent System hot leg regions. Attempte to re-establish reactor coolast flow using Beactor Coolant Pump IA (RC-P-IA) had not been successful. The Peactor Coolent System hat log temperature continued to Indicate off-scale (i.e. greater than \$207). The Reactor Coolant system cold leg resperatures were 180 F for Loop A and 225F for Loop B, and both were decreasing (figures 21 and 26). Steam Congretor A level was at AST of the operating tange (Figure 39). Steam Consenter & was isolated, with a level at 442 on the operating range (Figure 39). Condensor vacuum was lest due to the outility steen boiler tripping and loss of adequate nois stam presents. Steam Generator & wen stronging through the Proper Operated Berrancy Mits Steam Domp Valve (MS-VIA). Attempts to obtain a normal operating fracturing toward of 220 inches of water and establish presure control using the Pressurizer were not ourcessful. The Plectronatic

Reference

Relief Block Valve (RC-V2) was cycled to assist in this effort, resulting in increased Reactor Building pressure. The first Engineered Selety Features ectuation on high Reactor Building pressure was received and, four minutes later, bypassed by the operator to re-establish cooling water to various plant equipment within the Reactor Building. The Reactor Building pressure continued to stay above the isolation trip setpoint for approximately 1.4 hours (Figure 31). The Station Hanger ands the decision to maintain continuous Righ Pressure Injection and increase Reactor Coolent System pressure is an attempt to condense the superheated steam and gas in the Reactor Coolant System. This first attempt lested for approximately 2 hours.

Event

Time

05:20:00 (0920:37)	The operator incressed Reactor Coolean System pressure from 1250	AN (Low-2055 and Low/Low-1974) at 7LB	3a
Approximate	pois to 2100 pois during the ensuing 45 minutes. Reactor Coolant	MB and SC at PIA	
	System presents was then maintained at 2100 pelg (Figure 4).	AF (many clearing alerna) (Delay 2 88 minutes)	
05:23:34	The operator cleared the Resctor Building Isolation and Cooling	AM of PLIS, ST of PLS and PLIS	2a
(0924:11)	portion of Engineered Salety Features train A.	AP norm/defeated (Deley 2 90 minutes)	
05:23:34	The Reactor Building isolation and Cooling pertion of Engineered	AR at PLIS, ST at PLS and PLIS	20,60
(0924:11)	Safety Features train A Actuated on Reactor Building high pressure.	/P act/trip (Deley 2 90 minutes)	
	The estpoint is 3.58 pois (Figure 51).		
05:23:34	Interpretate Cooling Pump 1A (IC-P-IA) tripped automatically on	AM, ST, MR (PDISCH) and MR(F) of PLB	20
(0924:13)	the Engineered Safety Features train A Actuation	AP om/off (Delay 2 90 minutes)	
05:23:47	The operator defeated the Reactor Building Tabletion and Cooling	AR at PLI3, ST at PL3 and PLI3	26
(0924:24)	portion of Engineered Safety Features train A.	AF norm/defeated (Delay 2 90 stoutes)	

Thformation Available to the Operator Thformation Available to the Operator Ap on/off (Doing 2 90 minutes) Ap on/off (Doing 2 90 minutes) Ap on/off (Doing 2 90 minutes) An of Philip ST of Philip 3 90 minutes) An of Philip ST of Philip 3 90 minutes) And of Philip ST of Philip 3 90 minutes) And Control and Ap or Philip 3 90 minutes) And Control and Ap on Philip 3 90 minutes) And Control and Ap or Philip 3 90 minutes) Tradiction Ap or Philip 3 or Philip 3 90 minutes) Tradiction Ap or Philip 3 or Philip 4 print 5 5 4 minutes) Tradiction Ap or Philip 4 print 5 5 4 minutes) Tradiction Ap or Philip 4 print 5 5 4 minutes)				April 3, 1980
Designate storical intermediate Comiting Pump IA (IC-P-IA). The operator storical intermediate Comiting Pump IA (IC-P-IA). Ma. St., Ma (P ₂₁₂₂) and MR(P) or FLA An or PLI), ST or PLI) or Designation and Comiting portion of Engineered An orrelated (Delity 2 90 admiss) Ladery Posteror train A. The operator mercured the Pari Hamilton and Comiting portion of Engineered An orrelated (Delity 2 90 admiss) Ladery Posteror train A. The operator mercured the Pari Hamilton and Comiting Parish and Comiting Capable of A.B-LOD) and the Amiliary Parishing Lambello or A.B-LOD and A.B-LOD) and the Amiliary Parishing, and Onic 2 Comiting hamilding mediates believe contendenties Level in Date 1 Parishing and Amiliary Deliting and Amiliary Deliting and Amiliary Deliting Corridor Endining mediates (EP-L-134) bages contended to the Comiting Deliting Delitin	Ile Ile	Prest	Information Available to the Operator	. Peference
from the farter building lealeries counciled to defeat signal from the farter building lealeries and Cooling parties of Englawared AP corr/defeated (Deliny 2 90 admutes) form the farter building lealeries and Cooling parties of Englawared AP corr/defeated (Deliny 2 90 admutes) from the farter building lealeries and Cooling parties of Englawared AP corr/defeated (Deliny 2 90 admutes) from the farter account the Pool Hamilton Endaleries Food (Al-E-10) and the Amiliary Building for AB-10C and AB-10C and AB-10D). Althorer contentiation formatic food AB-10C and AB-10D) and the Amiliary Building for the food of AB-10D and the Amiliary Building. and Delic 2 Control does began to increase. Food industry Building Rediction Position (ED-113) and Control and He and HP or Fill 2 Control does began to increase the admittion Position (ED-123) began to this account to berrains the following benefit and and HP control and HB and the AB-10D and	(0024:34)		AB. ST. HM (Priscal) and HM(P) at FLA AP on/off (Polsy 2 90 winnes)	a
from the Review building including and Cooling parties of Engineered An corn/defeated (Dairy 2 90 admics) Addroy Foateres train A. The operator secured the Peel Handling Enhance Free (Ah-E-10h and Enhance Free (Ah-E-10C and Ah-E-10). Atthere contentanties Enhance Free (Ah-E-10C and Ah-E-10). Atthere contents Enhance Free Free Enhance Enh	03:20:00	Daring the next ofm minutes the operator reserved the defeat eignal	All of PLIJ, ST or PLJ and PLIJ	28
The operator secured the Peal Hamilton Cheune Fees (AD-C-10A and Cheuser Peas) for and ST or 7123 The operator secured the Peal Hamilton Cheune Fees (AD-C-10A and Cheuser Peas) for and AD-C-10C) and the Amiliary Publishing Selection or AD-C-10C) and the Amiliary Publishing Selection or AD-C-10C) and the Amiliary Publishing Selection	(Marie)	from the Reviter Building Isolation and Cooling portion of Engineered	AP corn/defeated (Dality 2 90 admetse)	
The operator secured the Peal Handling Ephanot Pass (AB-E-10A and Ethanot Pass) Ethanot Control and AB-E-10C		Selecty Posteres train A.		
massic fees (AB-B-ICC and AB-B-ICC) and the Annillery Duilding Rediction termins in most 70 (Unit 1 Control Ress) Invals is Dait 1 Paul Resiling and Auditiony Duilding, and Duit 2 Control Sees began to increase. Paul Resulting Dailding Endiction Menitor (EB-D-113) and Control and ing and inp of Fill? Control Sees began to increase. Paul Resulting Dailding Endiction Menitor (EB-D-113) and Control and ing and inp of Fill? And Resulting Dailding Endiction Menitor (EB-D-113) and Control and ing and inp of Fill? (a) Annillary Dailding Corridor Endiction Menitor (ED-D-112) (b) Reserve Dailding Perge Dait Area Rediction Menitor (ED-D-112) (c) Annillary Dailding Daise Dait Area Rediction Menitor (ED-D-112) (d) Reserve Dailding Perge Dait Area Rediction Menitor (ED-D-112) (e) Paul Resulting Dailding Daise Dait Area Rediction Menitor (ED-D-112) (f) Reserve Dailding Perge Dait Area Rediction Menitor (ED-D-112) (g) Paul Resulting Dailding Dainer Dait Area Rediction Menitor (ED-D-112) (h) Reserve Toward Cross 3 tripped due to a ground Fault. Seven Area Print (ED-D-112) (g) Paul Resulting Dailding Dailer Dailer Area Rediction Menitor (ED-D-112) (h) Reserve Toward Salar Proper was provided to the Preservitor Endery April (ED-D-112) (h) Reserve Dailer Breader Dailer D	05:29:23		Exhaust Peas SC and ST or 7425	M.M.3t,3c
Included to the (AL-6-AC and AL-6-AC). Attheres contentioned and Duit 2 profile in Duit 1 Paul Randing and Austiliary Building, and Duit 2 Construct down began to increase. Duit of down began to increase.	Consoles (Consoles Consoles Co	MF-E-100 or AF-E-10C and AF-E-100) and the Aunillory Pullding	Rediction Levels: M and MP (Unit 1 Control Ross)	
Control Sees began to Secretaes. Control Sees began to Secretaes. Control Sees began to Secretaes. Part Sanding Bailding Radiotion Realtor (NP-R-213) and Control and NB and NP at Fil2 Bervices building Corridor Radiotion Realtor (NP-R-214) began to instruct the bailding Corridor Radiotion Realtor. Incomplete indicated by the following monitors Secretaes are redicated by the following monitors Secretaes and NP and Secretaes and NP and Secretae Bailding Design Dail Area Radiotion Realtor (NP-R-332) (b) Associat Bailding Design Dail Area Radiotion Realtor (NP-R-332) (c) Paul Sanding Bailding Coloury Dail Area Radiotion Monitor (NP-R-332) (d) Paul Sanding Bailding Coloury Dail Area Radiotion Monitor (NP-R-3240) (e) Paul Sanding Bailding Coloury Stripped due to a ground fault. Seven (NP-R-3240) (f) Presention Restor groups were graitable at this time. All morn/trip (Boley 2 93 minutes) The Electrometic Railed Palvo (NC-R2) and the Presention Railey. Palvo (CRIA) dismbarge line high temperature alors reset. All bigh (2007)/serm (Poley 2 94 minutes) Palvo (CRIA) dismbarge line high temperature alors reset. All bigh (2007)/serm (Poley 2 94 minutes)			IN and 10 or PLIZ	
Control does began to increase. The Sanding Bailding Endiation Memiter (ED-R-213) and Control and in and PP at PLI2 the Dervices building Endiation Memiter (ED-R-213) and Control and increase to berman to be made to coming memiter (ED-R-234) began to instruct to be remained by the following memiter (ED-R-234) began to instruct the all wave almost act action: (a) Ammiliary building Access Corridor Endiation Memiter (ED-R-232) (b) Reactor Bailding Purge Dait Area Redistion Memiter (EP-R-232) (c) Paul Ramiliary Building Enhance Dait Area Redistion Memiter (EP-R-232) (d) Paul Ramiliary Building Enhance Dait Area Redistion Memiter (EP-R-232) (e) Paul Ramiliary Memiding Enhance Dait Area Redistion Memiter (EP-R-232) (f) Reactor Memier Group 3 tripped due to a ground foult. Seven At norwiting (Bolby 2 93 attmost) (g) Paul Ramiliary Memiding Enhance Dait Area Redistion Memiter (EP-R-2320) (g) Paul Ramiliary Memiding Enhance Dait Area Redistion Memiter (EP-R-2320) (g) Paul Ramiliary Memiding Enhance Dait Area Redistion Memiter (EP-R-2320) (g) Paul Ramiliary Memiding Enhance Dait Area Redistion Memiter (EP-R-2320) (g) Paul Ramiliary Memiding Enhance Dait Area Redistion Memiter (EP-R-2320) (g) Paul Ramiliary Memiding Enhance Dait Area Redistion Memiter (EP-R-3220) (g) Paul Ramiliary Memiding Enhance Dait Area Redistion Memiter (EP-R-3220) (g) Paul Ramiliary Memiding Enhance Dait Area Redistion Memiter (EP-R-3220) (g) Paul Ramiliary Memiding Enhance Dait Area Redistion Memiter (EP-R-3220) (g) Paul Ramiliary Memiding Enhance Dait Area Redistion Memiter (EP-R-3220) (g) Paul Ramiliary Memiding Enhance Dait Area Redistion Memiter (EP-R-3220) (g) Paul Ramiliary Memiter Enhance Dait Area Redistion Memiter (EP-R-3220) (g) Paul Ramiliary Memiter (EP-R-2120) (g) Paul Ramiliary Memiter (EP-R-2120) (g) Paul Ramiliary Memiter (EP-R-2120) (g) Ramiliary Memiter (EP-R-2120) (g) Ramiliary Memiter (EP-R-2120) (g) Ramiliary Memiter (EP-R-2120) (g) Ramiliary Memiter (EP-R-2120) (h) Ramiliary Memiter (EP-R-2120) (lavels to Date 1 Peel Resulting and Austitory Building, and Date 2		
partices building Dailding Endiction Mention (EP-13) and Control and Manding Dailding Endiction Mention (EP-13) began to increase to bermies 40 and 70 counts per aimster (EP-13) began to increase to bermies 40 and 70 counts per aimster (EP-13) began to increase to bermies 40 and 70 counts per aimster (EP-13) began to thick time all mays almost add scale cards acres desired manding building Dailding Daildi				
increase to bermine 40 and 70 counts per minute. The rediction learness to bermine 40 and 70 counts per minute. The rediction learness to bermine 40 and 70 counts per minute. The rediction learness to bermine 40 and 70 counts per minute. The rediction learness to being building monitors and of scale. (a) Ammiliary building perge Duit Area Radiction Monitor (NP-R-333) (b) Reserve Bailding Perge Duit Area Radiction Monitor (NP-R-333) (c) Paral Manding Building Debance Duit Area Radiction Monitor (NP-R-333) (d) Presidentiary Region Group 3 tripped due to a ground fault. Seven Presidentiary Region Cross 3 tripped due to a ground fault. Seven (e) Paral Manding Building Talve (NC-N2) and the Presentior Enfety The Electromotic Raine Valve (NC-N2) and the Presentior Enfety Where (NC-N1A) discharge lies high impercence alone reset. AP bigh (2007)/core (Doing 2 94 minutes) Papagetive values at 192-07 and 192-07 and reserveded.	5:29:23		B and 19 at 19.12	8,8
increases to bermine 40 and 70 counts per elemine. The rediction larvale indicated by the following monitors increased until 1419023 (1900-00) at which time all more almost off acale. (a) Amailiary building Access Corridor Endiation Menitor (NP-R-3235) (b) Reactor Baliding Porgs Duit Area Rediction Menitor (NP-R-3235) (c) Paul Randing Building Endouse Duit Area Rediction Menitor (NP-R-3240) (c) Paul Randing Building Endouse Duit Area Rediction Menitor (NP-R-3240) (c) Paul Randing Building Endouse Duit Area Rediction Menitor (NP-R-3240) (c) Paul Randing Building Endouse Duit Area Rediction Menitor (NP-R-3240) (d) Paul Randing Building Endouse Duit Area Rediction Menitor (NP-R-3240) (e) Paul Randing Building Endouse (NC-R2) and the Presentior Endoy The Electromatic Raited Talva (NC-R2) and the Presentior Endoy The Electromatic Raited Talva (NC-R2) and the Presentior Endoy The Electromatic Raited Talva (NC-R2) and the Presentior Endoy The Electromatic Raited Talva (NC-R2) and the Presentior Endoy The Electromatic Raited Talva (NC-R2) and the Presentior Endoy The Electromatic Raited Talva (NC-R2) and the Presentior Endoy The Electromatic Raited Talva (NC-R2) and the Presentior Endoy The Electromatic Raited Talva (NC-R2) and the Presentior Endoy The Electromatic Raited Talva (NC-R2) and the Presentior AP DOTAL (NC-R1) AP DOTAL (NC-R1) AP DOTAL (NC-R1) The Electromatic Raited Talva (NC-R2) The Electromatic Raited Talva (N	ON MINES	Pervices Building Corridor Radioties Healter (NP-R-234) bogan to		
		increase to borners 40 and 70 counts per simila. The rediction		
(1900)00) at which time all more almost off scale. (b) Amaillary building Access Corridor Radiation Monitor (NP-R-232) (c) Rescret Bailding Perps Onit Area Radiation Monitor (NP-R-3236) (d) Paul Acading Building Exhaust Duit Area Radiation Monitor (NP-R-3240) Freelevabler Restor Group 3 tripped due to a ground fault. Seven vy nr FFP, 57 at FLA pressuring haster groupe uses available at this time. AP socultrip (Poloy 2 93 admitse) The Sloctromatic Raised Valve (NC-R2) and the Pressurior Enfaty PP or FLIO The Sloctromatic Raised Valve (NC-R2) and the Pressurior Enfaty PP or PLIO The Sloctromatic Raised Valve (NC-R2) and the Pressurior Enfaty PP or PLIO The Sloctromatic Raised Valve (NC-R2) and the Pressurior Enfaty PP or PLIO The Sloctromatic Raised Valve (NC-R2) and the Pressurior Enfaty PP or PLIO The Sloctromatic Raised Valve (NC-R2) and the Pressurior Enfaty PP or PLIO The Sloctromatic Raised Valve (NC-R2) and the Pressurior Enfaty PP or PLIO The Sloctromatic Raised Valve (NC-R2) and the Pressurior Enfaty PP or PLIO The Sloctromatic Raised Valve (NC-R2) and the Pressurior Enfaty PP or PLIO The Sloctromatic Raised Valve (NC-R2) and the Pressurior Enfaty PP or PLIO The Sloctromatic Raised Valve (NC-R2) and the Pressurior Enfaty PP or PLIO The Sloctromatic Raised Valve (NC-R2) and the Pressurior Enfaty PP or PLIO The Sloctromatic Raised Valve (NC-R2) and the Pressurior Enfaty PP or PLIO The Sloctromatic Raised Valve (NC-R2) and the Pressurior Raised Valve (NC-R2) (NC-R2) and the Pressurior Raised Valve (NC-R2) (NC-R2) and the Pressurior Raised Valve (NC-R2) (NC		breats indicated by the fellowing monitors increased watfi 14:59:23		
(b) Amatildary building Accord Corridor Endiation Monitor (NP-R-323) (c) Reaccor Duilding Porgs Duit Area Redistion Monitor (NP-R-3240) (e) Poul Reading Duilding Exhaust Duit Area Redistion Monitor (NP-R-3240) Presidential Residual Duit Area Redistion Monitor (NP-R-3240) Presidential Residual Duit Area Redistion Monitor (NP-R-3240) Presidential Residual Duit Area Redistion Found (NP-R-3240) The Electromatic Residual Valve (NC-R2) and the Presourtion Endity The Electromatic Residual Valve (NC-R2) and the Presourtion Endity The Electromatic Residual Valve (NC-R2) and the Presourtion Endity The Electromatic Residual Valve (NC-R2) and the Presourtion Endity The Electromatic Residual Valve (NC-R2) and the Presourtion Endity The Electromatic Residual Valve Migh temperature along the Presourtion Endity The Hoperitor Valve at 192-07 and 192-37 uses received.				
(b) Reactor beliding Perge Duit Area Redistion Houlton (NP-R-3236) (c) Paul Armiling Duilling Exhaust Duit Arm Redistion Houlton (NP-R-3240) Presidential Familing Duilling Exhaust Duit Arm Redistion (NP-R-3240) Presidential Familing Duilling Exhaust Duit Arm Redistion (NP-R-3240) Presidential Familing Duilling Exhaust Duit Committee Serven AP morth(rip (Doloy 2 93 admits)) The Sloctromatic Relief Falve (NC-02) and the Presential Eafaty The Sloctromatic Relief Falve (NC-02) and the Presential The Sloctromatic Relief Falve (NC-02) and the Presential The Sloctromatic Relief Falve (NC-02) and the Presential The Sloctromatic Relief Falve (NC-02) and 192-37 use received.				
(c) Part Asaditag Dailaing Exhaust Duit Aran Rediction Monitor (RP-R-1240) Frediovidate Restor Group 3 tripped due to a ground fault. Seven Ar prif. 57 at FLA presentions haster groups uses available of this time. The Electromatic Relief Valve (RC-R2) and the Presentions Enfaty MF or FLIO The Electromatic Relief Valve (RC-R2) and the Presentions Enfaty MF or FLIO The Electromatic Relief Valve (RC-R2) and the Presention Enfaty MF or FLIO The Electromatic Relief Valve (RC-R2) and the Presention AP high (2007)/sorm (Delay 2 % minutes) Despective values of 192-07 and 192-37 was received.		Reserver		
Presidentiant Noator Group 3 tripped due to a ground fault. Seven that FT at FLA presentiant haster groups was available at this time. As norm/trip (Boloy 2 93 admice) The Electromatic Raided Talve (AC-A2) and the Presentiant Safety This (AC-A1A) discharge lies high temperature alors reset. As high (2009)/sorm (Boloy 2 94 admices) Despective values of 192-07 and 192-37 was received.			3240)	
presentions haster prospe unto grafishin of this time. The Sloctrosatic Rolled Valve (SC-82) and the Presentior Safety The Sloctrosatic Rolled Valve (SC-82) and the Presentior Safety The Sloctrosatic Rolled Valve (SC-82) and State Controlled (SC-81) (05:30:34		CR at FIP. ST at FIA	2
The Electrosatic Roited Polve (SC-E2) and the Presentiors Enfety MF of PLIO This (SC-E1A) discharge lies high (smperotors alors reset. AP high (2007)/sors (Polsy 2 94 minutes) Bespective values of 192-0f and 192-0f and 192-0f and 192-0f.			A som/trip (beley 2 93 edmtes)	
Notes (RC-Ris) discharge lies high imperature alors reset. Baspetite value of 197-0f and 197-9f was received.	05:34:37	The Hoctrosotic Rollof Tolve (AC-A2) and the Pressurior Eslety	W et 71.10	2
Despective volume of 192.07 and 192.97 were received.	(Marie Marie	Tabes (RC-Ris) discharge lies high impersture alors reset.	AP bigh (2007)/sorm (Boloy 2 94 minutes)	
		Despective values of 192.07 and 192.97 were recorded.		

Time	Event	Information Available to the Operator	Reference
05136164 (0637111)	Safety Injection logic of the Engineer Sefety Features trains A	AM at PLI3, ST at PL3 and PLI3	14
(003/111)	and B reset on Increasing Reactor Coolant System Preseute.	AP trip/corm (Delay 2 95 miceston)	
	The entpoint is 1665 poig.		
09:39:27	Protoumings Safety Valve (RG-RIB) discharge line bigh temperature	NF at PLIO	26
(0940:04)	elera raset. A value of 192.67 one recorded.	AP high (2007)/corn (Delay 2 97 micentes)	
95:41:06	The operator chaored the agfory injection portion of Engineered	AM ot PLIJ, ST at FLJ and FLIJ	2a
(0941143)	Safety Yestures trates A and B. At this time all Engineered	AP soru/defeated (Delay 2 100 minutes)	
	Safety Pestures are in an armed condition.		
05:43:09	The operator opened the Electrometic Ruling Block Value (RC-V2)	NC Pt NR and SC at PLA	1.33.30.93,
(0943:46) Approximate	to etop the Reacter Coolast System pressure increase. During the	RC-V2: ST at PLA	R.90,9u,10
	period 05:43:09 (0943:46) thru 07:38:37 (1139:34), the operator	13 7: 3C at 713	
	attempted to condense the stass in the Reacter Coolant System by	EB T: 10 at 7L25	
	mintelning high pressure injection and controlling the Reactor		
	Coolset System prosours at approximately 2100 pais by cycling		
	26-72 (Figure 4). The Reactor Building pressure and temperature		
	reflected the cycling of EC-V2 (Figure 45).		
05:43:27	The Ricctrosatic Relief Valve (RC-R2) discharge line high temperature	NP at PLIO	2a
(0944:04)	slars was received. A value of 214.7 was recorded.	AP high (2007)/norm (Delay 2 100 minutes)	
05144101	Pressuriasr Safety Valve (RC-RiS) discharge line high temperature	10 ot PL10	20
(0944:38)	clars was received. A value of 205.4F was recerded.	AP high (200F)/norm (Delay 2 101 minutes)	
05:46:27	Presserizer Safety Valve (RC-RIA) discharge line high temperature	IP at PLIG	2a
(0947:04)	elers was received. A value of 205.97 was recorded.	AP high (200F)/norm (Delay 2 103 minutes)	

05149123 Redis (0930:00) Approximate Area berry			
1111	Redistion levels as indicated by the Intermediate Cooling Pump Area Redistion Monitor (EP-R-207) and the Reactor Building Dasignary Cooling Booster Pump Area Redistion Monitor (HP-R-204) peaked at a value 4 m 10 ³ mR/hr. All Costrol Noom Intsha Duct redistion monitor (perticulate, iodine, gas) (HP-R-220) level increased. The perticulate channel reached a value 1 m 10 ⁴ counts per minute while the iodine and gas channels reached a value 3 m 10 ³ counts per minutes.		1
651-591.54 The (1000) 313 Approx. (1000) 313 Approx	The operator executed filling Stem Commuter A lovel free apprent- mately 49% to 45% on the operating range to an attempt to induce natural circulation. Stems Commuter A lovel reached 95% on the operating reads at 06:49:04 (1049:45).	ME (operating temps) at PLA and PLS	-
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	The Doit I Control form work lettern system was placed in a controlletton made.	SC and ST (Smit 1 Control Bom)	
04:09:23 Airbo (1010:00) Approximate every	Airhorms radioactivity levels in this 2 control roms required encounties of all bet excepted personnel.	AM, MM and MP at FLIZ (air supply) Chit 2 Control Dom Air Emple date	\$\$ \$\$
06:00:23 The R (10:00:00) Approximent errite	The Bucker Regulatory Commission Region I inspection tess errived on site and went to the Unit I Control Room upon direction of the Manager Denerating Station Bucker.	Dait 2 Central Rome settlish of Arrival of Ducloser Regulator Countailon impaction toon	1
(1014:14) Pless (1014:14) Pless	Pressuriser Heater Groups 1 and 2 de-energized outomatically. Five pressurizer heater groups were available at this time.	All ot FLD, ST at FLD, All marriety (Soley 2 116 admits)	
(1014:43)	Presentiate Seater Groups 1 and 2 energized automatically. Seven personation baston groups were grantlable at this time.	AM or PLS, ST at PLA, AP more/trip (Doloy 2, 116 admstes)	

TOR 044, Rev 3	*	
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			April 3, 1980
Time	Event	Information Available to the Operator	Reference
(1015:00)	The Swergency Control Starton was moved from Unit 2 Control		•
Approximate	Acon to the Unit I Control Room due to increased airborne radioscrive levels.		
06:17:00	Paramel 1s Bait 2 control rem usto required to most respirators		i d. 33:
(1017-37) Approximate	due to increased elrhotus radioactivity levels.		
62:61:90	The sportter started the Peel Rendling Building Extense Pass	K and 17 at 1925	N.B
(1020:00) Approximents	(AP-9-15h and AP-6-106 or AP-6-106 ood AP-6-109) and the Ann-		
	illory Exhant Pans (Al-E-DC and Al-E-ED). These fans ren for		
	appreciantely 3 eductor at which time they etopped.		
06:47:23	The operator statted the Puel Bendling Building Exhaust Pana	X == 11 = 12 ×	34-38,34,34,
Approximete	(AS-2-10A and AB-E-10B or AR-2-10C and AR-E-10D) and the Aux-		•
	iliary Building Enhaust fans (AB-E-8C and AB-E-8D). Airborns		
	contamination levels in Unit 1 Puel Headling and Auxiliary		*
	beliefings began to decrease.		
07:06:23	The Bucless Regulatory Commission Region I inspectors arrive		4.8.8
Approximate	in Unit 2 Control Room to evaluate the operational and		
	radiological status of Unit 2.		
87.00.31	The operator storted Emergency Duckmiter Pump 12 (EP-2a) to	H. m(a) and in (P _{011G2}) at 724	
	intrains Stem Comruter & lovel from 933 to 1008 on the	to middle and the (875 perig)/men	
	opomoting Fanga-	(belay 2 116 attacton)	
07:00:41	The plant staff requested the computer to print the following locare		24,94
	Thormacuples Batlot Temperatures. The following uplans were tenerised. At norm/had (out of range 50 to 7007) (Bolay 2 116 adontes)	AP mores/hed (out of respe 00 to 7007) (belay 2	116 admtm)
	40.000 - 30		
	40°00 - X		

				April 3, 1986
2300	Freet		Information Available to the Operator	Reference
	\$**** B	\$ R		
	4.00.0	\$ · · · · · · · · · · · · · · · · · · ·		
	# · · · · · · · · · · · · · · · · · · ·	6 341.07		
	77 - 000.09	730 = 044,07		
	78 - 000,00			
	These (non, 0) inidicates the	.) inidication that the eigned was outside of the		
	computer rouge (Range - OF to 700F).	- OF to 700F).		
27.16.17	New Gentines & Lord State	beam Compressor & Lovel indication reached 1003 on the specuting	EC (operating range) at PLA and PLS	
Constant	ramp (Figure 43).			
07127100	The sporteres ettaped Bargen	s stayped Bargaucy Perdistor Pump 2A (EP. 6-2A) after	ST, ME(A) and HR (Pasca) at PLA	1,28
CHILLY HO	increasing Non- Sourcest	News Searcher & level from opprominately 932 to 1002	At eacloff and low (875 psig)/norm (Doloy 2 116 minutes)	
	at the sportting rasps.			
67,38c59	the Manager-Canarating Stats	the Manager-Cenerating Station Batlans directed the operator to	North marts	1,30,93,9
orfueto.	open the El	ertromatic Rollef Block Walve (BC-V2) to repidly depres-		
	series the Esector Casiset S.	Reactor Coolset System and actuate the Core Flood System		
	while High Pressure Injection	Prespure Injection was maintained (Figure 12). This was		
	done after the operator ohae	the operator observed so evidence of natural circulation		
	of the Beactor Content by	of the Reactor Content System pressure was shown 2000 paig. The		
	reduction in Reactor Conlent	reduction is Reactor Conlant System prinsure was also done to approach		
	conditions which would allow	which would allow the Decay Stat Removel Pumps in and IS		
	(BH-P-18 and DH-F-19) to be	d DM-F-185 to be put into service.		
67:41:39	The sperseion byposed the Es	the operator byposed the fainty injection portion of Latenered	All at PLED, ST at PLS and PLES	1.4
131971149	Driety Postures trains & and	before features trains & and R to present initiation during the	AP norm/hypassed (Delay : 141 sinates)	
	Boorer Coalors System depression leation.	west lest lon.		

			Apr 11 3. 1980
The same	Event	Information Available to the Operator	Peterska
07143101	The Safety Injection parties of Deplacement Safety Postures trakes	All or Fulls, ST or Full and Full?	4
(1143:18)	A and & actuated no however Conlant System presents decreased	Ab norm/activation (Bellsy, 166 educton)	
	to lose than 1640 petg. Bourver, initiation did not eccur		
	because the menual bypass provincially introduced was still on-		
97143164	Presention Seator (Frouge 1 and 2 tripped and re-emergical after	n e. 77.	
345:310	I necess dan to placing presentery batter central oriention	AP morn/trip (Belay 2 145 minutes)	
	is the enough position.		
07130-16	The special de-energiand Pressur'sar Bester Groups 1 and 2 to	H PL	2
150:533	meet at in lower Ranctor Coolent System pressure. Garan pres-	AP worm/trip (Bolay 2 145 eduntes)	
	ouriser heater groups care evallable of this time.		
27,58,15	The operator initiated process inor openy flow to mediat in lowering	723 SAM: 11 oc 714	1,86,80
(1134,52)	Bearing Coalast System presente. Freshourises apray flow was mela-	NC Pt. 16 and SC or PLA	
	talend up til 00:07:14 (1908:01).		
07:99:37	The spectator requirement the parties the carllet importance	UP Cholay 2 0 startes)	a
	(BC-16-163) of Presentiset Safety Value (RC-818). A trapereture of	AP high (Sp0F) fours (Beloy 2 148 atmess)	
	106-19 was resorted.	* . Tio	
8111.8	Cave Flood Tenk 1A (CP-T-1A) high level elerse was received.	5:12	A
Reino	The lovel use 13,32 feet,	W norm high (13.3 feet) (belay 2 156 admitted)	
08116136	Presoutists folety talve (RC-Bin) discharge lies high imperators	W et 710	
2171.339	slore fessit. A temperature of 192.59 we recorded.	49 high (1988)/sees (Delay 2 134 et mice)	
06:22:58	Presention: Safety balve (RG-RIE) discharge line high compersions	• • • P.10	A
558:522	afarm resoft. A temperature of 193.99 use tercorded.	AP high (7007) (norm (Bolay 2 156 minutes)	

The Oats, her 2

		RIMBK.	Information Aretichia to the Operator	Reference
042 NO 00 (1270s 37) Approximate		The Fower Operated Decryson: Fain Stems Dosp Valve (HS-F1M) was shot at the request of corporate wanagement in response to concern expressed by the Pennsylvania State Government.	Conlice degradately at PLS	4,.444.
(1221:43)	The operator started Dec- sed 18 (MC-P-14 and NC-P- Rest System in service.	started Decay Neat Removal Closed Couling Pumpe 1A and .[A and 16-F-18] in proparation for plantag the Secay in service.	Ff at PL3 and PL13, ME(P_pipers) or PLS, ME(A) or PL3. Aft notalitity and safuff (Delay 2 135 adapted)	į,
08:37:08 (12:37:51) Approximate		Assertor Conlast System pressure reached 600 polg which to the semical gas pressure metatesias in the Core Flood Tacke.	The second secon	7.7.4
10 mm m m m m m m m m m m m m m m m m m			(1) (1) (1) (1) (1) (1) (1) (1) (1) (1)	
	******	46° 2866 • 3001		

compared range (Burge - 55 to 1009).

			April 3. 1980
4	Meent.	Information Aveilable to the Operator	- Man
# 12 15 15 15 15 15 15 15 15 15 15 15 15 15	Core Flood fook is (CP-T-is) navel fored slave we released. The level wee 15-13 feat: This indicated the Core Flood System tagested a mail moment of mater take the Reacter Coolent System.	All and M. st. 71.5. Af morn. Migh (13.3 feet) (Doloy 2 130 admits)	A Á
(136433)	The operator stopped beactor Coolant Makeup Pump C (FE-0-1C) and tsturned the Seartof Coolant Reharp System to one pump specialism.	All of FLA, St and Mala) or FLA A correlating and normalest (Delay 2 150 minutes)	X Å
(1)05300) Approximate	Paramed in Baic I Control loss notes required to wan templicators for to increased eitherns redissorbility levels. Excess personnel wars moved to the Observation Conten.	M. M and W (Dait 1 Control Bows) Dait is Control Bows off comple data	1
	The operator chest the Electrometic Bolts: Sleck Valve (SC-92).	2 :	7
00.10.30 (1317.30)	The Electromatic Letted Talvo (RC-02) discharge line high tempereture alara reset. A temperature of 192.77 was recorded.	No at PLIO Ap bigs (2009)/oven (Saloy 2 170 admits)	
CHANGE CONTRACTOR	The operator speed the Electrometic Meliaf Limit Valve (SC-V2).	2	a
100 100 100 100 100 100 100 100 100 100	The Electromatic Solies Velvo (RC-R2) discharge How high importants glass was received. A temperature of 270.47 was recorded.	NP of Pully AP high (2009)/sers (Dolsy 2 167 attenton)	
001301377 (11301377 (11301377	The operator closed the Hestrometic helied Mach Valve (RC-VI).	2 : :	,
5 (K)	The operator eterial the computer as a two atomic group tread of the fallowing plant persenters. This tread one malabolised for the Averline of North 29, 1979.		,

emissed has collected to the Pressutteer. This gas had been wented through the Electromatic Policy Walve (RC-R2) to the Peactor Conlant

from the reaction between afreonium fuel cladding and the reacted

pas resident in the resetor contant and hydrogen gas generated

Death Took and released to the Newton Building through the Drafa

15 Tr SC at PL25

Titas		Inferentiam Augiliable to the Operator Beiggs	Neferment
	Took kupiuce bingbrags (Mil-UIS) which had been breached. The hydrogen		
	concordention in the containment eventually reached an explosive mixture		
	This delocation resulted in a Seactor Building pressure spike of 18 prig		
	skill a corresponding rapid increase to Bearing Beliding air respectors.		
09148143	Magas Constal Genter 37A and 42A wase loss. These supply power	Local indication of the Badwaste penel.	58.8s.93
(1 Mot 203	to the seal water pump which furnishes seal water to many of the		
	Reducate Pumps to the Auntifacy Building.		
99186186	The Leanton Building legistion and Gooling portion of Engineered	AR at 76.13, 87 at 76.3 and 76.33	20,25,35,50
CHARGE	Safaty Peatures trains A and B actualed on bigh and high-high	AP enveloct (Delay 2 159 stoutes)	
	Seactor Building Pressure (Figure 51). The setpoints are 3.38 poig		
	and 35 paig compectively. This was a rount of the 28 paig Reactor		
	Reliding pressure impales from the hydrogen demonstion. Beartor		
	Reliding Labiation, cooling and containment apray were actuated.		
99:49:44	Drony Heat Ermoval Pumps 1A and 19 (DM-f-1A and 18) started and	DE-P-18/18: ST or PLI) and PLJ, Will prog) or PLA	
11,000,111	incormediate confling pumps in end 19 (IG-P-in and 18) tripped	M(A) at PL3, AF on/off and norm/trip	
	estonseitcally on the Engineered Sefety Features Frains A and	(Delay 2 159 attentes)	
		IC-F-14/18: 48, 57, 78 (P _{815GB}) and 48 (F) at FLA AP on/off (Dainy 2 159 atouton)	
693.693.63	Asserted Cochant Makeup Pump C (WG-P-1C) started sationalically by	Aff or FLD, 18(12) and 57 or PL3	28,30
(1250x23)	the Laglanering Safety Feators Train & activations.	ad morm/krig (Delbey 2 159 attention)	
94:69:40	bearing beliefing Spray Pumps in and in (195-7-in and ill) stering sector	ST at PLIS and PLIS	
(WE SHOELD)	matically upon actual les of Inglowered Safaty factures trains A and B.	AF normfurty (Delay 2 166 atoures)	
BS - 2 - 28	Nametor Coolens Fungs 1A and 19 (BC-P-15 and BC-P-18) taket atr	MC-P-1A/18 %: AF norm/high (122F)(Delay 2 168 attentes)	A
(1 1961 59p	bigs compensate alorms and Prospections Seferty Volvers (RC-Ris and	RC-Ris/iSt AF norm/high (Delay 2 161 admutes)	
	MC-183) discharge then high temperature alarms were received.		

			Apr 23 3, 1980
Time.	omenty	Information Aradiable to the Coursing	* Inference
(1330)46)	The speciator defeated the teater building implation and Coulding partition of Englanding Safety Pastores teats &.	and art PLIJs, NY art PLJ and PLIJ AP north/Authented (Delay 2 lel estentes)	
69+50c0) (1350+46)	The operator started intermediate Cooling Pomp 18 (15-7-12).	M. M. M. Ching) and Mall) on Flat of males? (State 2 162 attention)	
091.58418 (1356148)	The specialist definited the facetor building looks for and Cooling portion of Engineered Safety Pasterns train 5.	as or PLIS, ST or PLS and PLIS As more/defeated (Delay 2 192 atlantes)	
095 58h 11 (1350: 08)	the operator started intermediate Coaling Pump 19 (ED-P-18).	AB, FT, PM (P _{BERMA}) and MR(P) at PLE AP males? (Dalay 2.105 attention)	•
079-58-24 (1358-64)	The operator stopped Searces Conlant Many C. (MC-4-(C))	Aft or PLS, ST and MS(A) or PL3 AP norm/trip (Dalay 2 162 minutes)	***
094.511.94 (13551.35)	The Biastromatis Belief Taive (8C-62) and the Pressurizer Safery Taive (8C-81s) discharge line high temperature sters reset. Nespective temperatures of 186.57 and 176.67 and recorded.	Of the contract contract the statement	
65 SE	The Electromatic halfof thive (BC-RE) discharge line high comparators about was received. It is believed that this was a result of the sparetor cycling the Backrewaitle Palice Black Talve (RO-RE).	ny at PLIG AF bight (2008)/werte (Dalay I 161 attention)	
25t N2t 55 (118'59'119)	The operator, during the next admits, removed the defeat signal from the Enector Bailding technical and trooking portion of Englancered Enfect Features trains I and 9.	AN at 74,33, ST at 74,3 and 72,3 AF unra/Anfanted Chelay 2 161 educted)	•
# 14 14 11 11 11 11 11 11 11 11 11 11 11	The Ebactrosatic Asited Tabre (BC-R2) discharge line bigli Coperature alarm reset. A temperature of 177.35 was recorded.	NO at PLIG Ab bigh (700P)Junes (Onlong 2 181 afoctors)	•

DR Sak, hore

ET at Ph3 and Ph.13, NR(A) at Ph3, NR(P DISCH) at Ph.8 AP onfolf and normitring (below 2 166 adouted) an norm/had free of rese of to youry (Dolog 2 108 mines) The operator stopped Decay Seat Pumps & and B (DM-P-1A and DM-P-1B).

the following Incore Thetwoonpie temptroluces decreased to lose

(1400:03)

The Reactor Conlast System prospers use mover line enough to put

99136136 (1387133)

the Secay Sout System in nervice.

Gesting one a statelit of Core Flood Tent (CP-T-IA) discharge then

then 1000 error the part attacks. The fact camed resulter core

2

A

42 - 487 AP 36 199 - ma

the resistor ----

176. * 666.78

FR - 681.6F

			April 3, 1986
The	entricination of the second of	Information Arabieble to the Operator.	Reference
10+00+39 (3+03+35) Appl cet Sout s	The operator spould the Macromotte Ralled Ment wire (RD-2).	2 8 8	R
(1401:38	The Electromatic Bailed Takes (BC-E2) and the Pressucions Safrty Males (BC-E15) discharge line high respectives alarms were received. Respective temperatures of 206.7F and 206.0F wave technish.	AP high (7000)/ware (Dolony 2 159 eduction)	
0.40401)	The operator initiated presentions appear flow in another in lower Resident Conlant System Francist. Presentiver aprey flow was mathematered antil 17:05:54 (1608-17).	70 POSS, ST 750	3
10:05:25	The spatialist mangless from their Season Groups 1 and 2. Six generalists bester groups are centlable on this time.	Ef et PLA Af morm/telp (Delay 7 156 simutes)	
(10:07:19	the specials decement and Pressurables David Orange 1 and 2. Sing promitive basis graps are prolitable or this time.	Af morm/tertp (Delay 2 136 atoutes)	z
(51.1924.1)	Procesuaisen fafety Valve (RO-219) discharge line high temperature alors reset. A temperature of 192,07 was recorded.	No at PLIS AP high (2009)/sorm (Dalay 2 152 minutes)	
0.444.00 0.444.00	Basitos Ceolast System Loop a bot leg temperature decreased to within the instrumentation range (Figure 24). This was the comult of the atom in Loop A het leg confensing.	ME are Plat and Plato, Me are Plat, and are Plat	I. PS. CHA.PS.
10-79-13 (14-30-100) Appr or facts	At the tequest of the State greenment, the Herropolities Edisons Company Fire Freshfeld of Description translad to the Covering's office to report the Thi Plant status. We see accompanied by the Manager-Descripting Station Healths man better and Date 2 Superintendent	to the 2 Control of Co	

fachaited Support. The Emergency Director Secignies use directed

Time.	Prest	infermation Available to the Querator	Beference
	to mistale the plant in a stable condition during their charges.		
	The Bangar-Generating Realise Beclear carried a remote paging		
	decide to portfit bin to be contacted, if excessory.		
1015/125	The operator started Reactor Coolera Helbrop Pump C (160-9-1C)	AB at FLA, ME(A) and ST at FL3	25,35
(1412:47)	efter an unsuccessful ettainst to exact the pump at 10,18:20	Af norm/trip (Belay 2 12% adoutes)	
	(1433:02). Reactor coolawt presents use approximately 440 pelg.		
16133136	The operator energized Pressurings Beater Groups I and I. Six	2 : 8	A
(1483113)	processes heater groups were evallable at this time.	AF word(trip (buley : 130 stores)	
19035033	The Reactor Conlant System pressure reached a mintees value of 409	of (being : 0 dentes) or	
	•		
10: 15: C	The Damper Conlock System lamp & late 14g Comperators Correspond	Se 14. W a 110 ad B at 16. 604 - 111 15	1,00.99.90.
(14.36) IFF	ayes the range of the functionalisation den High Prompts	2	
	begandens was directed to long. Bet ing (Pigures 24 and 29).		
10:33:35	The spontes stapped bactes Coulon mabore bem C (18-9-15).	All at 715, 18(2) and 57 at 713	28,56
(14.04.131)		AP norm/trip (Delay 2 113 atmotos)	
18:38:57	The special of the manufact from the fact of the per 1 and 2. His	2:8	A
(1438034)	presention hader groups were continue on this time.	A comittein (Bulley ; 105 admitted)	
101.791.30 (1440107)	Searter Coolean Spores Long & ben Ing temporalute derremed	R at 74, 10 at 7410, 10 at 74, 10(14) - 4127 at 743	1.0.13.B.
	WATER TO THE PARTY OF THE PARTY		

-	1	
	2861	
2	S;	
#	m	
	3	
100	N.	
鼾	æ	

The operators emissioned bytesseriant become law for the time. The first base because beta desiration become mailtoning tape was removed and emergence. The first base securing the set he receding the of these mesods and desiration desiration become militarist tape entries beta desiration become militarist tape accepted the first because the securing the set highligh the set highlight the set high the set high the set highlight th	T100	Press	Information Available to the Descript	Prierrence
The fractionies for a feet Acquisition System municating tops was removed and exactly from configuration for a section of the acquisition of the a	10: 38:51 (1440: 28)	The operator emergical Procession Ducer Graps I and 2. 188. procession baster grups was entitable at this time.	SP at PlA AF normitrip (Belay 2 182 strattle)	A
The sizes prices maifunctioned between 11:00:13 (1901:10) to my (Nolsy 2 o atmoso) 11:01:30 (1900:13). Dating this partied the sizes printer. Freezes we performed by the sellity parties. Freezes may performed by the sellity parties. Freezes a perform indicentively level to be a selected of 13 abrurah (Physics 33). The species and reference man (to Electronic End of Section	(1656-19)	The Essectionist Data Acquisition System monitoring taps was removed and soother tape started by plant staff personnel. This operation was required daily due to the recording time of three seconds and the tape storage tapubliky. The reactimeter was off line between 10:35:33 (1634:10) to 10:37:33 (1636:00).	Shit I comired room confilled of reactimeter for chargement.	
Frence investigation to the content of the content		The miners princer and durationed between 11:00:13 (130);:10) to 11:01:39 (1500:15). Desirab this posted the alarm printer fraction was performed by the stillty printer.	AP : (balay 2.0 adomesos) Papar fend problem to printee	Ž
The stributes radioscribility lared in Dail 2 Control Dama reduced. The sportford radioscribility percent) were provided to remove respiration. The sportfor distributed the Dail of Silver Tables (No. 2017). The sportfor distribution in Larp A (Figure 21) The sportfor distribution in Larp A (Figure 21) The sportfor distribution in the Presention (Min-P-1C) The sportfor distribution in the Presention lared lare). The sportfor distribution in the Presention lared.	(1508:12)	Presentate level tearing decreasing from 300 tunhon to 174 tuchon ones a parted of 13 milwite (Pigero 53).	NC AT PL 4, AN (Migh/Plgh - 315 inches, Nigh - 209 inches, Low - 200 inches and Low/Low - 80 inches) or PAS.	•
The operator after the Blootromatic Point Siech This (DC-2)). If at Pic Bick the Contract Colline Dystem Loop A cold ben compressed to the act Pilo Section Dystem Loop A (Figure 21) The operator started Bantice Colline 198-up C (M-7-1C) The operator started Bantice Colline 198-up C (M-7-1C) The operator started Bantice Colline 198-up F (M-7-1C)	1316103		Ad, no and tiff or PLIS (att papply) Det 2 control new aft ample dots	9.4
Seactor Cultant Dystom Loop A cold Ing compressions planted to 19 or 7110 Secretar from 2137 to 4157 thirteeting the accordance of some account effectivities in Loop A (Figure 24) The operator crarted banctor Conlore Manue Funy C (ML-P-IC) The operator crarted banctor Conlore Manue Funy C (ML-P-IC) The operator crarted banctor Conlore Manue Funy C (ML-P-IC) The operator crarted banctor Conlore Manue Funy C (ML-P-IC) The operator crarted banctor Conlore Manue Funy C (ML-P-IC) As as 714, 78(A) and 57 at 71, 11 The operator crarted banctor Conlore Manue Funy C (ML-P-IC) The operator crarted banctor Conlore Manue Funy C (ML-P-IC) As as 714, 715 (Ml-P-IC) As as 714, 715 (Ml-P-IC) As a function of Function Conlore Manue Funy C (ML-P-IC) As a function of Function Conlore Manue Funy C (ML-P-IC) As a function of Funk Manue Funk Ma	11:12:08 (1512:37) Approximate	The specialist the Clearments Boiled Sleet toline (SC-23).	2: 1:	33.8
The operator crarted barrior Conlore Sabres Fram C (ML-P-IC) AR at Fill, MR(A) and ST at PL3 to atop the pupil full in the Transmisor laws. As norm/trip (Delay 2 M atmites)	(1316124)	Reactor Custant System Loop A cold Ing comperceture started to increase from 2137 to A177 Indicating the occurrence of some motural effectivities in Loop A (Figure 24)	e ruio	e*fe*t
	The State of the S	The operator oracted banctor Contour 1987usp Fung C (ML-F-IC) to atop the rapid fall in the Presourtour lavel.	All at FLA, 186(A) and ST at PL3 AP norm/trip (Dalay 2 S4 atmites)	1,34,5

Time	Prent	Information Available to the Operator	Reference
11:21:35 (1522:12)	Presentiant level atopped decr soing at 174 inches and started slowly increasing, going off scale foring the next hour (Figure 33).	C at PLA	1
11:24:29 (1525:00)	The Electrometic Relief Valva (SC-82) discharge line high temperature	MP at PLIO	24
	alarm reset. A temperature of 191.97 was recorded.	AF high (2007)/sorm (Selay : 14 edentes)	
11:26:23	The operator requested the computer to print the outlet temperature	BP (Deloy 2 6 misstos)	2 e
(1751110)	(RG-10-TRI, RG-10-T82 and RG-10-TE3) of the Electromatic Relief Velve	AF high (200F)/sorm (Delay : Bi minutes)	
	(RC-R2) and the Procountzer Sefety Valves (RC-RiA and RC-R1B).	We at File	
	Respective values of 198.79, 170.69 and 174.79 were indicated.		
11:28:12	The operator stopped Seactor Coolant Hakeup Pump C (HD-P-1C).	AS at PLS, MR(A) and ST at PL3	2a,5c
(1528:49)		AP sorm/trip (Deldy 2 65 winutes)	
11:28:52	The operator de-energised Presouriour Senter Groupe 1 and 2 due	ST ot PLA	20,98
(1529129)	to the los procouriser level. Six pressuriser heater groups	AF norm/trip (palsy 2 85 minutes)	
	were evallable at this time.		
11:29:23	The Auxiliary Policing exhaust face (AB-E-SC and AB-E-SO) etopod.	Exhaust Faun: SC and ST at FL23	30.34
(1530:00) Approximate	Airborne contemination levels in Unit 1 Peel Souding and Auxiliary	Rediction Levels: MR and 12 (Unit 1 coutrel room)	
	Building, and Buit 2 Control Ross bogan to increase. The reason	HR and NP at FL12	
	for these fens stopping is unbhows.		
11:32:37	The operator scotted Seastor Conlant Radony Pump C (MU-P-IC)	AN at PLB, MR(A) and ST at PL3	2a,5c,911
(1533:14)	to raise the pressurizer level.	AP sorm/trip (Delay : 84 minutes)	
11:33:44	The operator started Emergency Foodwater Pump 28 (EF-P-28) to	ST. HE(A) end HE (P _{DISCE}) at PLA	20
(1534:21)	increase Steem Conerator B level.	AP on/off and low (875 paig)/norm (Delay : 85 minutes)	

Time	Event		Information Available to the Operator	Reference
11:35:48	The operator etopped Beacter Co	selest Meknup Pump C (ME-P-IC).	AM at PLB, NR(A) and ST at PLS	20,5c
(1534:25)			AF corm/trip (Deloy C 83 minutes)	
11130:30	The Operator started filling St	em Generator & from 57% to	SC (operating range) at PLA and PLS	1
(1579+15)	172 on the operating range in a	m attempt to induce setural		
	atrealettes (Pigura 39). The 9	PT level was reached at 11:52:04		
	(1552(41)-			
11:45:12	The operator energized Pressur!	mer Heater Groups 1 and 2.	ST AC PLA	20
(1545:54)	Sin preserter bester groupe vo	re svailable at this time.	AP norm/trip (Delay 2 64 minutes)	
11:49:23	The Fiel Foodling exhaust flow	fluctured during the next three	SC and ST at PL25	36
(1590:00) Approximate	hours. The resson for the flow	fluctuation to window.		
11:52:04	Stars Consessor S level indicat	ion reaches 97% on the operating	SC (operating range) at PLA and PLS	1,20
(1952:41)	reage (Figure 45). The operate	er etopped Sucrementy Feedunter	ST, HR(A) and MR (PDISCE) at PLA	
	Pap 28 (EP-P-25).		AP em/eff and low (875 poig)/norm (Deley ; 85 minutes)	
12:10:55	The plant staff required the c	expeter to print the fallowing incore	UP (Soley 2 0 minutes)	20,98
(1611:32)	Thereocouple Outlet Impereture	e. The following values were recorded.	AP normalised (out of range OF to 7007)(Belay ; 50 minutes)	
	m - +44,47	35 - 444,47		
	TR = 396.97	58 - een.ep		
	90 - ***,07	58 - 410,09		
	87 = 444,47	6L = 362.19		
	98 - ***.07	78 a con,op		
	77 a 004,09	a • •••,••		
	72 - 000,07	70 - 000,°7		
	8G = ****,**			
	Note (***.*) Indicates that the	eignal was setates of the		
	computer range (Range - Of	te 750F)		

			1700
Time	Event	Information Available to the Operator	Referenc
12:34:29 (1633:06) Approximate	The operator opened the Electromatic Relief Block Valve (RC-V2).	57 et PLA	35,22
12:29:23 (1430:00)	The operator started the Auxiliary Building exhaust famm (AR-C-SC	Etheust Fang: SC and ST at PL25	30, 30
Approximate	and AN-2-ED). Airborne contemination levels in Unit 1 Fuel Rendling	Rediction Levelet MB and MP (Suit 1 Control coom)	
	and Antiliary Delidings, and Outt 2 Control Room began to increase.	78 end 19 et 21.12	
12:34:29	The Electrometic Relief Valve (RG-R2) discharge lime high temperature	Wet 7.10	2a
(1635:06)	elem me received. A temperature of 233.0F was recorded.	AF high (2007)/sorm (Delay 2 0 minutes)	
12:34:59	Procesurioer Safe y Valve (RC-RIS) discharge line high temperature	HP at 7-10	2a
(1635:36)	alera was received. A temperature of 203-2F was recorded.	AP high (2007)/norm (Delay 2 0 minutes)	
12:36:29	Pressurizer Safety Valva (RC-RIA) discharge line high temperature	W at PL10	2a
(1637:06)	alara was received. A temperature of 201.47 was recorded.	AP high (200F)/norm (Delay 2 0 minutes)	
12:43:80 (1643:37) pprostants	The operator closed the Electromatic Solief Block Valve (RC-V2).	ST at PLA	31
12:44:53 (1645:30)	Pressurizer level indication came on scale (Figure 33).	SC at PLA	1
12:52:50 (1652:37) uprantaete	The operator opened the Electromatic Relief Block Valva (RC-V2).	ST at PLA	3)
12:58:33	Pressurizer Salety Valve (BC-RIA) discharge line high temperature	NP at 7L10	20
(1659:10)	alarm reset. A temperator of 192.27 was recorded.	AP high (2009)/nerm (Delay 2 0 minutes)	
13:02:23	The operator started Condenser Vecture Pump 1C (VA-P-1C) is an	ST at 7L17	20,48
(1703100)	ettempt to re-establish vacuum. The emiliary beiler had been	AP on/off (Delay = 0 minutes)	
	returned to service and was supplying gland scaling steam to the		
	cale turbim.		

PLAST STATE

13,13,10

ing. The Long A hot ing etom had been collapsed and netwent efreulation stapped. Steam and gas malared in the Rometer weent head and Liber 3 her A level use 97% of the speed, rungs (Pigers 39). Stem Comretor 6 une Describe that I dieg I have vis the Electrometic Solid Valve (EC-12) and (1) a hydrogen competention increase and a-bonquest demotation which consed a 28 petg pressurise pulse to the Roactor Deliding. Attempts to ass the Care Flored Systems to cost the core over the last six hours had resulted Presence injection flow into the Bearing Coolant System and then to the all Bearer Coulost Pupe (MC-P-IA, MC-P-IA, RC-P-IS and BC-P- 3 usrs flor orthitched in this lasp. Contensor recom use outablished ofter Conloce System depressurated t. 630 polg (Pigure 12). Venting through Cherremetic fielded belon (RC-R2) to the reactor building resulted in Detremetic belief Hack talve (BC-V?) we open, hesping the leacted isolated, with a level or 93d of the spotate roops (Figure 39). The In librited seconds. The reactor core was being cooled by (1) High returning the satiliary stem beller to service. Stem Cenerator Core Plant Tank A percial discharge. TH .. 74

93.90.90.10

as ottempt to condense the reseiving atom in the Reactor Coalcot System by Increasing Repertor Coolont System procures (Figure 12).

13115100 (1715137) Approximates

The operator that the Electometic Salies Black Talva (BC-92) in

Time	Event	Information Available to the Operator	<u> Poterose</u>
15:23:04 (1723:41)	The operator started Reactor Coolant Hakesp Pump C (NG-P-1C) to further increase Reactor Coolant System pressure.	ND-P-IC: AR at PLS, NR(A) and ST at PL3 AP norm/trip (Delay 2 0 minutes) BC F: NR and SC at PLA	30,3m,5e,9
13:24:59 (1725:36)	The Electromatic Bellef Velve (RG-R2) discharge line high temperature elera reset. A value of 192.97 was recorded.	MP at FL10 AP high (2007)/sorm (Pelay 2 0 minutes)	2a
13:26:09 (1726:46)	The operator de-energiaed pressutiser Sector Groups 1 and 2. Bix pressuriser bester groups were evailable at this time.	9C et PLA AF nore/trip (Delay 2 0 minutes)	26
13:44:23 (1743:00)	The operator started atoming Steam Constator A to the consensor uning Turbine Bypece Velves (NS-V25A and NS-V25B).	NS-V25A/25B: at FL 5	u.
14:25:26 (1826:03)	The operator energised Pressuriner Beater Groupe 1 and 2. Six pressuriner heater groups were eveilable at this time.	ST at PLA AP norm/trip (Delay 2 0 minutes)	24
14:25:31 (1826:08)	The plant staff requested the computer to print the following locore Thermocomple is that Imperatures. The following values were recorded. Mr. 400,07	UP (Delsy 2 0 minutes)	20,91
	More: (ass,s) indicates that the signal was outside of the computer range (fange OF to 700F)		
14:32:81 (1832:36)	Safety Injection logic of the Engineer Safety Features trains & and B reset on increasing Reactor Coolant System pressure. The composet in 1665 paig.	AR at FLI), ST at FLI and FLIS AP norm/trip (Delay 2 0 minutes)	26
14:34:30 (1835:07)	The operator cleared the Safety Injection portion of Engineered Safety Features trains A and B. At this time all Engineered	AF at FLI3, 5T at FL3 and FLI3 AF corm/bypessed (Delay 2 0 minutes)	2a

			UR 044, Ler 2 April 3, 1980
The	Frenk	Information Available to the Operator	- Metersas
14:43:13	The operator propped basetor Conloct Makeup Pump C (MD-P-1C)	W-P-1C: AN or FLA, MA(A) and ST or FLA	¥,4
(IRASASI)	to also the repld toccome to Boarter Coolant System presence.	AP morn/trip (Boley 2 0 mimtes)	
		DC Pt NB and DC at PLA	
\$4.48122	The clarm princer collectioned des to poper feed problems. As a	AP (Dolay 2 0 advates)	20,78
Connection	result the elem newsy data from 16:46:22 (1948:59) to 13:00:52	Paper find proglem to printer	
	(1910129) was deloted.		
14:34:35	Manetor Coolent System presents reached 2332 poly (Plyure 14).	NR and SC of FLA. AR (Low/Low - 1900 paig.	27.2
		Low - 2055 paig and Righ - 2500 paig) at 'FLB	
14:59:23	The following redisting medices indicated as orale and continued	M. M and 10 at 7512	#.#
(1900:00)			
	(a) Reactor building Purge Unit Area radiation scatter (ID-R-1234)		
	(b) Auniliary Deliding Access Corridor radiative monitor (HT-R-212)		
	(s) Waste Disposal Storage Ares radiation annitor (W-E-216)		
	(4) Peel Sealing beliding Etheunt Beit Area redistion evaluer		
	(98-3-)340)		
	The Paul Bondling building radiotion souttor (NP-8-215) and Control		
	and Service Sollding Corridor radiation spotter (NF-E-236) indication		
	use steedy about 10 cosets per elemtes.		
15,111,72	The operator requesting the computer to print a security of Reactor	WP (Delay 2 0 admits)	*
(1011:30)	Coalast Pumps and Milbery Pumps parameter at stur.		

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Ties	Event		Information Available to the Operator	Reference
15132133	The operator started Reactor (started Reactor Coolant Pump IA (RC-P-IA) and after	RC-P-1A: ST. NR(A) and NR(P) at PlA.	1.28.38.38
100	10 seconds stopped the pump.	topped the pump. This is the normal procedure on a	AN (trip) at PLS	97.9H
	routine loop refill. Resctor	refill. Reactor Coolant System pressure decreased	AP norm/trip (Delay 2 0 minutes)	
	from 2320 pelg to 1440 pelg. I	ig to 1440 paig, Loop A cold leg temperature	NC T _C 1 NP at PLID	
	decreased from 410F to 270F and Loop & bot leg temperature	nd Loop A bot leg temperature	NC Pt. NR. and SC at. PLA	
	decreased from 545F to offecale low (i.e. less than 520F)	le low (i.e. less than 320F)		
	(Figures 14 and 24).			
15:32:46	The Selacy Injection portion of Inginesied Salayy Peatures	of Bagineer'ed Safety Pastures	M at 713, 57 at 73 and 713	A
(1933:23)	trains A and B actuated as Re-	B actuated as Restor Coolest System pressures .	AF norm/settention (Dollay 2 O minutes)	
	fall below 1640 psig.			
15:32:46	The operator attempt to start	attempt to start Reactor Coolest Makeup Pump 1G (NU-F-1G)	All at FLD, ST and ME(A) at FLD	2,2
(EZICEA)	due to the falling reactor coolent system presents.	olast system prosperts.	Ap worn/trip (Boley 2 0 admitted)	
15:32:47	Datey Reat Removal Pumps LA at	Ducay Beat Resoval Pusps 1A and 18 (DR-P-1A and 18) statted auto-	All and MR (Ppisca) at FLA, ST at FLS and FL13	
1	satically upon Engineered Safe	on Engineered Safaty Postures trains A and B	(4) •• 73	
	Actuation.		AP sorn/low and on/off (belay 2 0 wiestes)	
15:32:52	The operator stort of Reactor	started Reactor Coolast Makeup Purp 10 (ML-P-10).	An et 718, 57 and 18(A) at 713	2,2
1933:29)			AP norm/trip (Delsy 2 0 admites)	
15:33:03	The following factors Thermites	the (ellewing incore thermomeple Temperatures decreased to less	AP norm/had (out of range OF to 700F) (Belay 2 0 minutes) 2a	42 (4
1933140)	than 700F over the uast admit	or the west minute. The incressed Reactor Core		
	Cooling was a result of stary	a result of starting Reactor Coolean Pump IA (Mr.P-IA)		
	for 10 secub.			
	M - 524.6F	N - 101.07		
	3K = 604.0F	34 = 348.97		
	98 - 345.39	134 - 251.17		

		Information Available to the Operator	
Time		Turniserion vasitants to fos Obsistos	_ blomes
13:33:07	The operator namelly bypessed the Sefety Injection portion of	AM at PLI3, ST at PL3 and PLI3	20
(1732.00)	Engineered Safety Festures trains A and B.	AF torm/bypessed (Delsy : 6 misstes)	
15:35:18 (1935:35)	Safety Injection actuation logic of the Engianer Safety Features	AF at PLI3. ST at PL3 and PLI3	2a
(1133133)	treism A and B reset on incressing Seactor Coolant System	AP norm/trip (Delay 2 0 misstes)	
	presents. The setpoint is 1665 paig.		
15:30:42	The operator stopped Esector Coolest Sakesp Pump IC (MU-P-IC)	AN at PLS, NE(A) and ST at PLS	20,5c
(1939119)		AP corm/trip (Delay : 0 migutes)	
15:39:27	The sporator closes the Sefety Injection portion of Ingineered	Af at FLI3, ST at FL3 and FLI3	
(1940:04)	Sefety Pestures trains A and B.	AF porm/bypessed (Beley : 0 minutes)	
15:49:16	The operator started Reactor Coolean Release Pump 1C (NU-P-1C).	AN at PLS, NR(A) and ST at PL3	20,5c
(1949:53)		AP some/trip (Deloy 2 0 minutes)	
15:49:39	The sparetor started Seecter Coolast Pump 1A (EC-P-IA); Seacter	HC-P-1A: ST, HR(A), HR(F) and SC(A) of FLA	1,20,30,
(1950:34)	Contest presence decreased from 2190 pois to 1300 pais, Loop A	All (trip) at PLO	\$5,93,90,90 97,98
	cold log temperature decreased from 3457 to 2607 and Loop A	AF more/trip at PLS (Deloy 2 0 minutos)	
	het log temperature remained officeals low (S.o. less them	SC Tet IP St PLIO	
	5207) (Pigeros 14 and 24).	NC Pr IR and SC at PLA	
15:50:00	booter Coolant System Loop S bot ing temperature decreased from	AR(high - 612F) or PLB, SC or PLA and RF or PLIO	1
(1950:45)	officele high (greater thee 6207) to officele low (less than		
	9007) (Figure 29).		
15:50:13	The operator began to bypoor the Sefety Injection portion of Engl-	AM at FLIS, ST at PLS and PLIS	20
(1950:50)	second Refery Postures trains A and B because Reactor Coolast System.	AP sorm/hypassed (Delay : 0 edautes)	

Time	2	Event	Information Available to the Operator	Reference
	pressure was near the inf	s near the initiation setpoint of 1640 paig. He succeeded		
	in defeating train A, but	g train A, but train B did initiate. After 10 seconds		
	train 3 was bypassed.			
15:50:33	The following Incore Ther	The following Incors Thermocouple Temperatures decreased below 700F	AP norm/had font of range OF to 700F) (Dalay 2 0 minutes	A
(1931:10)	during the next four minu	during the meat four minutes. This was in response to Reactor		
	Coolent flow through the	Cooleat flow through the Resctor core as a result of starting		
	Reactor Coolest Pump lA (RC-F-1A).	(AC-P-1A).		
	98 = 468.37	138 - 546.37		
	78 = 465.9F	128 - 671.09		
	30 - 364.87			
15:55:03	The operator atapped Deca	The operator atopped Decay East Remyral Pumps (DS-F-1A and 13).	All and Ma(P _{Black}) at PLD. ST at PL3 and PL13 MB(A) at PL3	A
			AP norm/less and en/off (belny 2.0 minutes)	
15:56:06	The sperator etopped Base	The sporator etopped Easter Coolset Rabery Pesp 1C (161-7-10).	AB at 718, M(A) and ST at 713	28,5c
(1956:43)			AP moru/trip (Delay 2 0 minutes)	
16:56:59	The plant staff requested	taff requested the computer to print the following incore	UF (Delay 2 0 atuntes)	26,96
(2057136)	Theraccouple Dailot Top-	. Dallot Temperatures. The following values are recorded.		
	B - 00.00	Z - ****		
	76.804 - 80	SK - 348-67		
	W - 490.1P	78 - 377.99		
	20.000 - 78	48 - 326-67		
	9E - 637.67	98 = 540.47		
	77 - 249.77	111, - 211.57		
	7R - 505.49	12 332.17		
	NG = 347.69	138 - 000.07		
	% - *** - 9X			
	Des (***.*) tediestes	mees (***,*) indicates that the eignal was extende of the		

		TR 044, BP- 2	2 2 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3
ग्रन	Event	Information Available to the Operator	blores
(3100,00)	The operator increased the sitrogen cover gas presents on Core- Fiscal Yeaks IA and IB (CP-T-IA and IB) to 600 paig.	M(7) .: 7.4	R. a
17126-23	The operator operationery less Valve (DB-V-1B7) to properation for placing the factor less System in corride. It was letter decided out to use this made of tore coulding.	Date 2 comes of rom authorized the valve to be spend.	•
(3130:00)	The operator storing transferring the contents of the Austliary Building Sentralizer Tank (MDL-T-88) pre-accident water, to Unit 1. This was done to ollow mater in the Austliary Building Samp to be transferred in this tank.	Local indication of the had Weste Passi	3.3.3
1813A123 (2235100)	Nactor Coolest isidem flow mes lest. It is evaported plugging of either the leaders coolers, orifices or purification filters.	M(F) or 71.3	***
20,00:00 (P@0:37)	Beacter Coolent Pamp 1A (BC-P-A) was operating. Resetor coolent flow to the core had been re-established. The atem present in		

Resctor Coolent Habeup Pamp 19 (10-9-18) me operating supplying

believed to have a reactor contant aids to feeduater aids leak.

to the Main Condessor. Stone Constate B was included and use

Irays A and 3 had been condensed; hourser, a non-condessible gas

opace still enjeted in the Reactor Vessel head. The existance

of the gas space was not have by the operators. Reactor

Contain temperature and presents were stable at appreciately 240°P and 1165 paig with the presentiant level at 369 fuches. Becay heat mas being recoved by steaming Steam Generator A

Reference

Information Available to the Operator

Latiform had been lest ead on attempt to regain it was in progress. These redissective meterials were being released (through charcoal filters and sheelute filters) to the environment vis the station wat by their belidings vestilation system exhausts. To provide services and periodic ampling. Atthorns radioactive metarials for ecorage of water present in the Auxillary Building Sump, The Lanctor Building had been teelated except for executial Lanctor Coolent Pump Saal Injection Flow. Reactor Coolent ware present to the Auxiliary and Puel Banding Buildings. pre-accident water in the Autiliary Bollding Houtralizer Test (WDL-T-II) was being transferred to Unit 1.

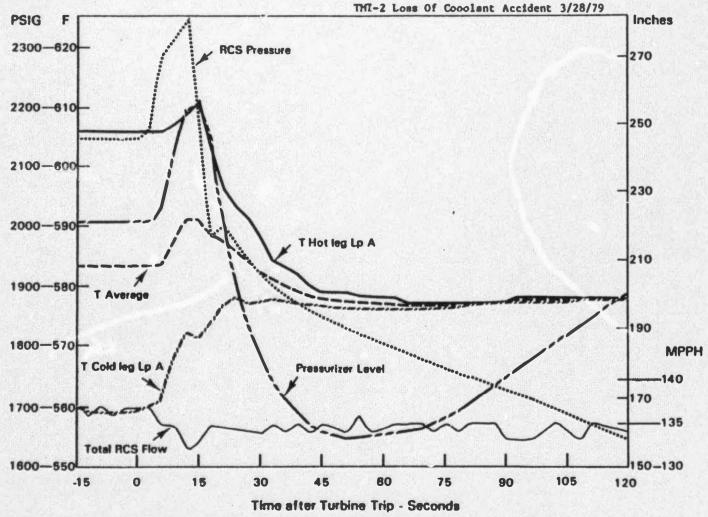


Figure 1 Summary of Reactor Coolant System Parameters

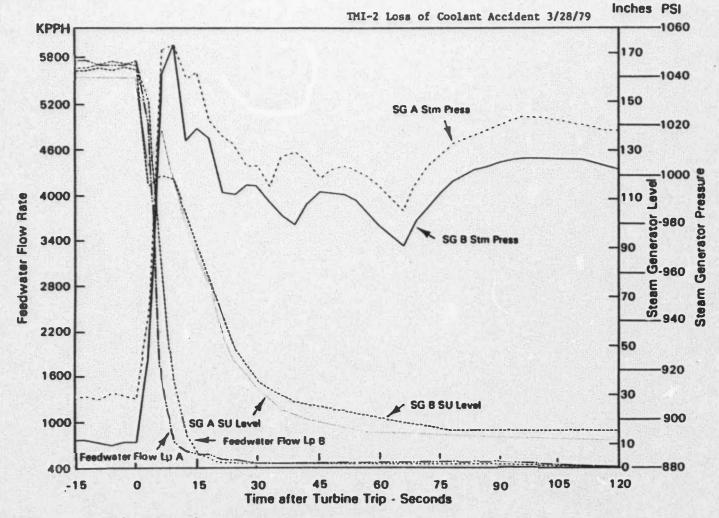


Figure 2 Summary of Steam Generator Parametera

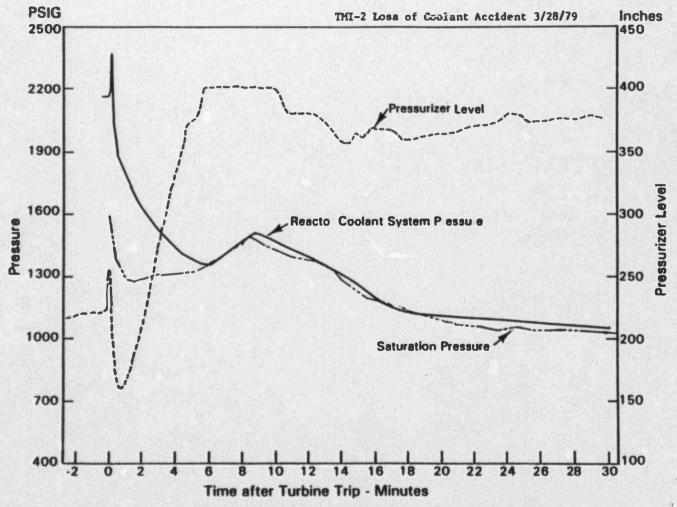


Figure 3 Reactor Coolant System Pressure, Saturation Pressure and Pressurizer Level

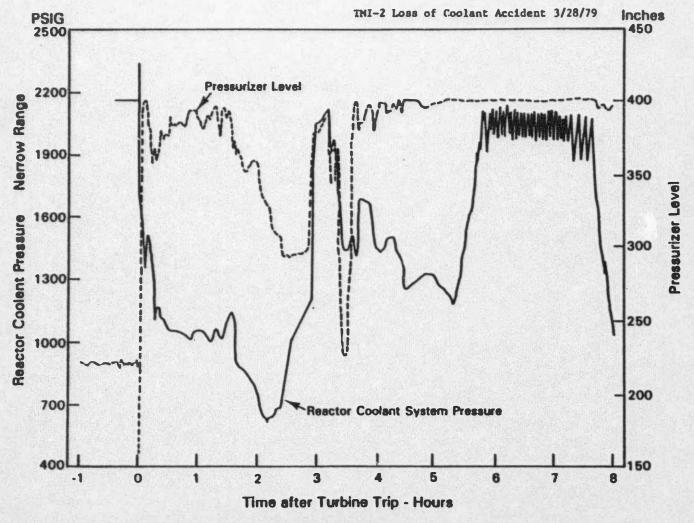


Figure 4 Reactor Coolant System Pressure and Pressurizer Level

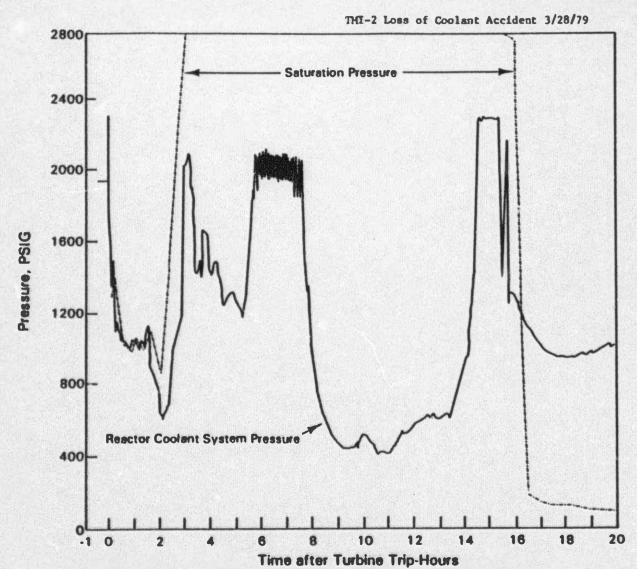


Figure 5 Reactor Coolant System Pressure and Saturation Pressure

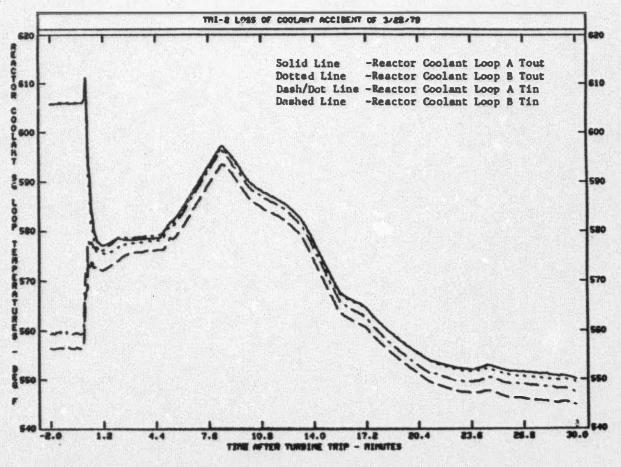


Figure 6 RCS Loop Temperature Vs Time After Turbine Trip

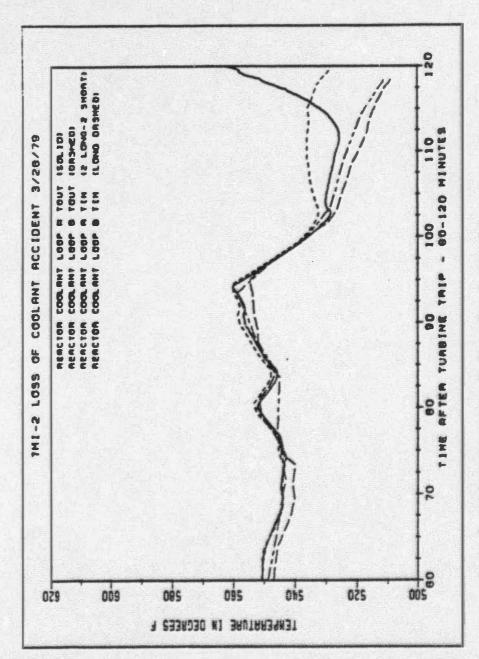


Figure 7 RCS Loop Temperature Ve Time after Turbine Trip

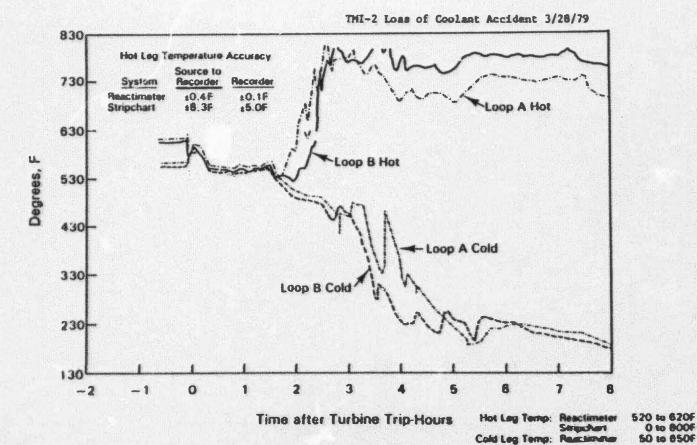


Figure 8 RCS Loop A and 8 Cold and Hot Leg Temperatures

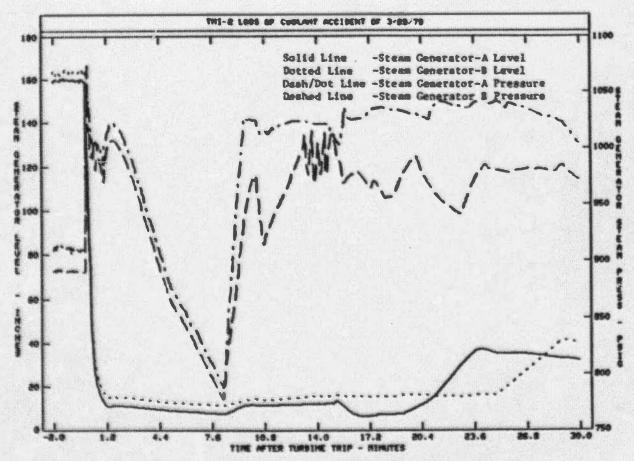


Figure 9 Steam Generator Level and Pressure Va Time after Turbine Trip

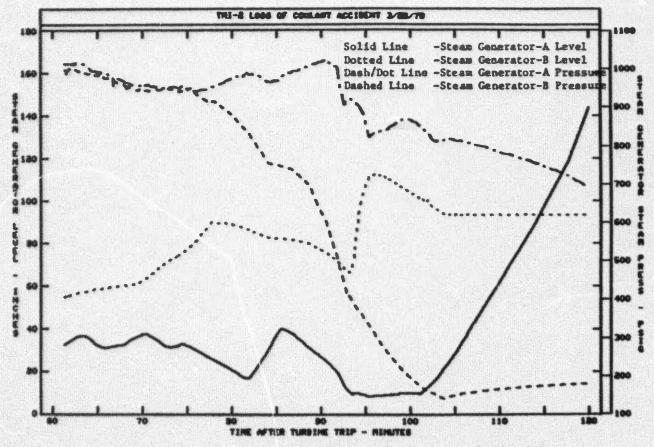


Figure 10 Steam Generator Level and Pressure Vs Time after Turbine Trip

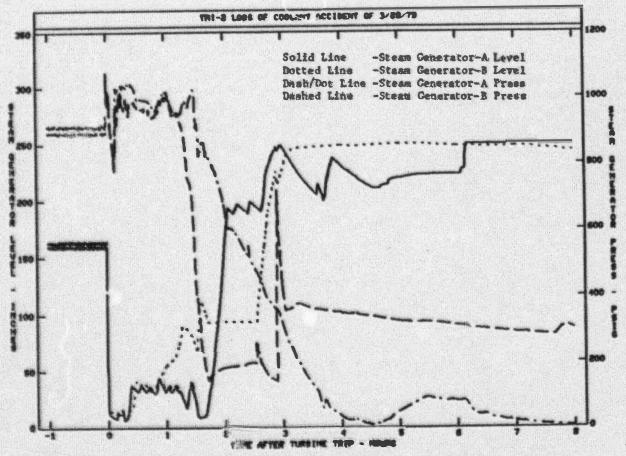
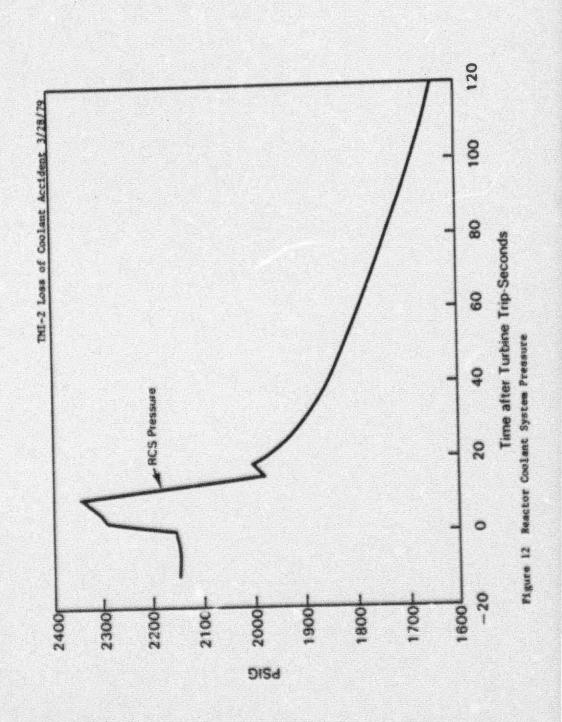


Figure 11 Steam Generator Level and Pressure Vs Time after Turbine Trip



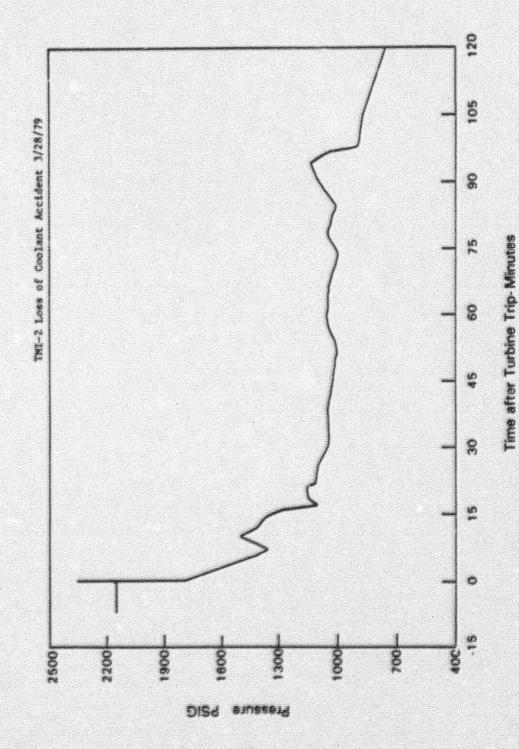
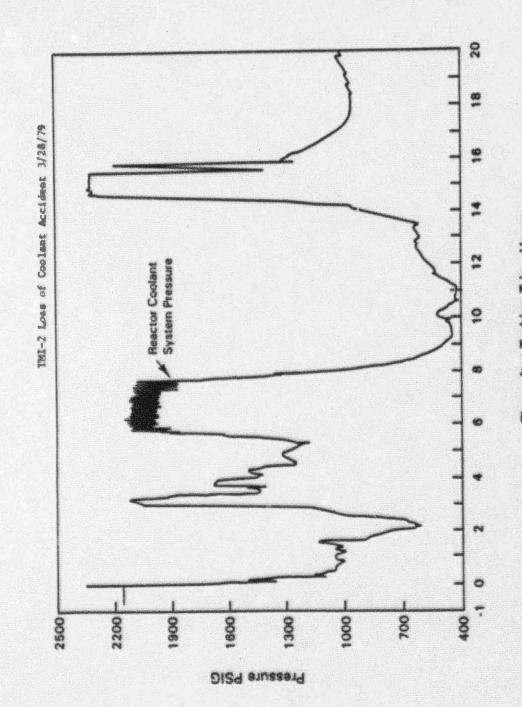


Figure 13 Reactor Coolant System Pressure

112



Time after Turbine Trip - Hours Pigure 16 Reactor Coolant System Pressure

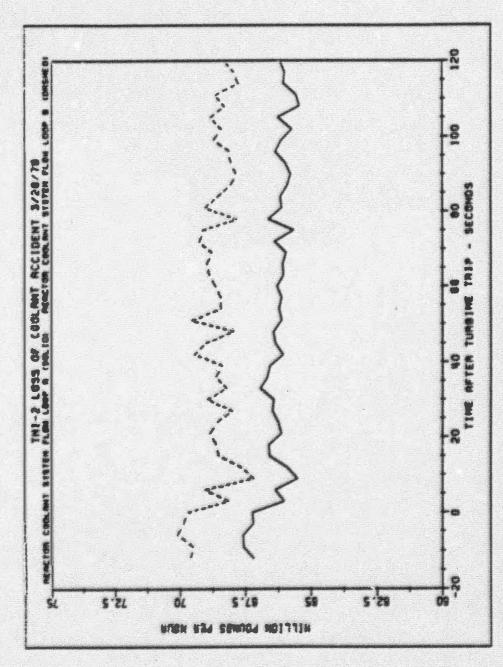
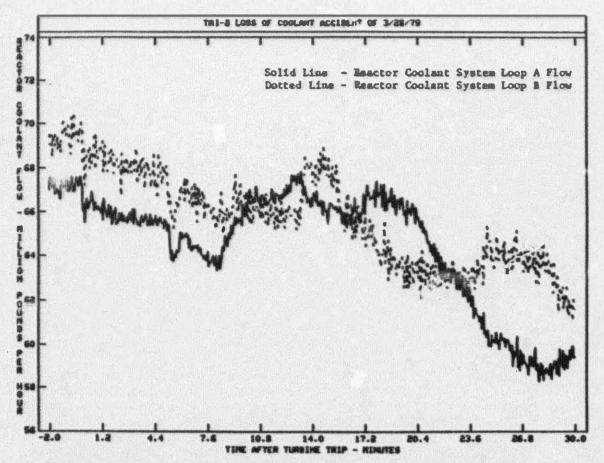
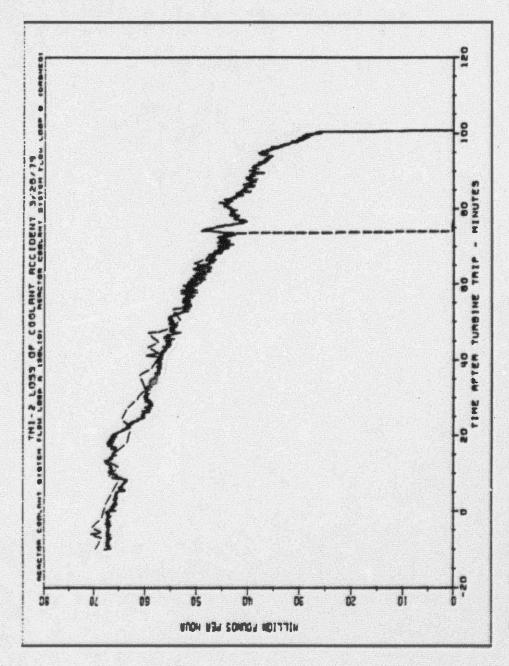


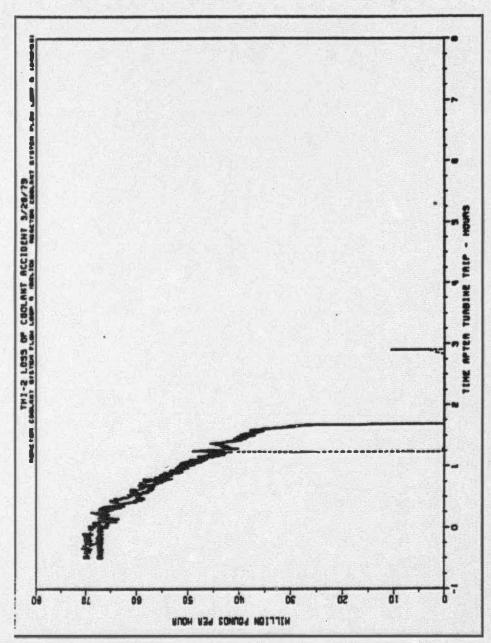
Figure 15 RCS Flow Rate Vs Time after Torbine Trip



Pigure 16 RCS Flow Rate Vs Time after Turbine Trip



Pigure 17 RCS Flow Rate Vs Time after Turbine Trip



Pigure 18 RCS Flow Rate Vs Time after Turbine Trip

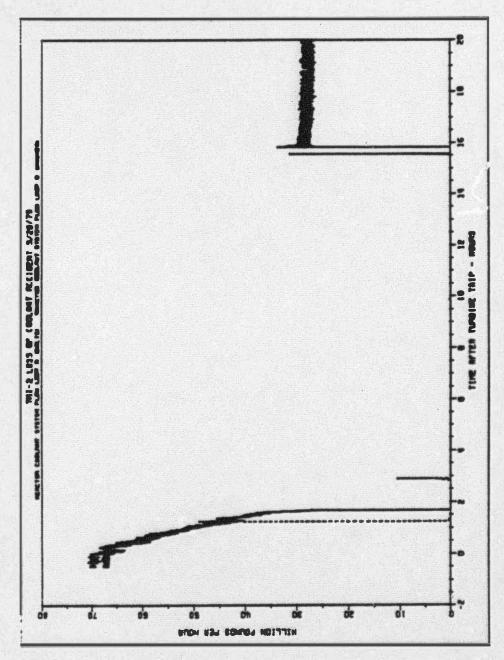
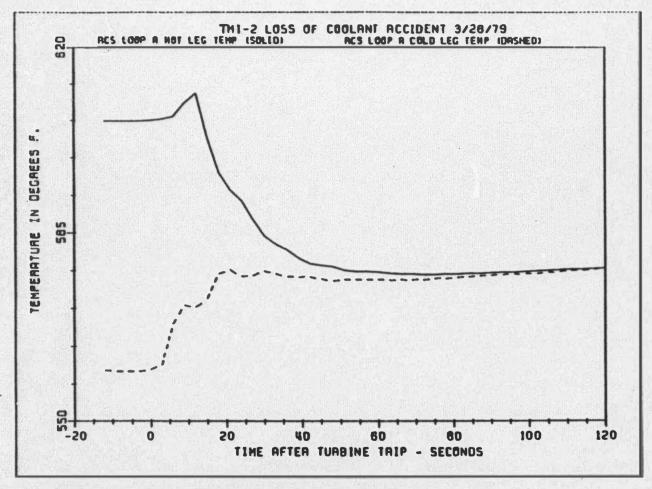


Figure 19 RCS Plow Rate Va Time after Turbine Trip



Pigure 20 RCS Loop A Temperature Vs Time after Turbine Trip

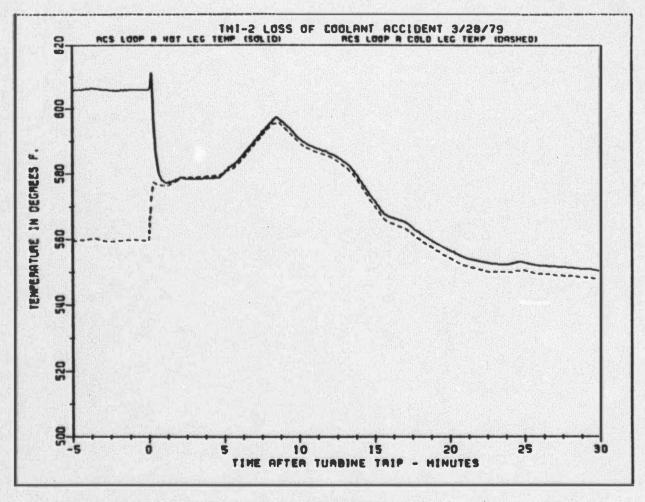


Figure 21 RCS Loop A Temperature Vs Time after Turbine Trip

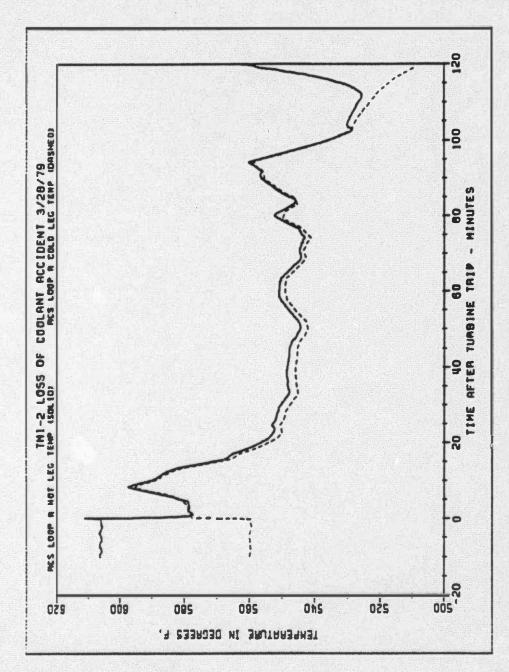


Figure 22 RCS Loop A Temperature Vs Time after Turbine Trip

Cold Leg Temp: Reactimeter

50 to 650F

Figure 23 RCS Loop A Cold and Hot Leg Temperatures

122

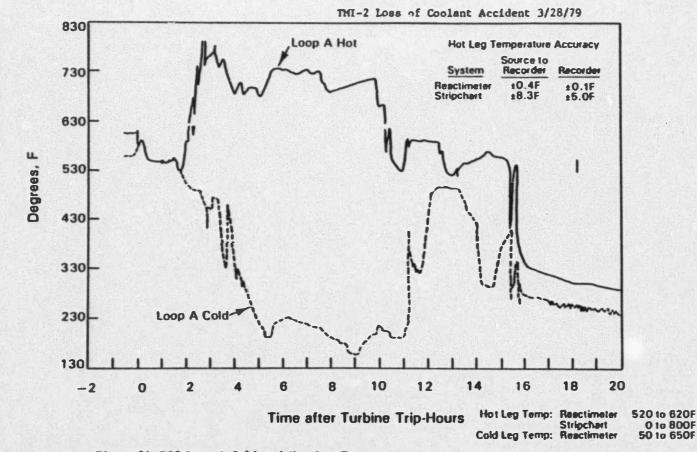


Figure 24 RCS Loop A Cold and Hot Leg Temperatures

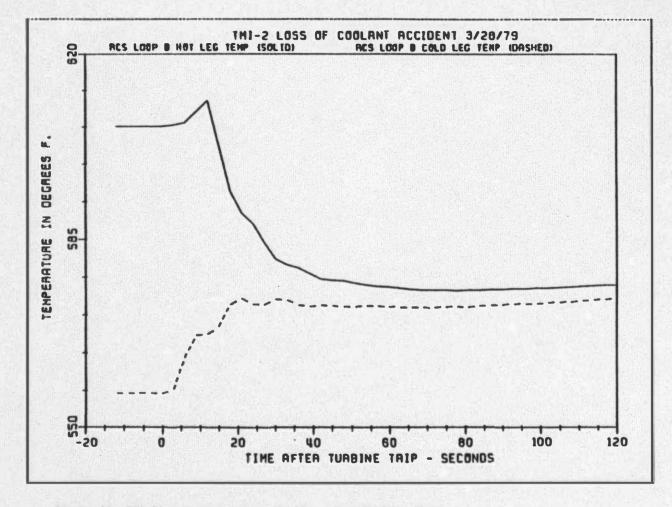
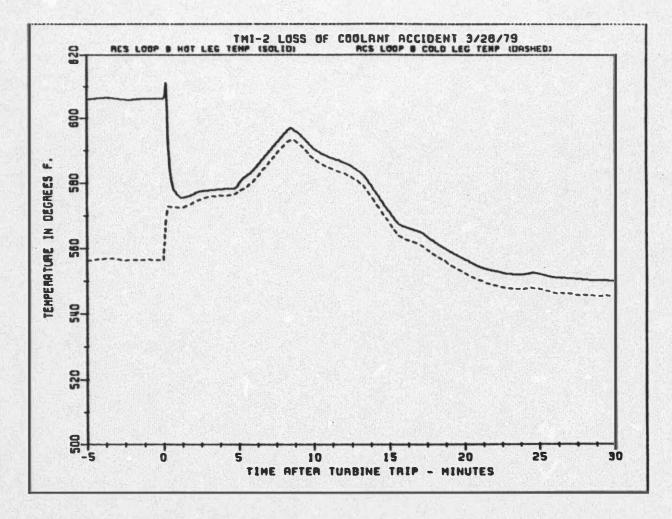


Figure 25 RCS Loop B Temperature Vs Time after Turbine Trip



Pigure 26 RCS Loop B Temperature Vs Time after Turbine Trip

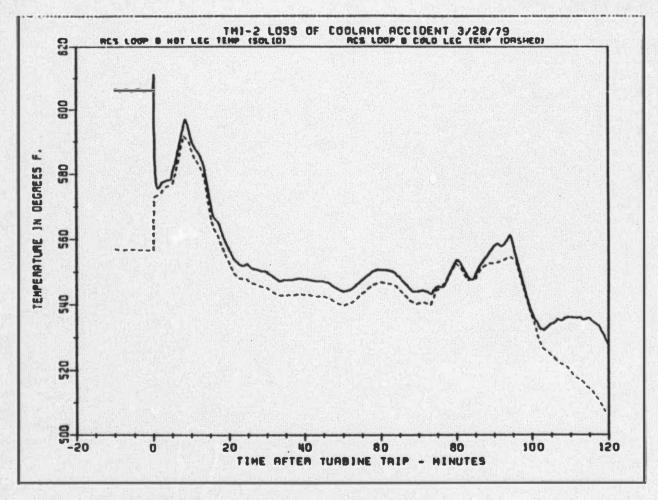


Figure 27 RCS Loop B Temperature Vs Time after Turbine Trip

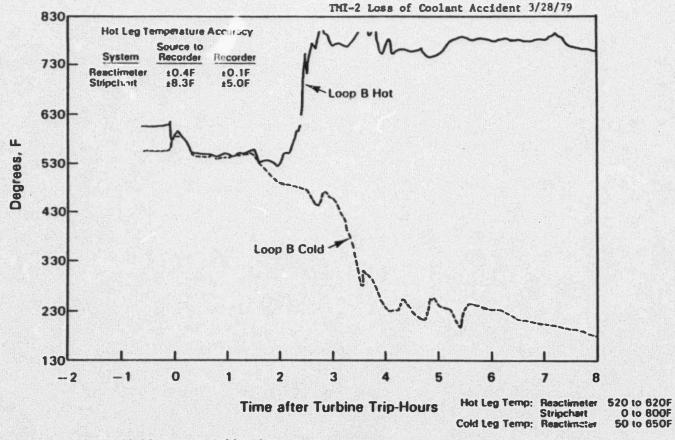


Figure 28 RCS Loop B Cold and Hot Leg Temperatures



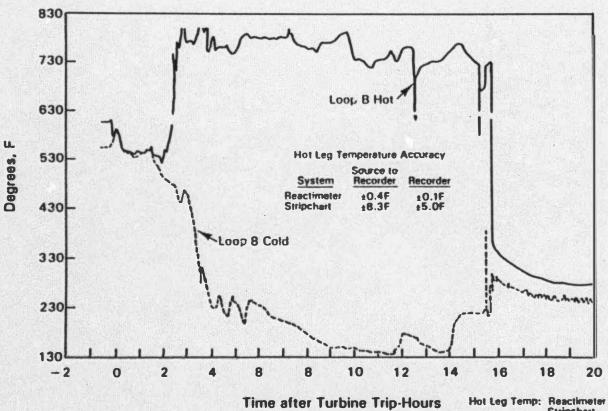


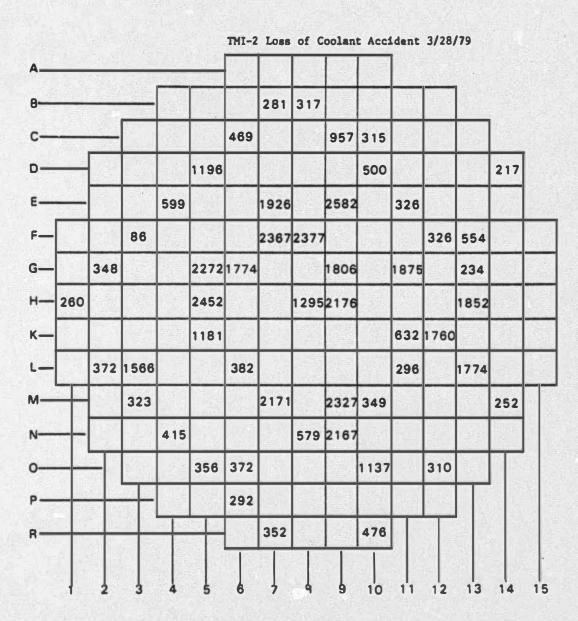
Figure 29 RCS Loop B Cold and Hot Leg Temperatures

Stripchart

520 to 620F 0 to 800F

Cold Leg Temp: Reactimeter

50 to 650F



Note: These values do not include connections for the reference junction which was reading approximately 75F.

Figure 30 Reactor Coolant System Exist Fuel Assembly Temperature at Approximately 04:59:23 (0900:00)

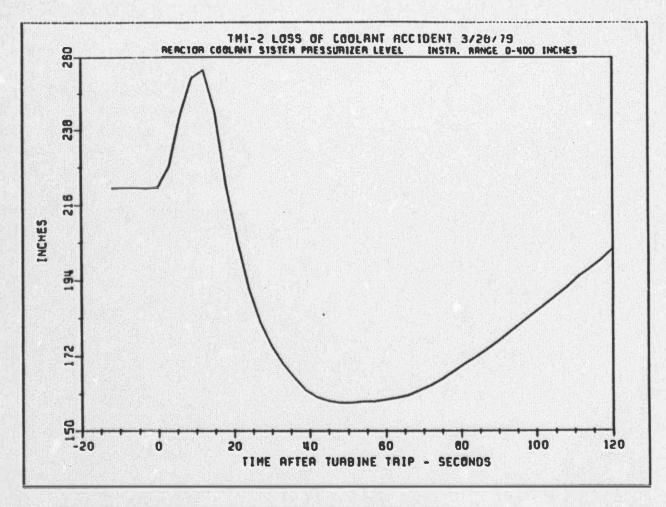
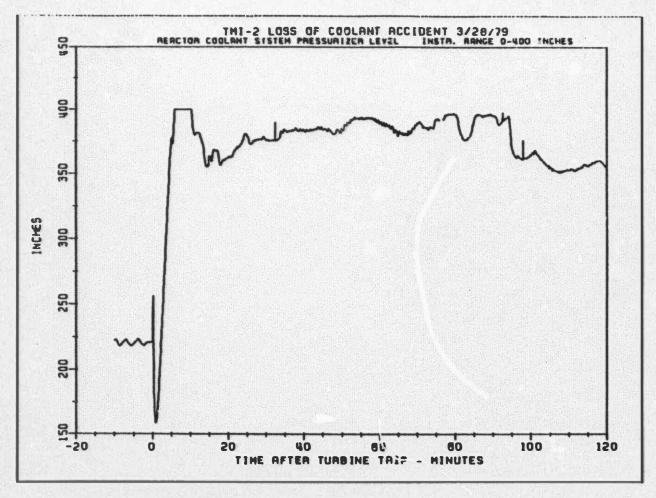


Figure 31 RCS Prossurizer Level Vs Time after Turbine Trip



Pigure 32 RCS Pressurizer Level Vs Time after Turbine Trip

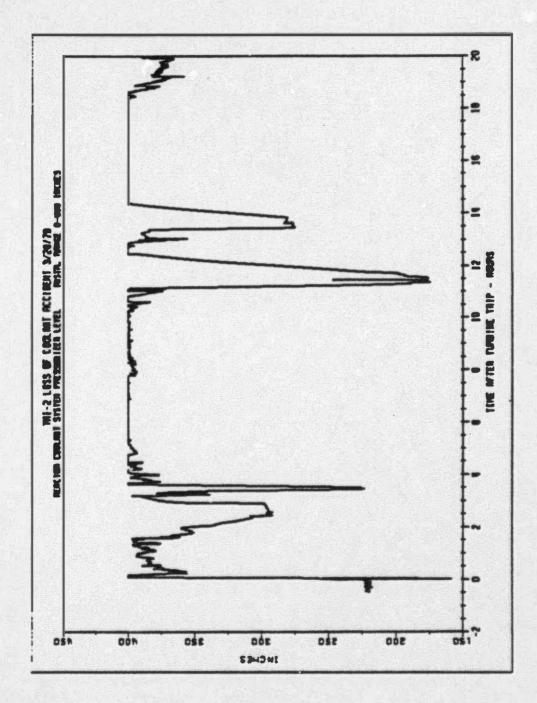


Figure 33 RCS Pressurizer Lavel Ve Time after Turbine Trip

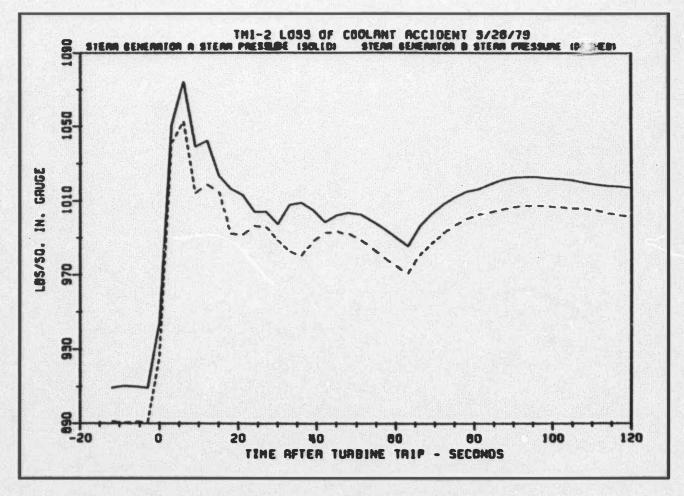


Figure 34 Steam Generator Steam Pressure Ve Time after Turbine Trip

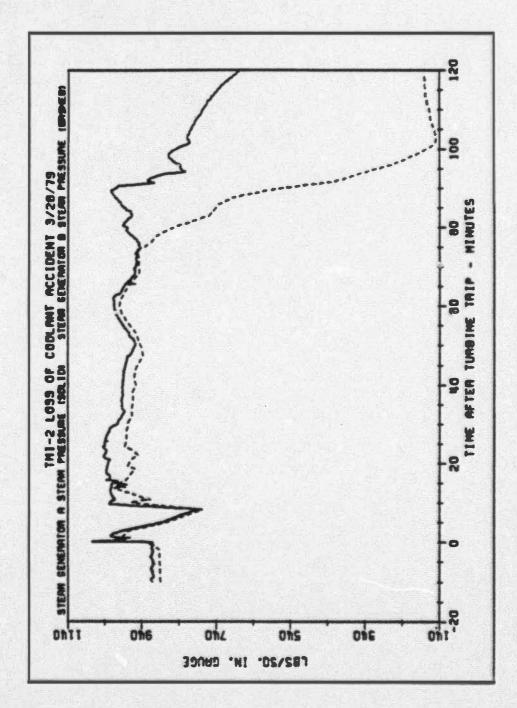
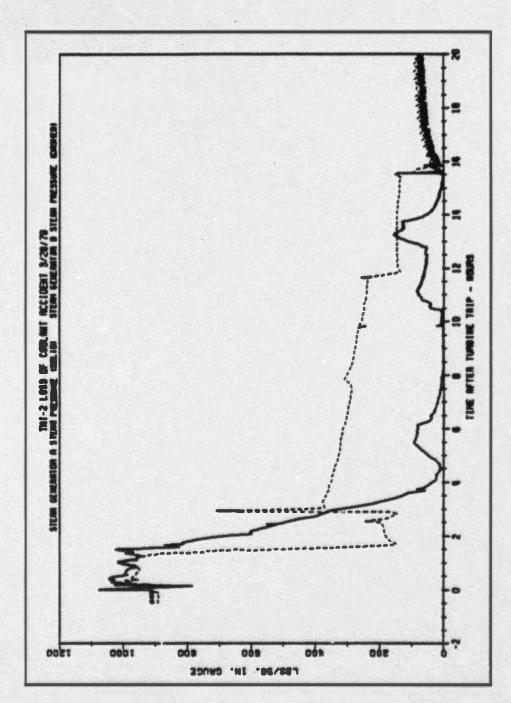


Figure 35 Steam Generator Steam Pressure Vs Time after Turbine Trip



Steam Generator Steam Pressure Vs Time ofter Turbine Trip Pigure 36

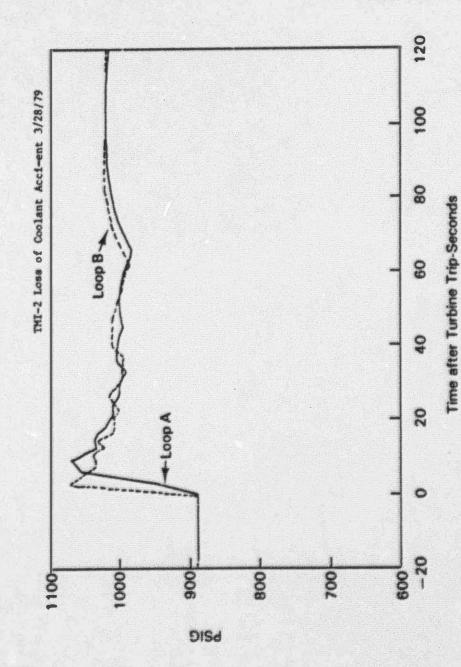


Figure 37 Turbine Header Pressure Loop A and Loop B

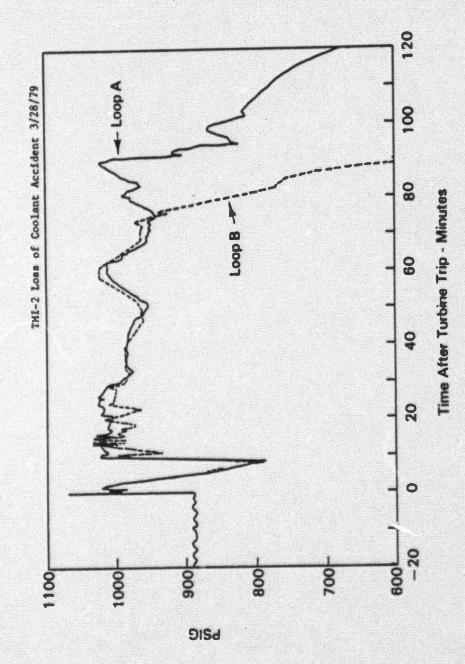


Figure 38 Turbine Header Pressure Loop A and Loop B

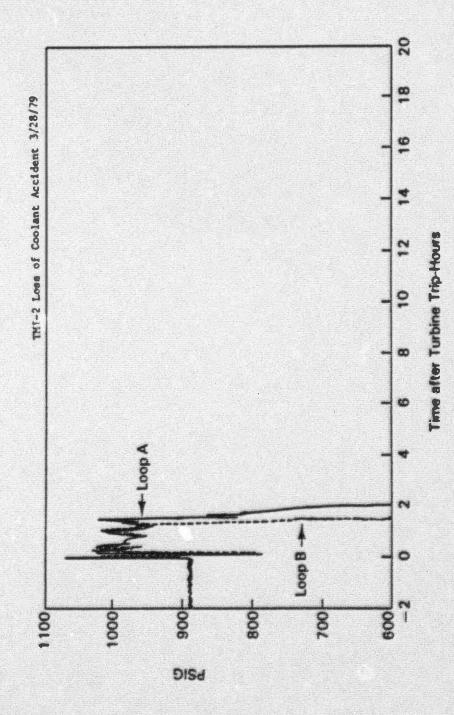


Figure 39 Turbine Reader Pressure Loop A and Loop B

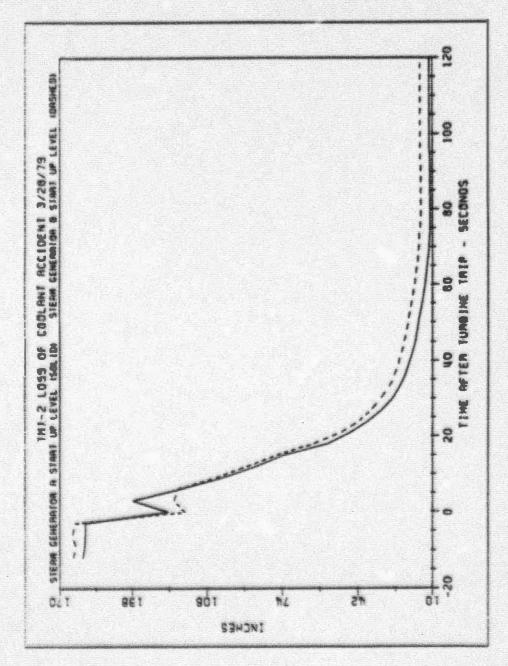


Figure 40 Steam Cenerator Level Vs Time after Turbine Irip

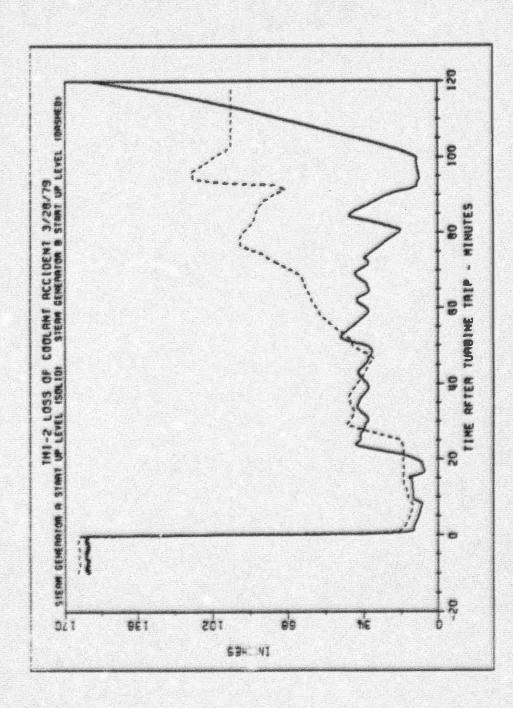


Figure 41 Stam Generator Level ow Time after Turbine frip

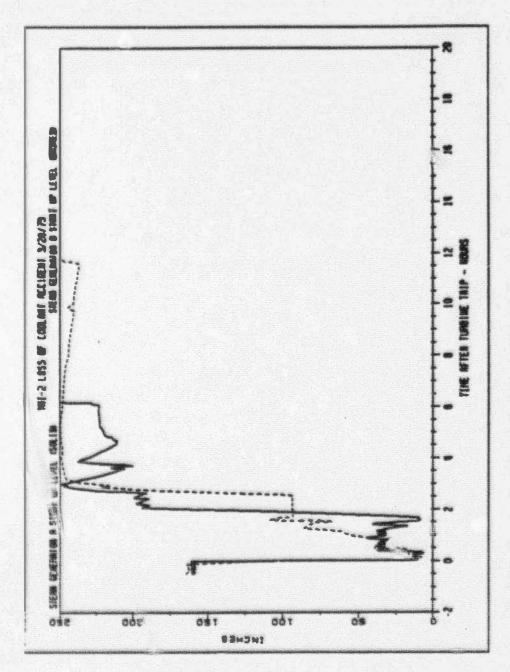


Figure 42 Steam Generator Level Va Time after Turbine Trip

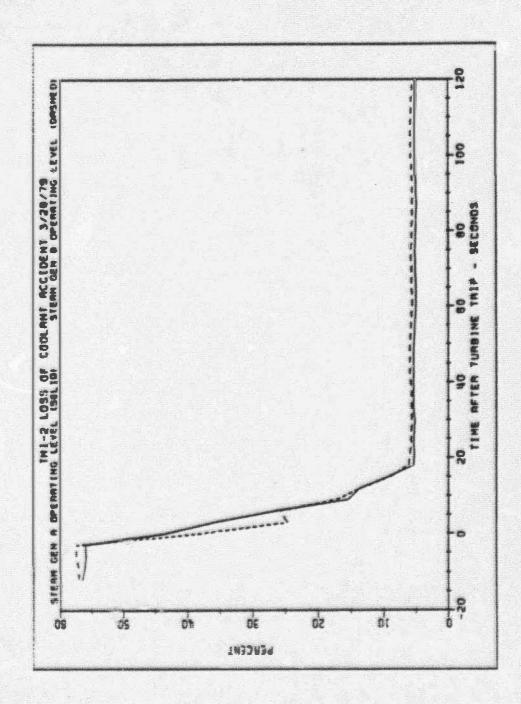
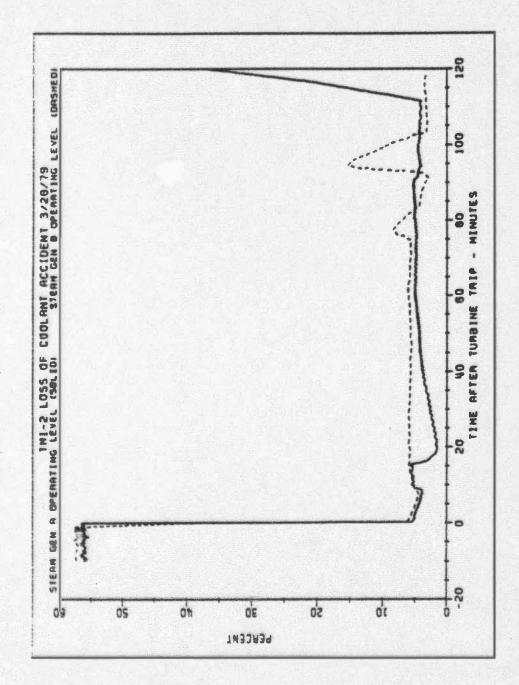


Figure 43 Steam Georgior Level Vs Time after Turbine Trip



Pigure 64 Steam Cenerator Level Ve Time after Turbine Trip

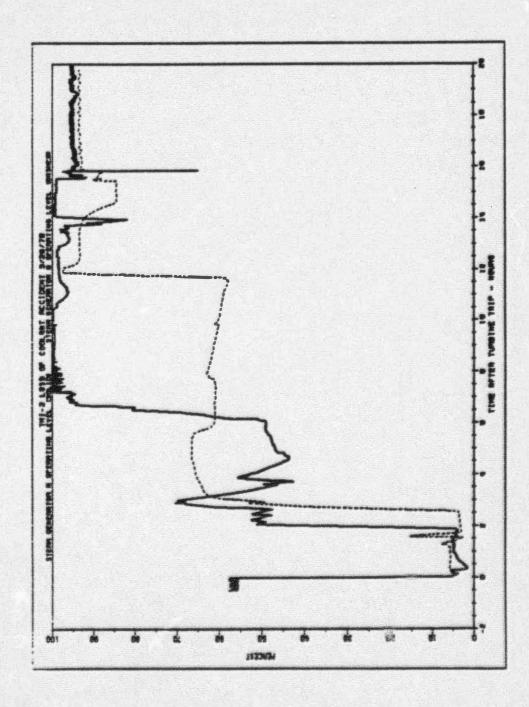
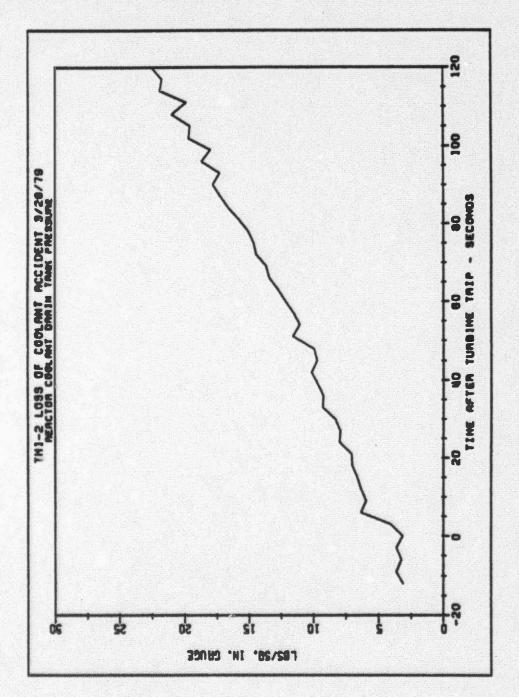
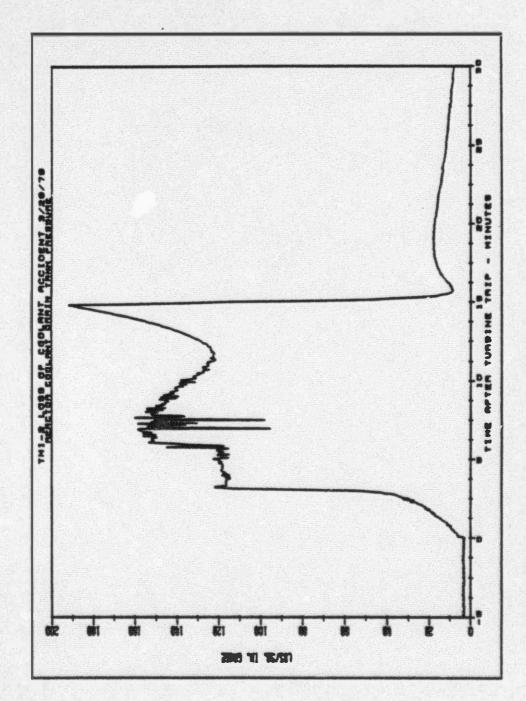


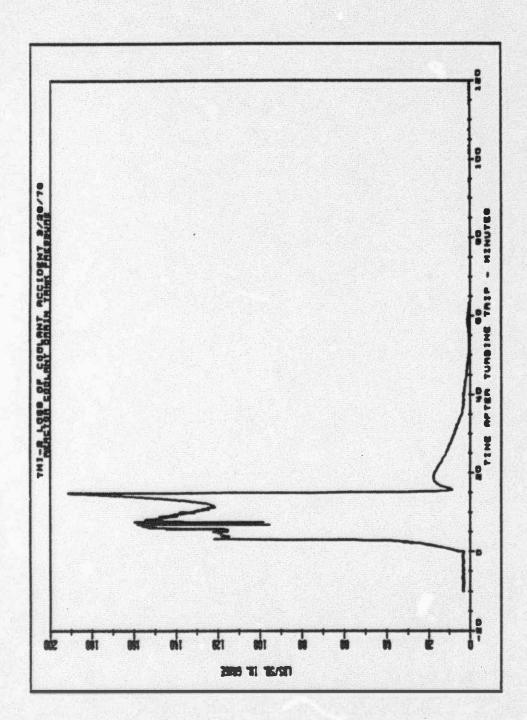
Figure 65 Stem Generator Level Ve Time after Turbine Trip



Pigure 46 RC Drain Tank Pressure Vs Time after Lirbine Trip



Pigure 47 RC Drain Tank Pressure Vs Time after Turbine Trip



Pigure 48 RC Drain Tank Pressure Vs Time after Turbine Trip

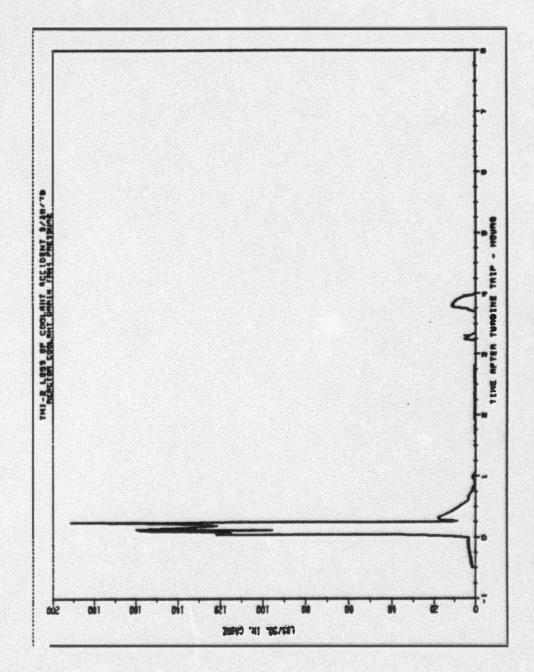
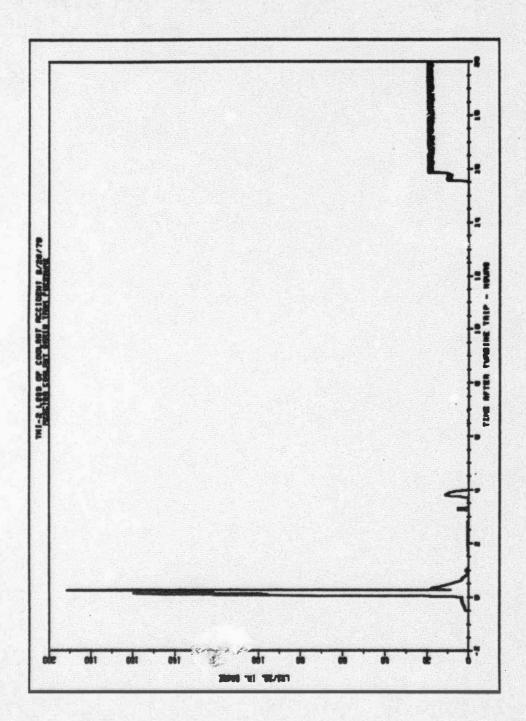


Figure 49 RC Drain Tank Pressure Vs Time After Turbine Trip



Pigure 50 RC Drain Tank Pressure Vs Time after Turbine Trip

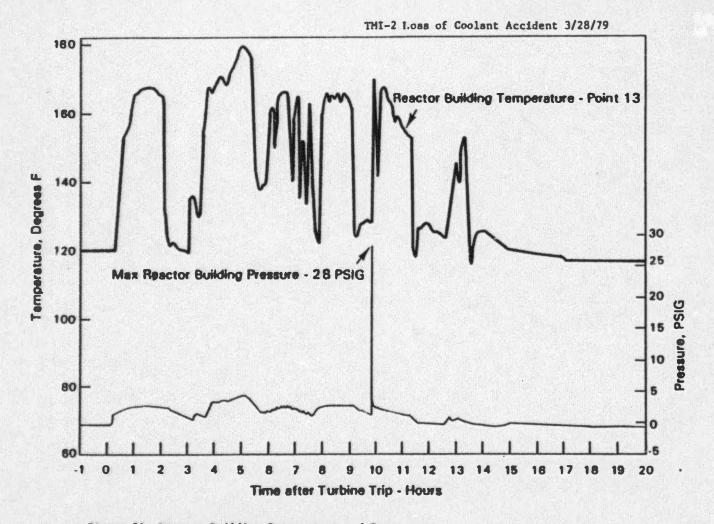
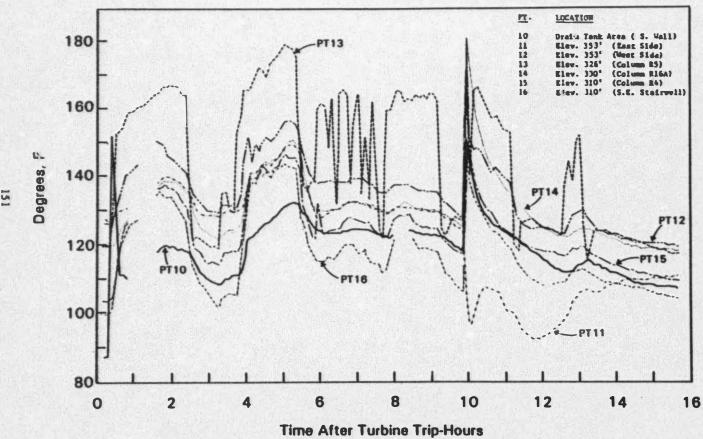


Figure 51 Reactor Building Temperature and Pressure

TMI-2 Loss of Coolant Accident 3/28/79



Pigure 52 R_x Building Temperature Recorder AH-YMTR-5017, Panel 25

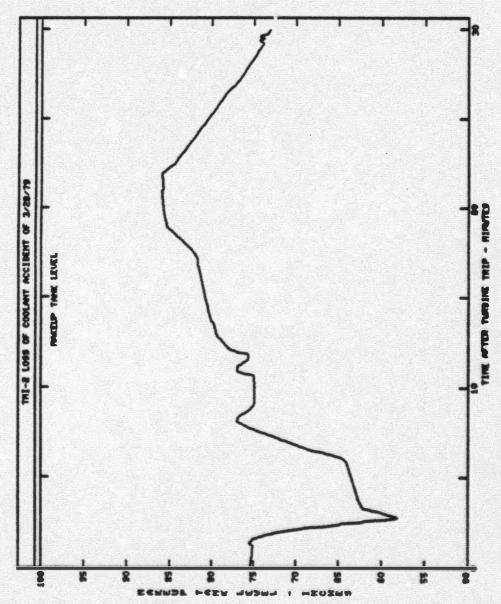
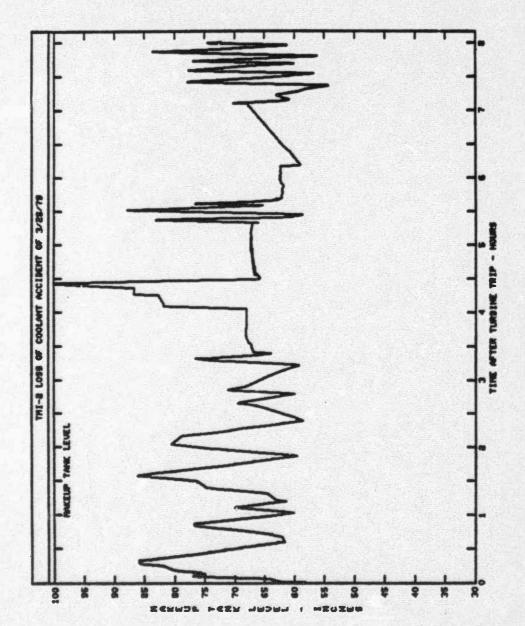


Figure 53 Makeup Tank Level Vs Time after Turbine Trip



Pigure 54 Makeup Tank Level Vo Time after Turbine Trip

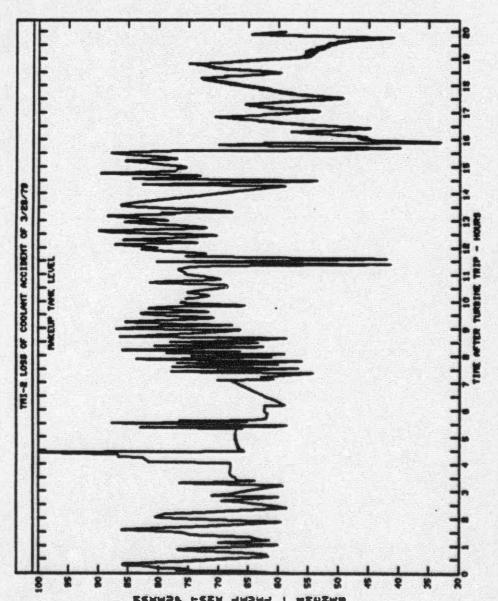


Figure 55 Makeup Tank Level Va Time after Turbine Trip

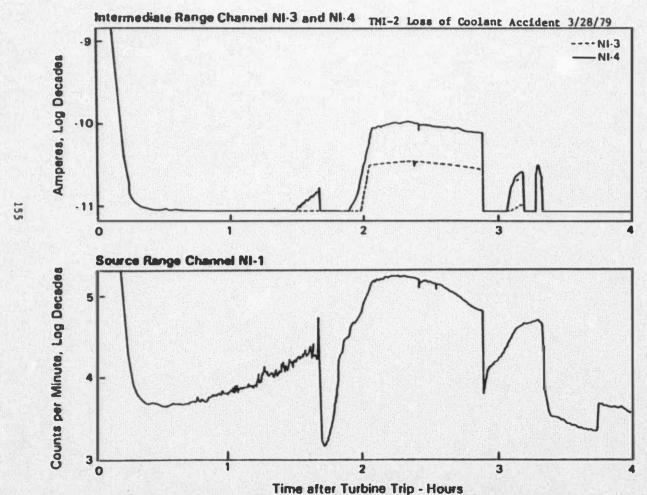


Figure 56 Intermediate and Source Range Nuclear Instrumentation

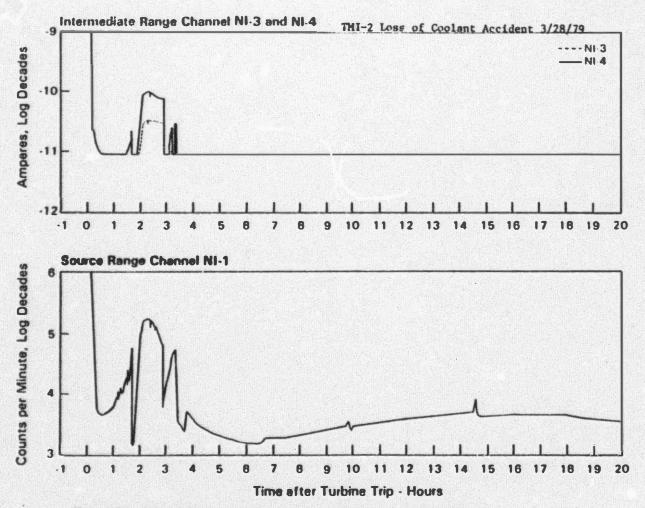


Figure 57 Intermediate and Source Range Nuclear Instrumentation

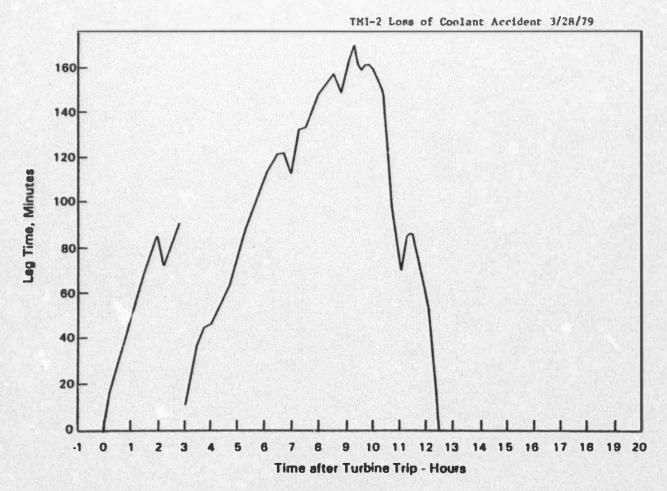
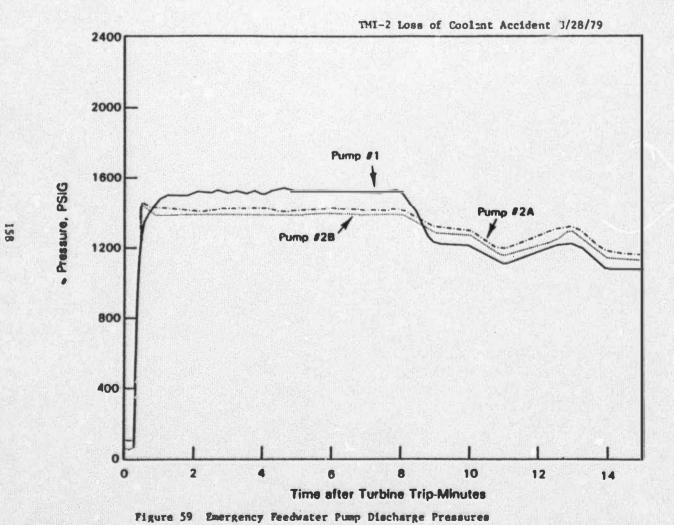


Figure 58 Computer Alarm Printer Lag Time



TMI-2 Loss of Coolant Accident 3/28/79 ğ ¥ OM O D BOTE 1 1 מוששיים מישים משרים נישים CAT MAT CAMES COOLING PURPS NEACTON COOLAST BAR HEAT MAI GENER PERS MARKET PROPERTY PROPERTY VACUUM PUMPS THE PERSON AND ADDRESS OF THE PERSON AND ADD SACTO COLAST NEWS LEARAGE TRANSFER PURPS STANDARY STANDARYS THE STATE OF THE PARTY OF THE P -20 P. 12 Party Party | 21.430

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Time After Turbine Trip-Hours

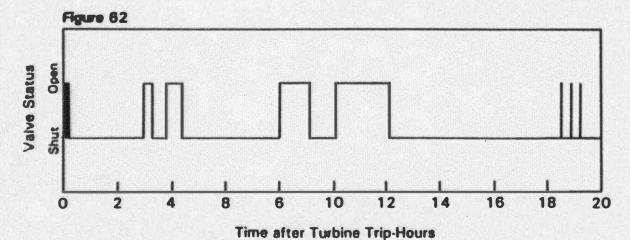
Note II: No computer printout is available which indicates when condensate pump 18 was secured or when

leakage transfer pumps 9A and 9B were started.

A Ran for short period (less than 5 minutes)
 ∇ Stop/start in less than 1 minute

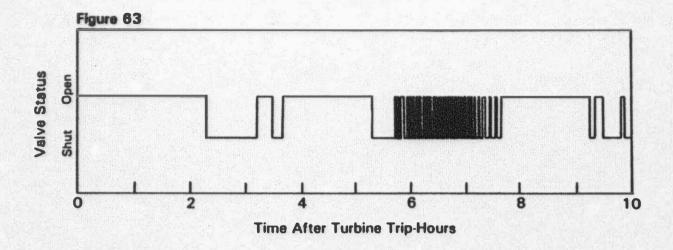
Start Run Stop

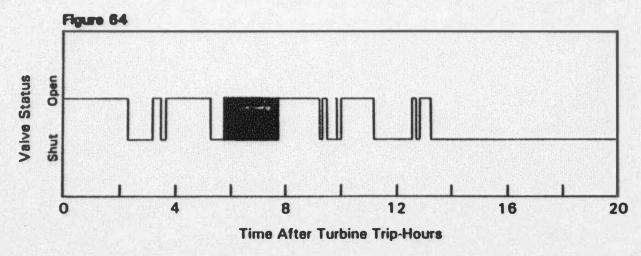
Figure 60 Pump Operating History



Figures 61 & 62 Pressurizer Spray Valve (RC-VI) Position

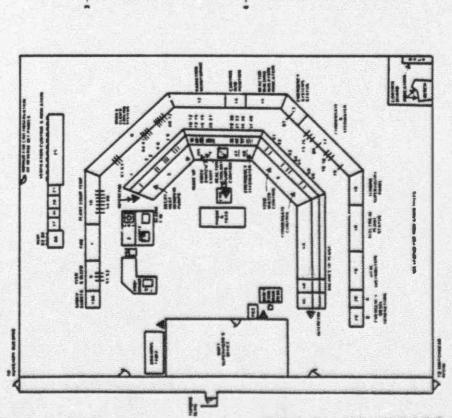
TMI-2 Loss of Coolant Accident 3/28/79





Figures 63 & 64 Electromatic Relief Block Vavle (RC-V2) Position

TMI-2 Loss of Coolant Accident 3/28/79



162

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Figure 65 Unit 2 Control Room Locations

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