PENNSTATE

College of Engineering

Radiation Science and Engineering Center

(814) 865-6351
Fax (814) 863-4840

Breazeale Nuclear Reactor Building
The Pennsylvania State University
University Park, PA 16802

August 23, 1991

Nuclear Regulatory Commission
Document Control Room
Washington, DC 20555

REF: Revision to the Safety Analysis Report
Penn State Breazeale Reactor
License No. R-2, Docket No. 50-05

Dear Sir or Madame:

On April 19, 1991, an amendment request was filed for the above-referenced license. The submittal included revisions to the Safety Analysis Report which introduced numerous new terms and acronyms related to the new reactor control system. For the convenience of the reader, a glossary was prepared and is hereby submitted as a further amendment to the Safety Analysis Report. Instructions for updating the report are as follows:

Remove Old Page		Insert New Page	
Number	Date	Number	Date
Title Page	4/19/91	Title Page	8/23/91
iv	4/19/91	iv	8/23/91
viii	4/19/91	viii	8/23/91
		ix	8/23/91
		VII-56	8/23/91
		VII-57	8/23/91

Sincerely,

M. H. Voth

Marcus H. Voth, Director
Radiation Science and Engineering Center

Attachments

MHV/tjw

cc: Charles L. Hosler
NRC Region I Administrator

9109090184 910823
PDR ADOCK 05000005
P PDR

A020
1/1

An Equal Opportunity University

Safety Analysis Report

for the

Penn State Breazeale Reactor

License Number R-2
Docket Number 50-05

The Pennsylvania State University
University Park, PA 16802

August 23, 1991

G. Systems Operation Description VII-20
1. Reactor Safety System Description VII-22
2. RSS Relay Logic Design VII-22
a. SCRAM Logic VII-24
b. Transient Rod Air Interlock Logic VII-25
c. Rod Drive Interlocks VII-26
H. PCMS Hardward Description VII-27
1. Computers VII-27
2. Input/Output Hardware VII-29
a. Chassis Arrangement and Watchdog/Test Cards VII-29
b. Analog Signal I/O Cards VII-30
c. Digital Signal I/O Cards VII-32
d. Watchdog and I/O Self Test Circuits VII-32
3. Motors and Associated Controllers VII-33
a. Motor Control VII-34
4. Power Supplies VII-37
5. I/O Assignment VII-37
I. PROTOL Generic Software Description VII-39
1. Control Language VII-39
2. The Operating System VII-40
3. Generic Tasks Running in the PROTROL System VII-41
4. System Self Checks and Defenses VII-42
a. Defenses Against Loss of Field Sensor VII-43
b. Defenses Against Loss of Power VII-43
c. Defenses Against I/O Failure VII-43
d. Defenses Against Computational Faults VII-44
e. Defenses Against Program Corruption Faults VII-44
5. DCC-X/DCC-Z Self Tests and Robustness Functions VII-45
a. Self Tests on Start Up VII-45
b. Self Tests While On Line VII-46
J. Application Software VII-48
1. Block Language Tasks VII-48
2. Non-Block Language Tasks VII-48
K. Control Room VII-50
1. General Description VII-50
2. Monitor Indications in the Control Room VII-50
L. Minimum Safety SCRAMS and Interlocks VII-53
M. References VII-55
N. Glossary VII-56
VIII. CONDUCT OF OPERATION VIII-1
A. Organization and Responsibility VIII-1
B. Reactor Operating Safety Philosophy VIII-1
C. Training VIII-3
D. Written Procedures VIII-3
E. Records VIII-4
F. Review and Audit of Records VIII-4

Safety Analysis Report

LIST OF EFFECTIVE PAGES

SAR - Title Page

Page i	August 23, 1991

SAR - Table of Contents

Pages ii - iii	April 19, 1991
Pages iv	August 23, 1991
Pages v	April 19, 1991

SAR - List of Figures

Pages vi - vii	April 19, 1991

SAR - List of Effective Pages

Pages viii - ix	August 23,1991

SAR-I Introduction

Pages 1-2	March 1, 1985

SAR-II Site Characteristics

Pages 1-10	March 1, 1985

SAR-III Reactor Design

Pages 1-23	April 19, 1991

SAR-IV Reactor Pool and Water System

Pages 1-8	April 19, 1991

SAR-V Facility Construction

Pages 1-4	March 1, 1985
Pages 5-6	April 19, 1991
Pages 7-10	March 1, 1985

SAR-VI Facilities and Experimenters

Pages 1-8	March 1, 1985
Pages 9-12	April 19, 1991
Pages 13-14	March 1, 1985

SAR-VII Reactor Safety, Protection, Control and Monitoring System

Pages 1-55	April 19, 1991
Pages 56-57	August 23, 1991

SAR-VIII Conduct of Operation

Pages 1-4	April 19, 1991

SAR-IX Safety Evaluation

Pages 1-28	March 1, 1985
Pages 29-30	April 19, 1991
Pages 31-48	March 1, 1985
Pages 49-53	April 19, 1991

N. GLOSSARY

TRADEMARKS

TRADEMARK	COMPANY
IBM, AT	International Business Machines Corporation
PROTROL	Atomic Energy of Canada Ltd.
Megatorque	Motornetics Corporation; subsidiary of Nippon Seiko K.K. (NSK)
TRIGA	General Atomics, San Diego, CA.

GLOSSARY

ADC	Analog to Digital Converter.
AI	Analog Input.
AO	Analog Output.
BIOS	Basic Input/Output System.
CANDU	Canada Deuterium Uranium Nuclear Power Reactors (PHWR).
CCTV	Closed Circuit Television.
CPI	Computer Products Inc.
CRC	Cyclic Redundancy Check Code- This is a polynomial based error detection method typically used for network systems. This is a Consultative Committee on international Telephony and Telegraphy (CCITT) standard.
CSS	Control and Safety System.
DAC	Digital to Analog Converter.
DBE	Design Basis Event
dec	Decades - 10 folds of fraction full power.
DEFPAR	Definable Parameter (***PROTROL*** block 0 tuning).
DCC	Digital Control Computer. The DCC-X computer performs all required protection, control, and monitoring functions. The DCC-Z computer performs only monitoring and historical data collection. The DCC-Z computer is not required to be operational for safe operation of the reactor.
DI	Digital Input.

DO	Digital Output.
DOS	Disk Operating System.
dps	Decades per Second.
EOT	End of Travel.
fac	Factor.
FC	Fission Chamber.
ffp	Fraction Full Power.
fps	Fractional Power (present value) per Second.
frac	Fraction.
GIC	Gamma Ion Chamber.
LED	Light Emitting Diode.
I/O	Input/Output.
ILDB	Interloop Data Base.
LAN	Local Area Network.
LN	Natural Logarithm.
LSS	Limiting Safety System.
PCMS	Protection, Control and Monitoring System.
PSBR	Penn State Breazeale Reactor.
PSU	Penn State University.
RAM	Random Access Memory.
RSS	Reactor Safety System.
SCRAM	Reactor Safety Shutdown
TC	Thermocouple.
TR	Transient Rod.

Watchdog Circuit A circuit consisting of a timer and a relay. The timer energizes the relay as long as it is reset prior to the expiration of the timing interval (see figure 7-7). If it is not reset within the timing interval, the relay will de-energize thereby causing a SCRAM. The term "kicked the watchdog" is slang for resetting the watchdog timer. The term "killed the watchdog" is slang for ceasing to reset the watchdog timer.

Wrap Around Describes the situation where an output signal is fed back so that the output signal can be verified (see figure 7-7).