July 6, 1989

Project No. 675

APPLICANT: Combustion Engineering Inc.

FACILITY: CESSAR-DC System 80+

SUBJECT: SUMMARY OF MEETING TO DISCUSS STAFF COMMENTS ON THE SYSTEM 80 BASELINE PRA IN SUPPORT OF THE SYSTEM 80+

On June 6-7, 1989, representatives of the NRC, Brookhaven National Lab (BNL) and Combustion Engineering met in Windsor, Connecticut to discuss concerns resulting from the staff's and BNL's review of the System 80 baseline PRA. The System 80 baseline PRA will be modified to reflect system design enhancements proposed for the System 80+ standard design such as improvements in the electrical distribution system and in the component cooling water system. Enclosure 1 is a list of meeting attendees. Enclosure 2 is the agenda followed during the meeting and the slides presented.

The first part of the meeting was a presentation by CE on the System 80+ standard design. A presentation was then given on the status of the System 80+ PRA and responses to NRC comments on the baseline PRA. CE has made design enchancements in the System 80+ standard design in response to previous comments by the NRC staff. Enclosure 3 provides a summary of the staff's and BNL's comments.

CE indicated they would respond to the staff's concerns discussed during this meeting and forwarded to them by letters dated December 15, 1988 and March 14, 1989. CE indicated that the final PRA for the System 80+ will be made in three submittals starting with the Fall of 1989 and ending in 1990.

In summary, the baseline PRA was generated from a generic BOP because the applicant didn't have sufficient detailed information during its development. Since the scope of the System 80+ has been expanded to include the BOP portions of the plant, CE will upgrade the System 80+ PRA to reflect the final design details of the plant using fault tree analysis methodology. CE indicated that the PRA now reflects changes made in the electrical distribution system and in the component cooling water systems. Other upgrades will be made as the design progresses.

8907140157 890706
PDR ADOCK 05000470
A PNU

/s/
Thomas J. Kenyon, Project Manager
Standardization and Non-Power
Reactor Project Directorate
Division of Reactor Projects - III, IV, V and Special Projects

Enclosures:
As stated

CONTACT:
T. Kenyon, NRR/PDSNP
492-1120

DISTRIBUTION:

Central File	OGC	EHylton
NRC PDR	EJordan	TKenyon
JSniezek	BGrimes	
PDSNP Reading	NRC Participants	
JMonniger	ACRS (10)	

DF03

PM:PDSNP	PM:PDSNP	D:PDSNP
JMonniger	TKenyon:cw	CMiller
07/5/89	07/ /89	07/6/89

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

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Division of Reactor Projects - III, IV, V and Special Projects

Enclosures:
As stated

CONTACT:
T. Kenyon, NRR/PDSNP
492-1120

Enclosure 1

ATTENDEES
PRA MEETING
CESSAR- DC SYSTEM 80±
June 6-7, 1989

Name	Organization
T. Kenyon	NRC/NRR/DRSP
S. Ritterbusch	CE Licensing
J. Monninger	NRC/NRR/DRSP
E. Kennedy	CE Licensing
G. Davis	CE Project Manager
C. Bagual	CE ALWR Project Office
D. Finnicum	CE PRA
B. Jaquita	CE PRA
R. Turk	CE ALWR Engineering Manager
R. Matzie	CE ALWR Director
T.L. Chu	BNL
B. Fitzpatrick	BNL
E. Chelliah	NRC/RES

AGENDA

MEETING WITH NRC STAFF ON S-80+ PRA

JUNE 6 - 7, 1989

TUESDAY

9:30	INTRODUCTIONS	S. RITTERBUSCH
9:45	OVERVIEW OF THE SYSTEM 80+ DESIGN	R. MATZIE
10:45	STATUS OF PRA AND RESPONSES TO NRC COMMENTS	D. FINNICUM R. JAQUITH
12:00	LUNCH	
1:00	PRA . . .	
3:00	SUMMARY OF SIR DESIGN	R. TURK

WEDNESDAY

9:00	PRA . . .	
12:00	LUNCH	
1:00	MEETING SUMMARY AND REVIEW OF ACTION ITEMS	S. RITTERBUSCH

MEETING WITH NRC STAFF ON
SYSTEM 80+ PRA

JUNE 6-7, 1989

OVERVIEW OF THE SYSTEM 80+ DESIGN

R. A. MATZIE
ALWR PROJECT OFFICE DIRECTOR

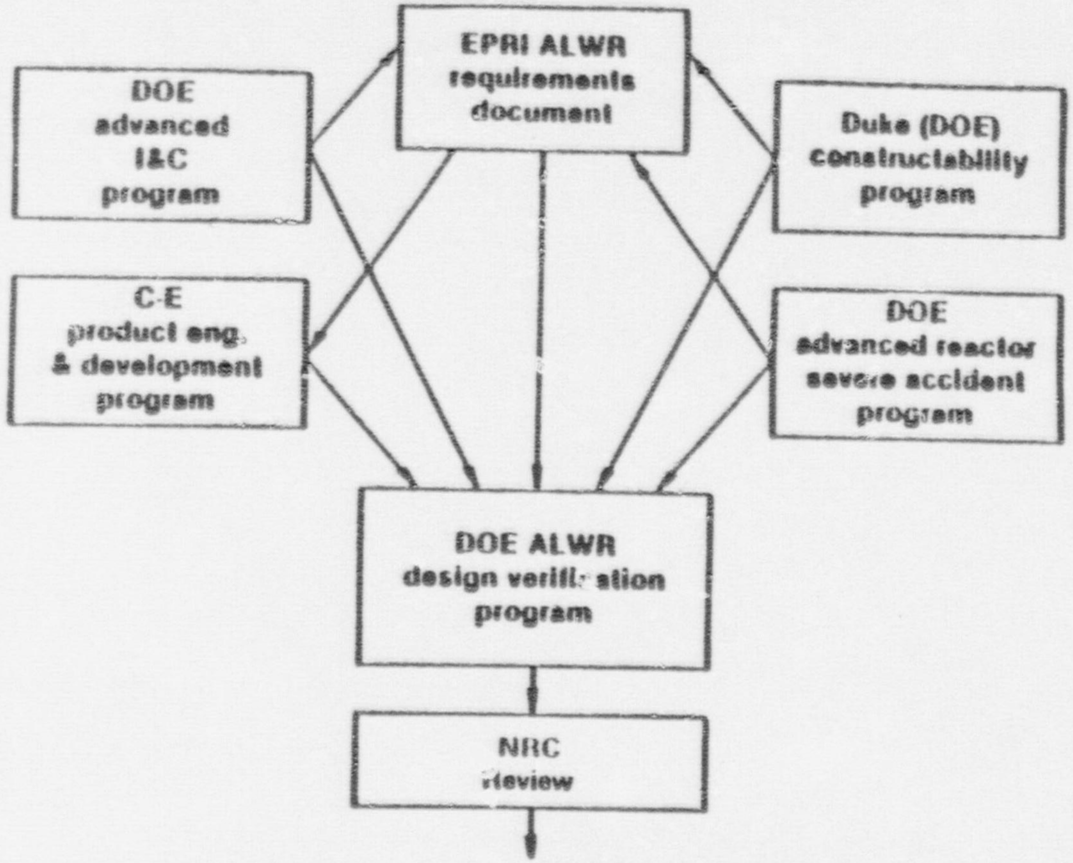
SYSTEM 80+

PROGRAM OUTLINE

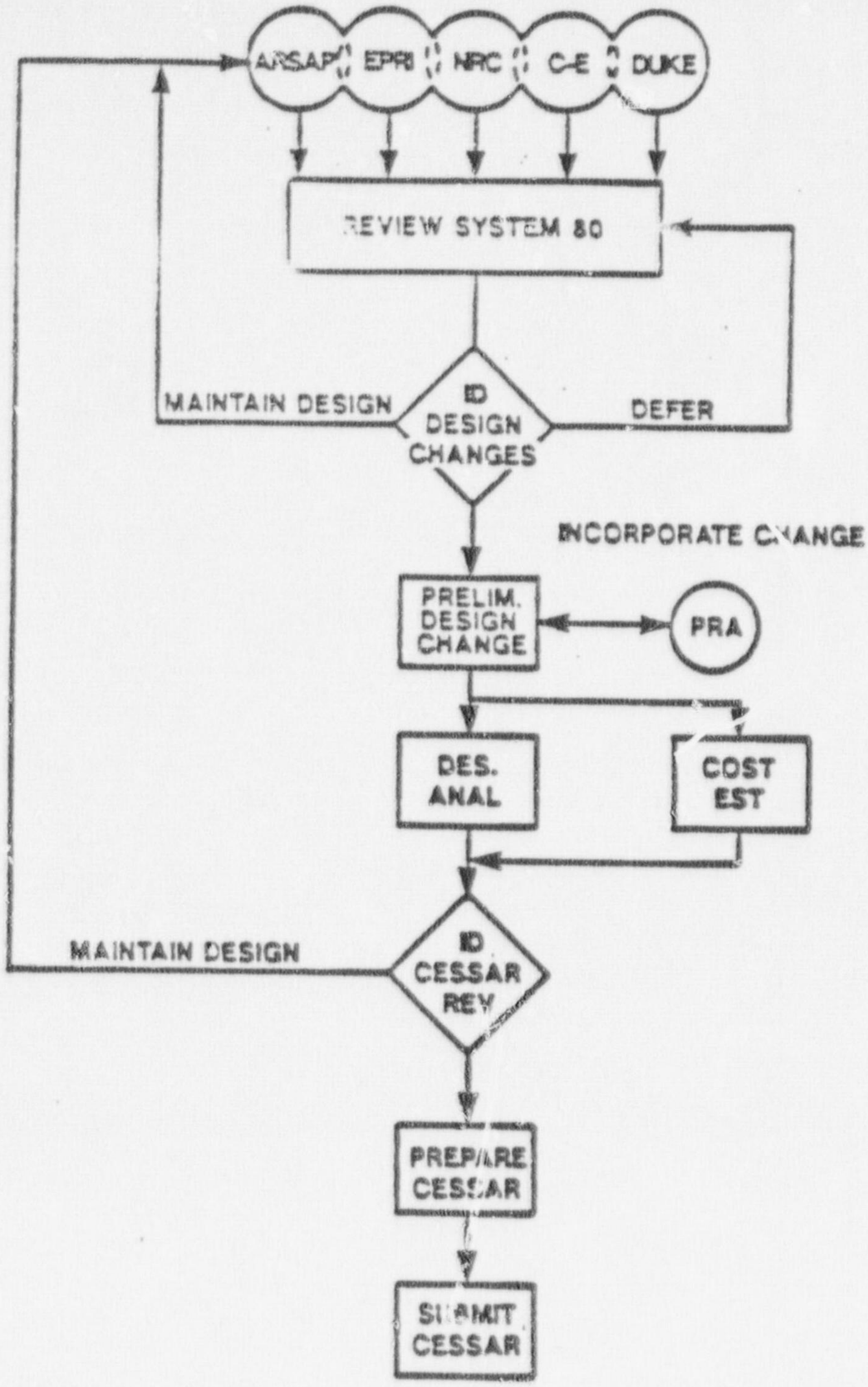
- O START WITH SYSTEM 80 STANDARD DESIGN (DESCRIBED IN CESSAR-F)
- O IMPLEMENT CHANGES TO REFLECT:
  - O EPRI ALWR REQUIREMENTS DOCUMENT
  - O C-E/DUKE DESIRED IMPROVEMENTS
  - O NRC SEVERE ACCIDENT POLICY & STANDARDIZATION RULE
- O MODIFIED DESIGN SUBMITTED TO NRC, IN STAGES, FOR CERTIFICATION REVIEW
- O REVISED DESIGN CALLED SYSTEM 80 PLUS
- O REVISED LICENSING DOCUMENT CALLED CESSAR-DC

SYSTEM 80+

C-E ALWR Program



CERTIFIED SYSTEM 80+™ DESIGN



THE SYSTEM 80+ DESIGN PROCESS

SYSTEM 80 ATTRIBUTES

0 PROVEN, STANDARDIZED DESIGN

0 ENGINEERED WITH FIVE DIFFERENT BALANCE-OF-PLANT DESIGNS

0 IN OPERATION AND SETTING WORLD RECORDS AT PALO VERDE

0 FINAL DESIGN APPROVAL FROM NRC

0 100% DESIGN DETAIL

0 OPERATIONAL FEEDBACK INCORPORATED

SYSTEM 80+

DESIGN CERTIFICATION PROGRAM

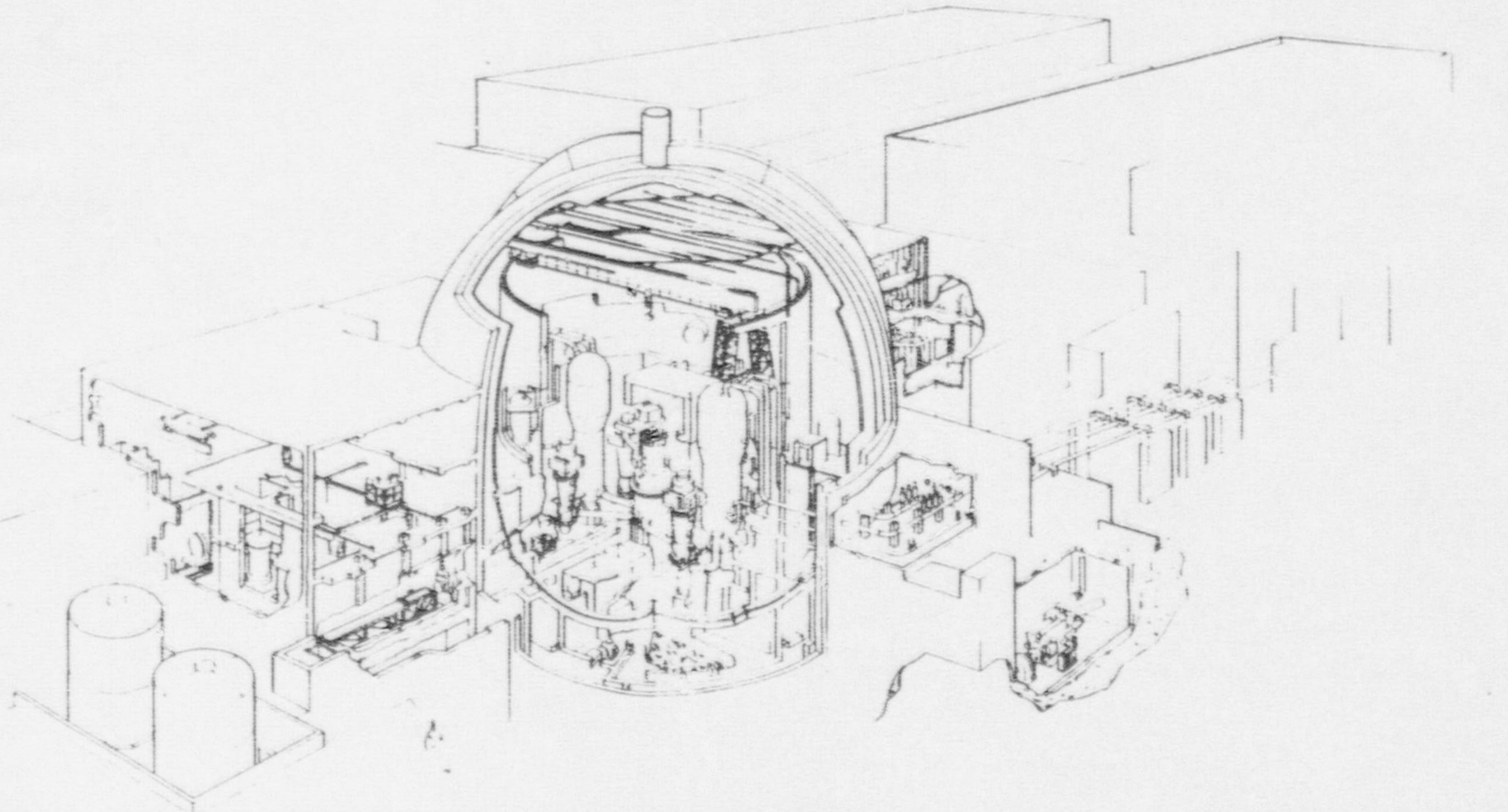
EXPANDED SCOPE

0 CURRENT SYSTEM 80 DESIGN INCLUDES NUCLEAR STEAM SUPPLY SYSTEM (NSSS)

0 SYSTEM 80+ DESIGN INCLUDES THE ENTIRE PLANT

- NSSS
- EMERGENCY FEEDWATER SYSTEM
- CONTAINMENT
- ADVANCED CONTROL COMPLEX (NUPLEX 80+)
- BALANCE OF PLANT

SYSTEM 80+™



SYSTEM 80 PLUS STANDARDIZED PLANT

SYSTEM 80+

WHAT IS NOT IN SYSTEM 80+ SCOPE?

10 CFR 52 STATES:

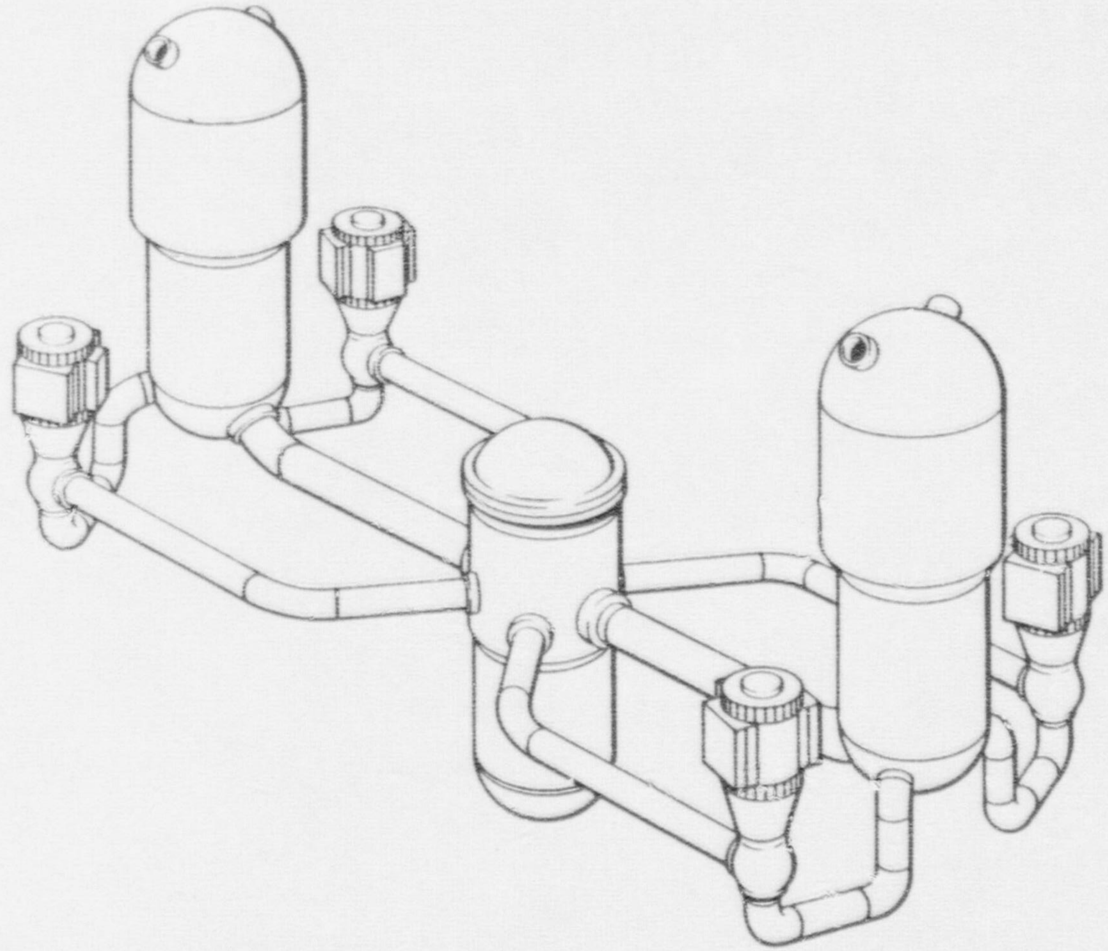
AN "ESSENTIALLY COMPLETE NUCLEAR PLANT" DESIGN IS ONE THAT INCLUDES "ALL STRUCTURES, SYSTEMS, AND COMPONENTS WHICH CAN AFFECT SAFE OPERATION OF THE PLANT EXCEPT FOR SITE-SPECIFIC ELEMENTS SUCH AS THE SERVICE WATER INTAKE STRUCTURE AND THE ULTIMATE HEAT SINK. THEREFORE, THOSE PORTIONS OF THE DESIGN THAT ARE EITHER SITE SPECIFIC (SUCH AS THE SERVICE WATER INTAKE STRUCTURE OR THE ULTIMATE HEAT SINK) OR INCLUDE STRUCTURES, SYSTEMS, AND COMPONENTS WHICH DO NOT AFFECT THE SAFE OPERATION OF THE FACILITY (SUCH AS WAREHOUSES AND SEWAGE TREATMENT FACILITIES) MAY BE EXCLUDED FROM THE SCOPE OF DESIGN."

NOT INCLUDED IN SYSTEM 80+: (IF SAFETY-RELATED, INTERFACE REQUIREMENTS ARE PROVIDED)

- SERVICE WATER INTAKE STRUCTURE
- ULTIMATE HEAT SINK
- WAREHOUSES
- SEWAGE TREATMENT FACILITIES
- POTABLE AND SANITARY WATER
- SWITCHYARD
- TRAINING FACILITIES
- OFFICE SPACE OUTSIDE THE CONTROL COMPLEX
- EMERGENCY OPERATIONS FACILITY

MAJOR DESIGN FEATURES
OF
SYSTEM 80 PLUS

- O MORE FORGIVING REACTOR COOLANT SYSTEM
- O ADVANCED CONTROL ROOM DESIGN
- O HIGHLY RELIABLE SAFEGUARDS SYSTEMS
- O LARGE, DRY SPHERICAL CONTAINMENT
- O INTEGRATED DESIGN APPROACH

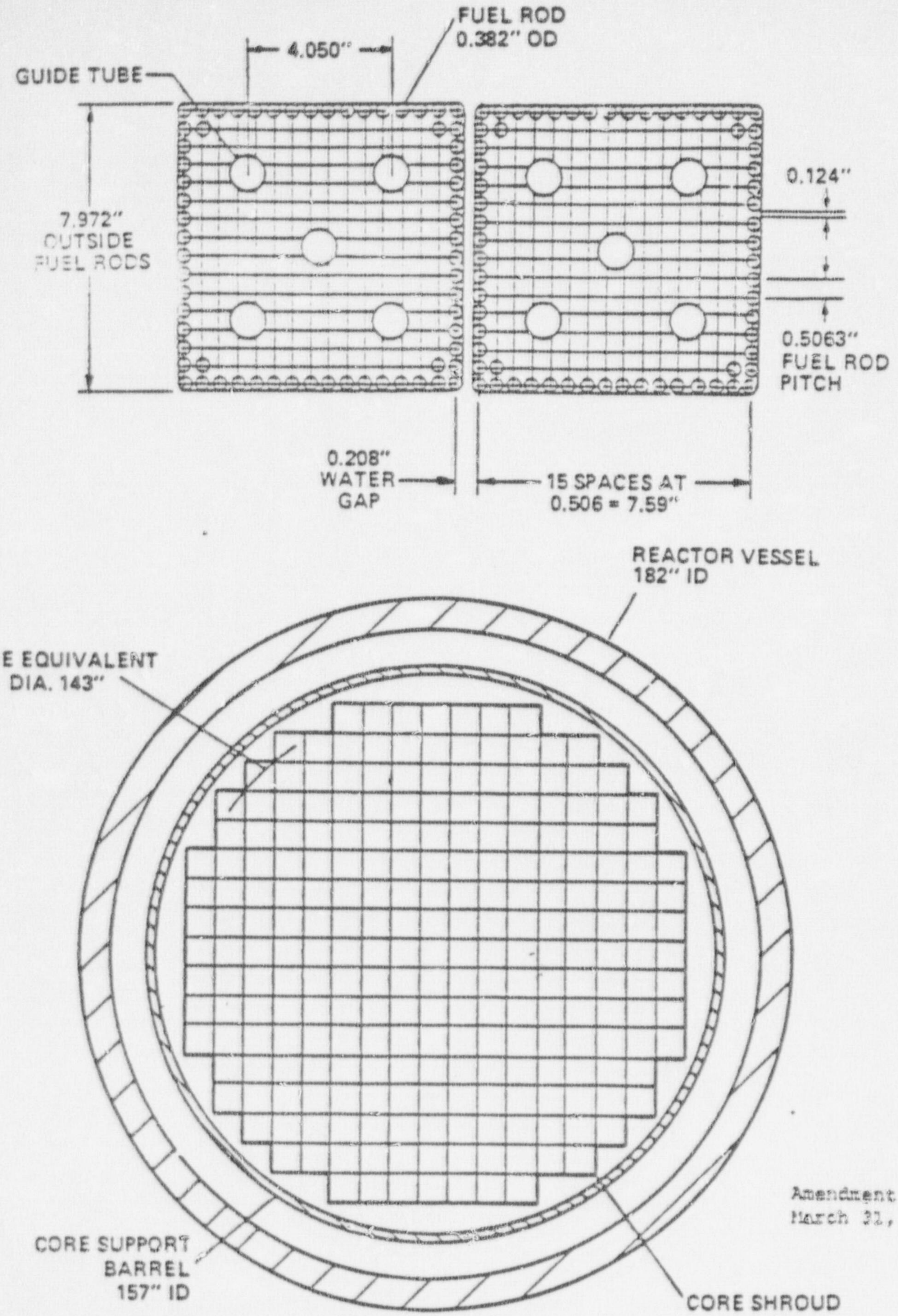


SYSTEM 80 PLUS REACTOR COOLANT SYSTEM

SYSTEM 80+™

MORE FORGIVING REACTOR COOLANT SYSTEM

1. INCREASED OVERPOWER MARGIN
2. MANEUVERING CONTROL WITHOUT SOLUBLE BORON
3. RING FORGED REACTOR VESSEL
4. LONG LIFE CONTROL RODS
5. LARGER PRESSURIZER
6. 10% STEAM GENERATOR (SG) TUBE PLUGGING MARGIN
7. INCREASED SECONDARY INVENTORY
8. CORROSION RESISTANT SG TUBES
9. SG DESIGNED FOR EASE OF MAINTENANCE
10. REDUCED HOT LEG TEMPERATURE (T_H)



Amendment B
March 31, 1988

SYSTEM 80+™	REACTOR CORE CROSS SECTION 241 FUEL ASSEMBLIES	Figure 4.1-2

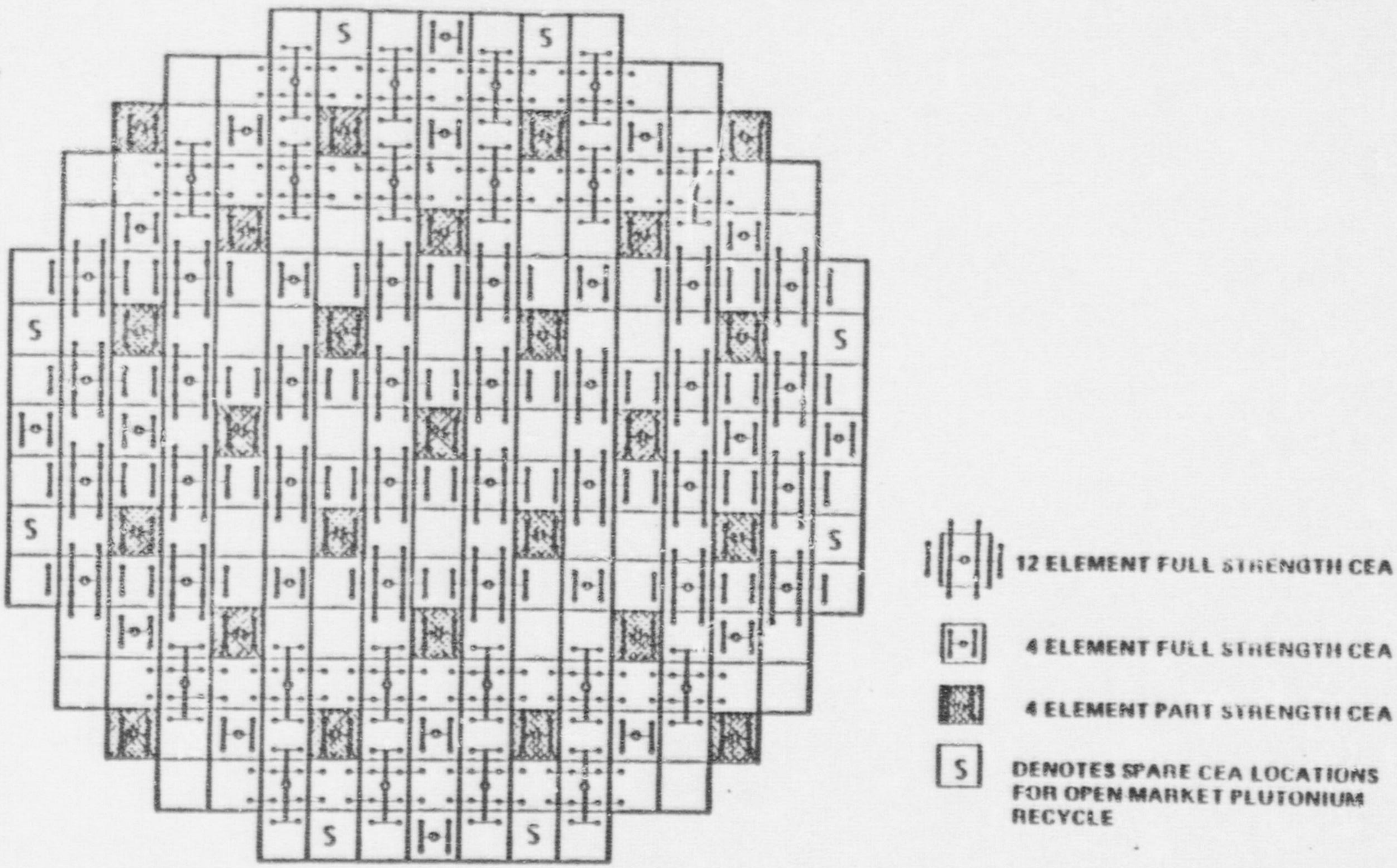
DESIGN CHANGES TO INCREASE THERMAL MARGIN

CHANGE	APPROX. GAIN
LOWER COOLANT TEMPERATURE (6F)	3%
HIGHER CORE FLOW RATE (2%)	2%
COLSS/CPC IMPROVEMENTS	4%
ADVANCED INTEGRAL B.P. (OPTIONAL)	2%
	9 - 11%

NET THERMAL MARGIN FOR SYSTEM 80+ (TYPICAL)

INITIAL CORE	18 - 20%
RELOAD CORES	15 - 17%

CONTROL ELEMENT ASSEMBLY PATTERN



SYSTEM 80+

1

IMAGE EVALUATION TEST TARGET (MT-3)

150mm

6"

1

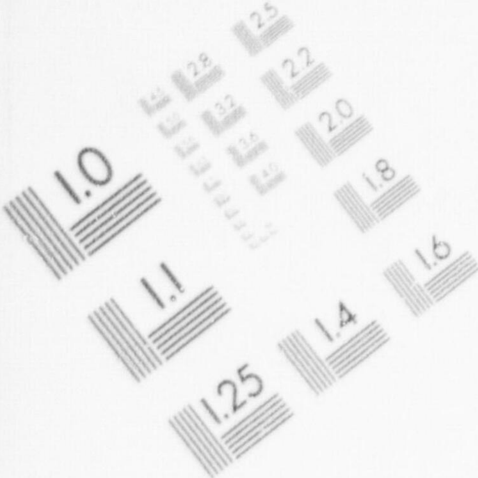
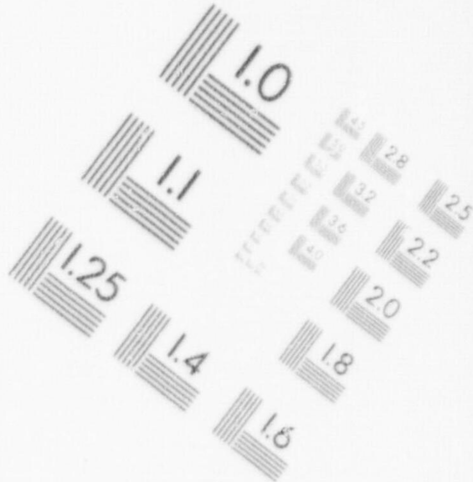
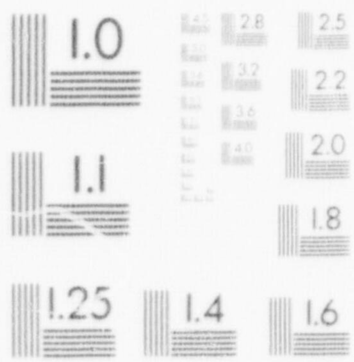
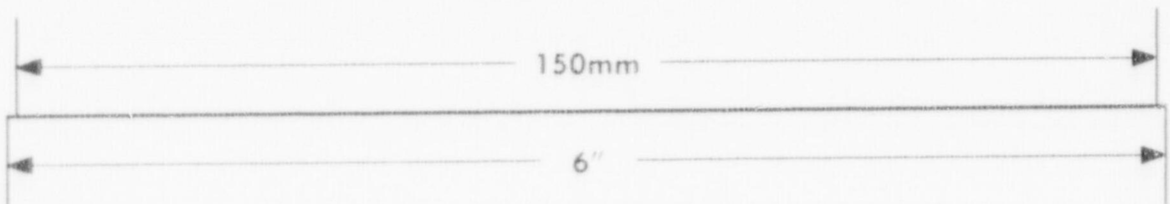
IMAGE EVALUATION TEST TARGET (MT-3)

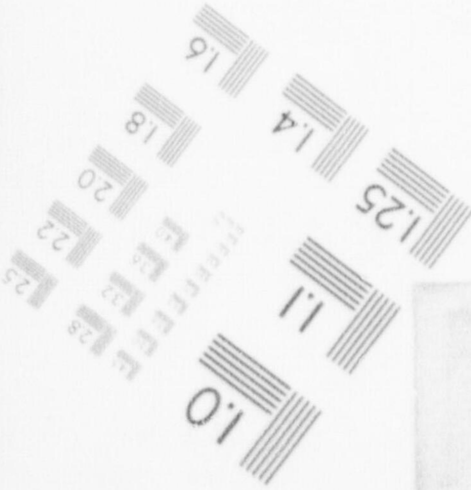
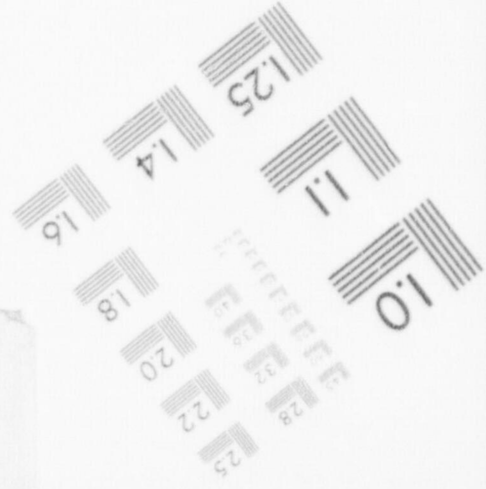
150mm

6"

1

IMAGE EVALUATION TEST TARGET (MT-3)

1

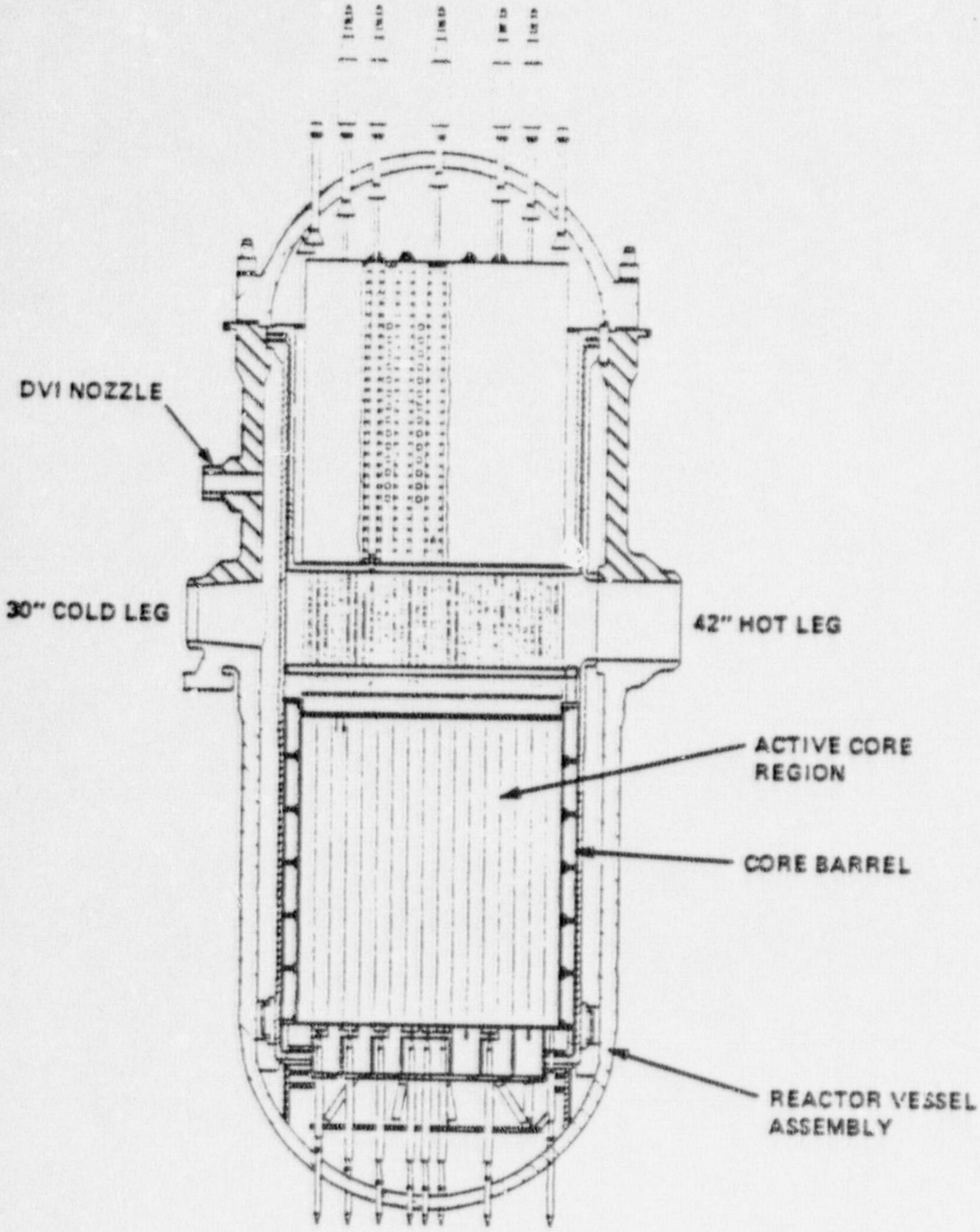
IMAGE EVALUATION TEST TARGET (MT-3)

150mm

6″

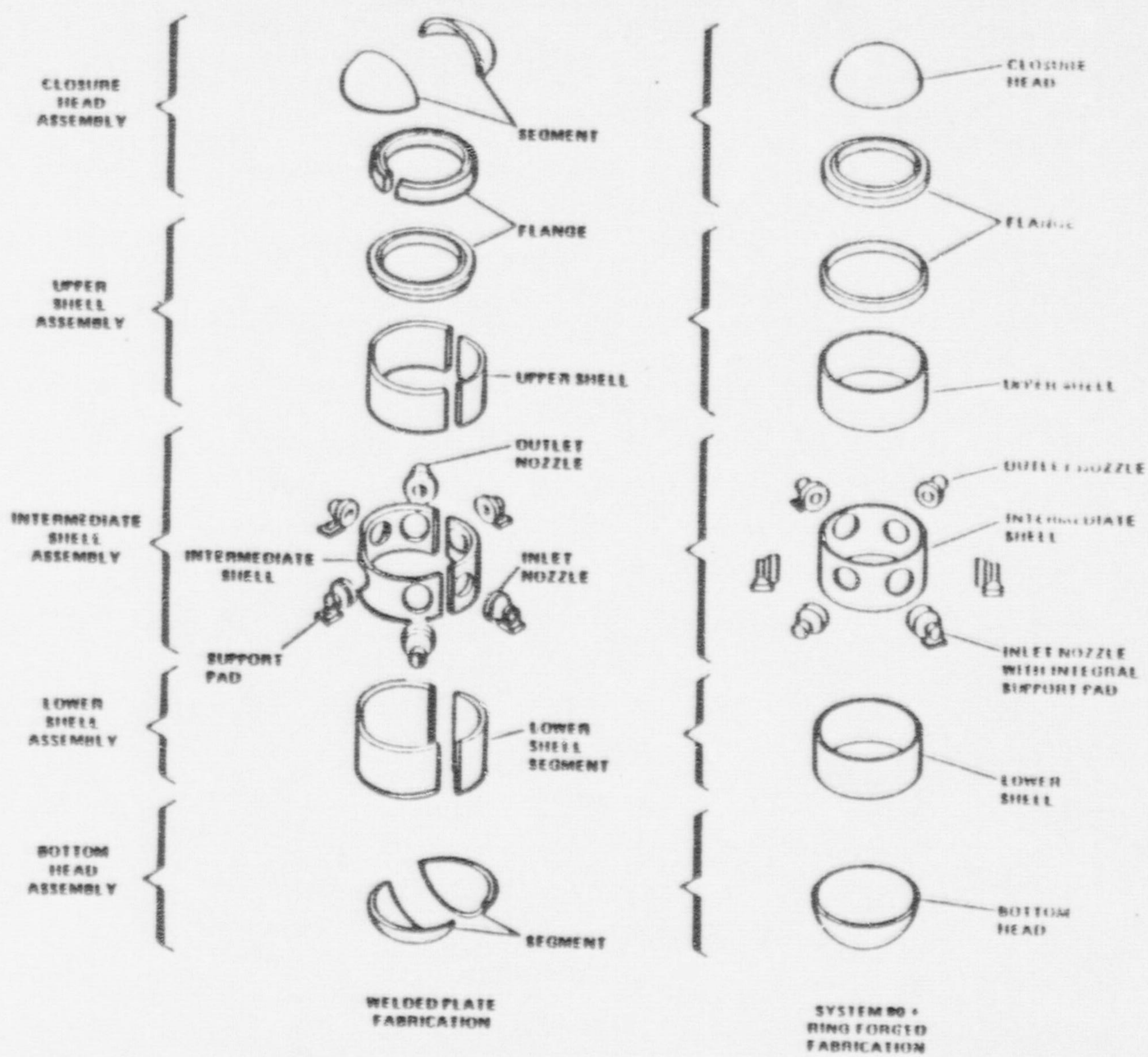
CONTROL ELEMENT ASSEMBLY DESIGN CHANGE COMPARISON

CEA TYPE	SYSTEM 80 NUMBER	SYSTEM 80 ABSORBER	SYSTEM 80+ NUMBER	SYSTEM 80+ ABSORBER
FULL STRENGTH (12-FINGER)	48	B_4C	48	B_4C
FULL STRENGTH (4-FINGER)	28	B_4C	20	AG-IN-CD
PART LENGTH (4-FINGER)	13	B_4C	--	--
PART-STRENGTH (4-FINGER)	--	---	25	INCONEL
TOTAL	89	10-YEAR LIFE	93	20-YEAR LIFE



SYSTEM 80+ REACTOR VESSEL

SYSTEM 80 REACTOR VESSEL COMPARISON



SYSTEM 80+

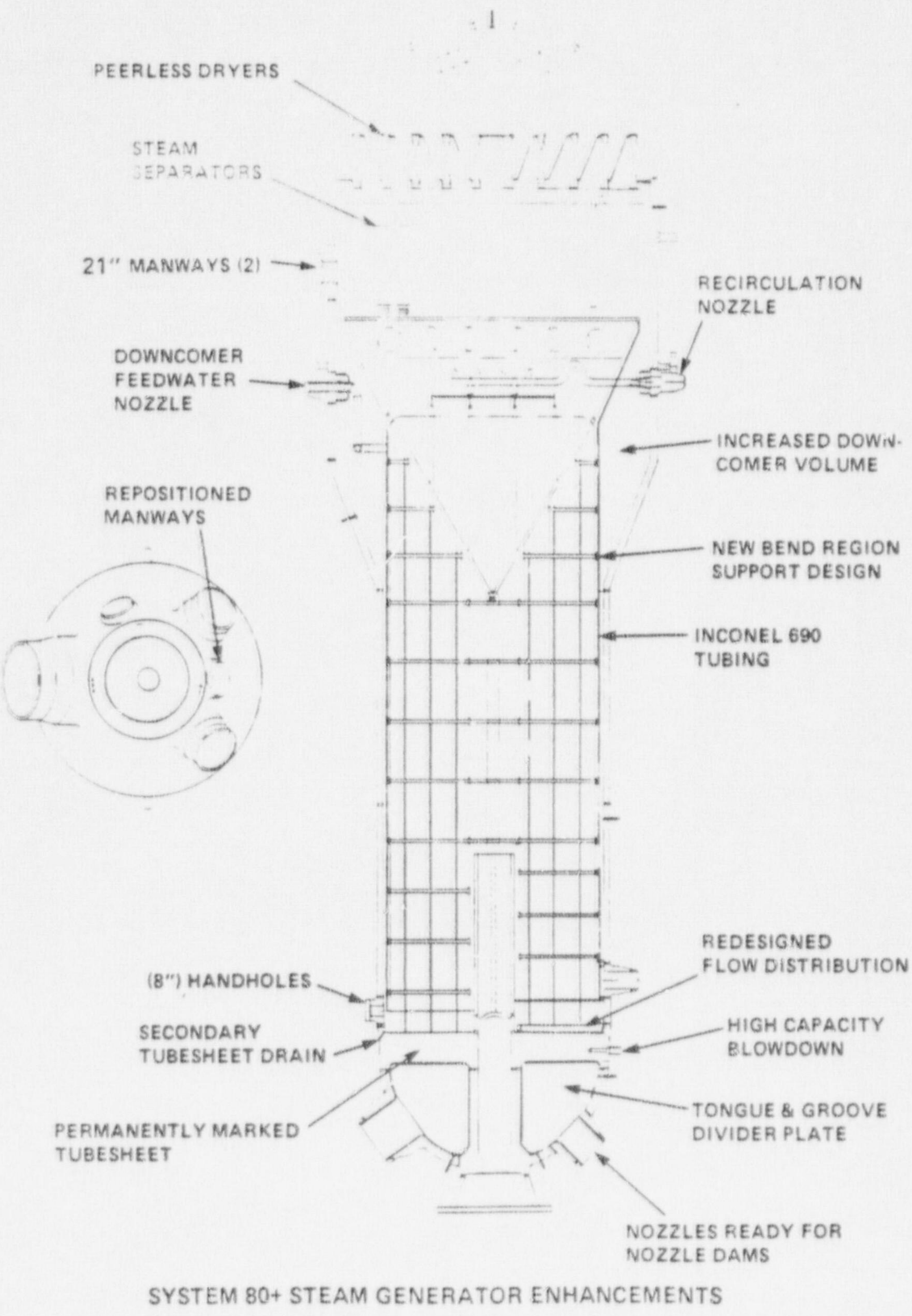
PRESSURIZER SIZE
(2400 FT^3)

O MAJOR DESIGN BASES FOR INCREASING VOLUME

- PREVENT DRAINING PRESSURIZER FOLLOWING A REACTOR TRIP
- MAINTAIN PRESSURIZER WATER LEVEL BELOW SAFETY VALVE NOZZLES FOR FEEDWATER LINE BREAK
- MAINTAIN PRESSURIZER WATER LEVEL ABOVE HEATERS FOR TURBINE TRIP
- MINIMIZE PRESSURIZER FLUCTUATIONS DURING TRANSIENTS

COMPARATIVE PRESSURIZER SIZING

PLANT	NORMALIZED PRESSURIZER VOLUME (FT^3/MWT)	PRESSURIZER VOLUME TO RCS VOLUME
PALISADES	0.682	16.0%
ANO-2	0.425	13.7%
SONGS 2 & 3	0.440	14.6%
PALO VERDE	0.472	14.7%
YGN 3&4	0.637	15.5%
SYSTEM 80+	0.629	19.4%



SYSTEM 80+ STEAM GENERATOR ENHANCEMENTS

SYSTEM 80+™

STEAM GENERATOR ENHANCEMENTS

INCREASED DOWNCOMER VOLUME	INCREASES "BOIL-DRY" TIME, AND REDUCES LEVEL FLUCTUATIONS DURING TRANSIENTS; 20% INCREASE IN SECONDARY INVENTORY
IMPROVED TUBE INTEGRITY	INCONEL 690 TT AND RECIRCULATION SYSTEM
LOWER T_{HOT}	615F INCREASES THERMAL MARGIN, REDUCES TUBE WATERSIDE CORROSION, AND INCREASES TUBE CORROSION RESISTANCE
INCREASED HEAT TRANSFER AREA	PROVIDES 10% TUBE PLUGGING MARGIN
IMPROVED ACCESS FOR MAINTENANCE	LARGER (21"), REPOSITIONED MANWAYS; INCREASED SPACE BETWEEN DRIERS AND SEPARATORS
IMPROVED DRYERS	99.9% QUALITY STEAM
REPOSITIONED DOWNCOMER DISTRIBUTION RING	AVOID WATERHAMMER

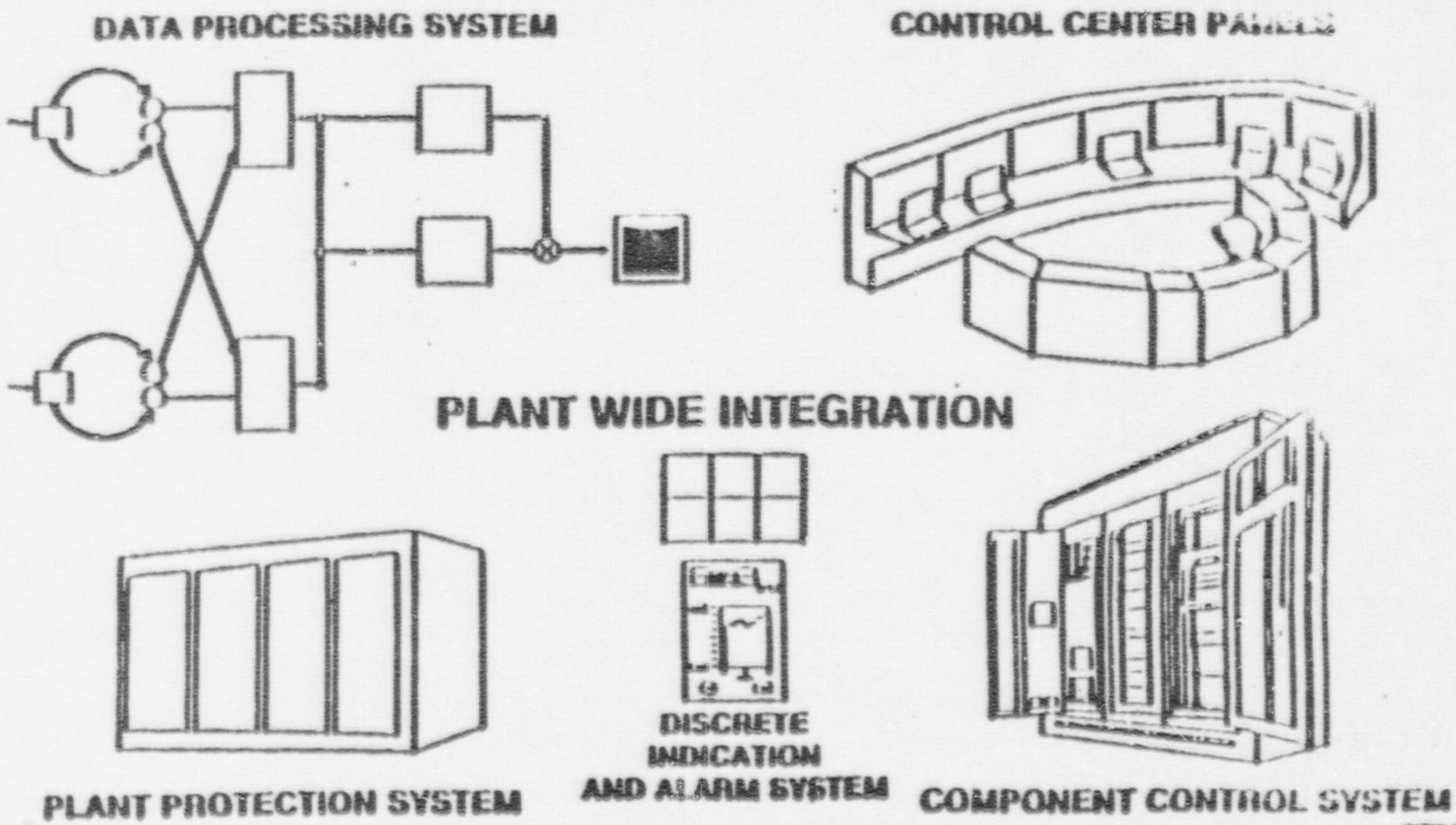
SYSTEM 80+

ADVANCED CONTROL ROOM DESIGN

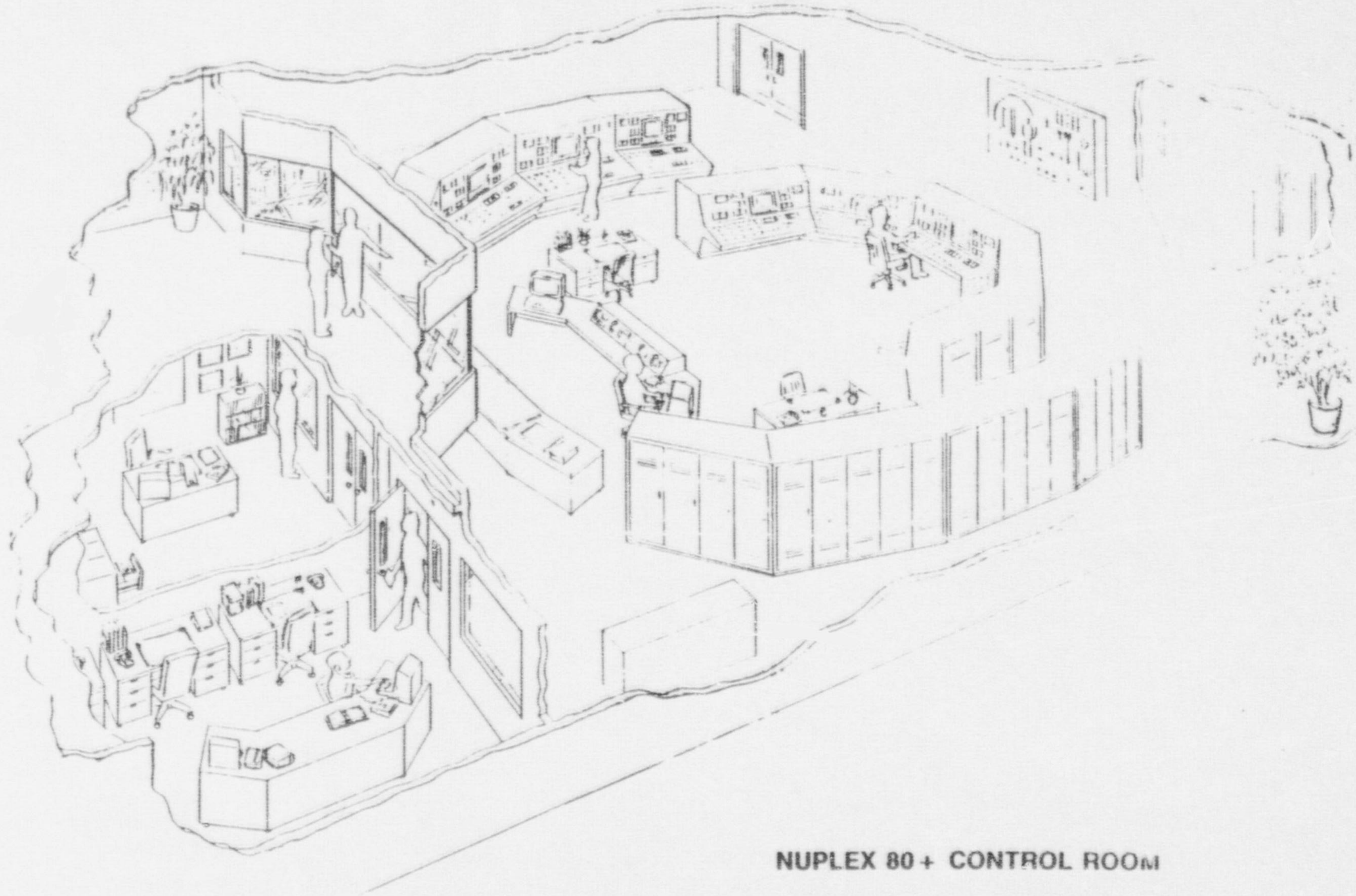
- 0 HUMAN FACTORS ENGINEERED
- 0 LARGE IPSO DISPLAY SCREEN
- 0 TOUCH-SENSITIVE CRTs & PLASMA DISPLAYS
- 0 MICROPROCESSORS TO REDUCE OPERATOR BURDEN
- 0 HIERARCHY OF INFORMATION
- 0 PRIORITIZED AND MODE DEPENDENT ALARMS
- 0 VALIDATED SIGNALS
- 0 MULTIPLEXING
- 0 OFF-THE-SHELF EQUIPMENT
- 0 SELF-TESTING FEATURES

ADVANCED CONTROL COMPLEX

NUPLEX 80+

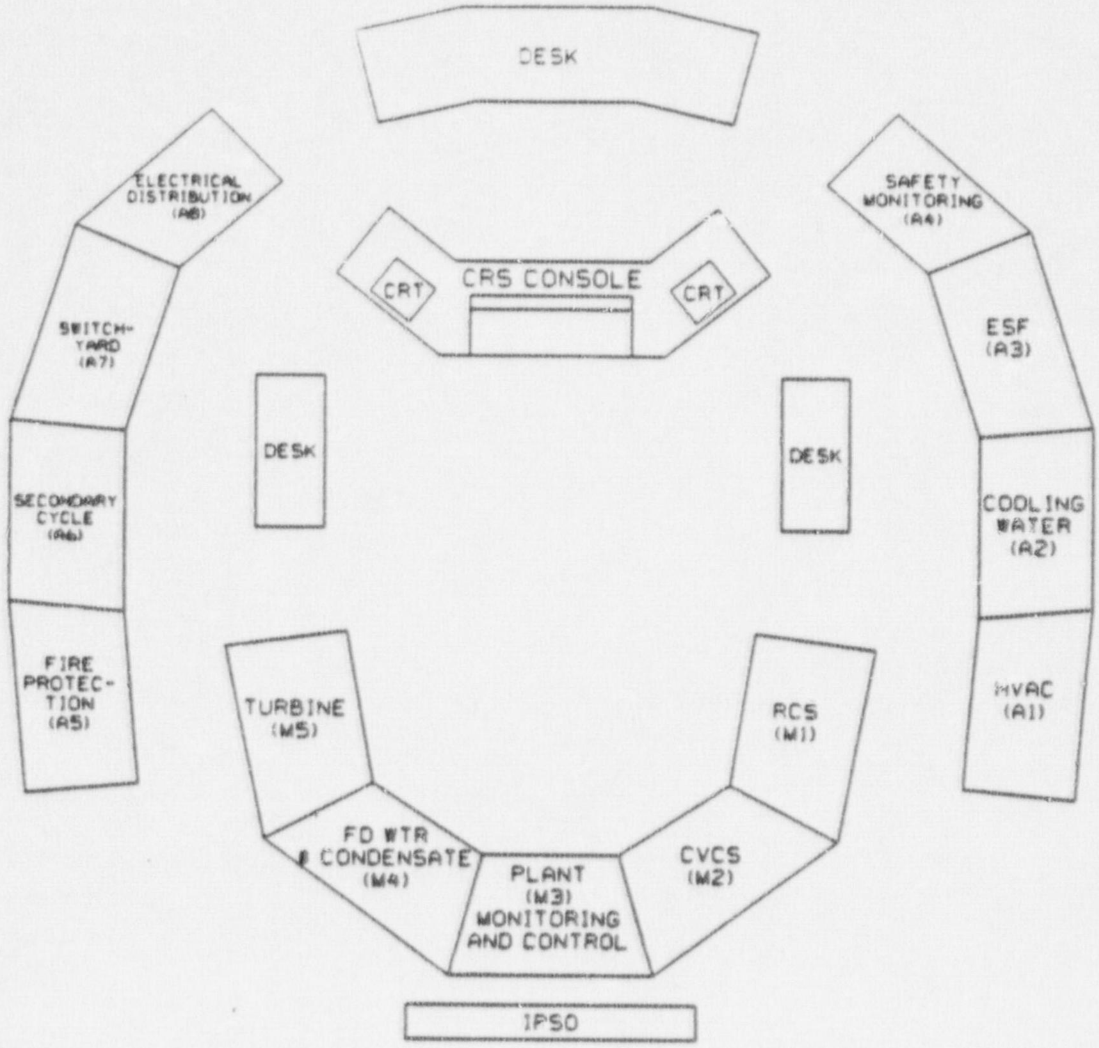


SYSTEM 80+

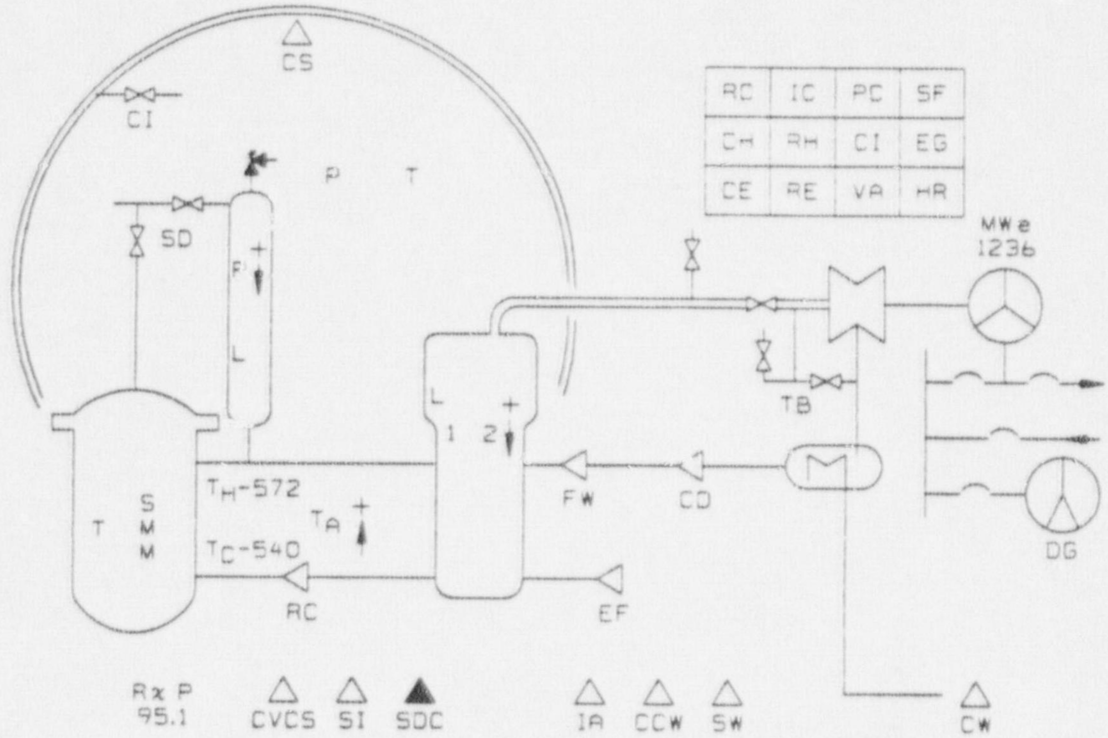


NUPLEX 80 + CONTROL ROOM

SYSTEM 80+™



SYSTEM 80 PLUS CONTROL ROOM



INTEGRATED PROCESS STATUS OVERVIEW DISPLAY

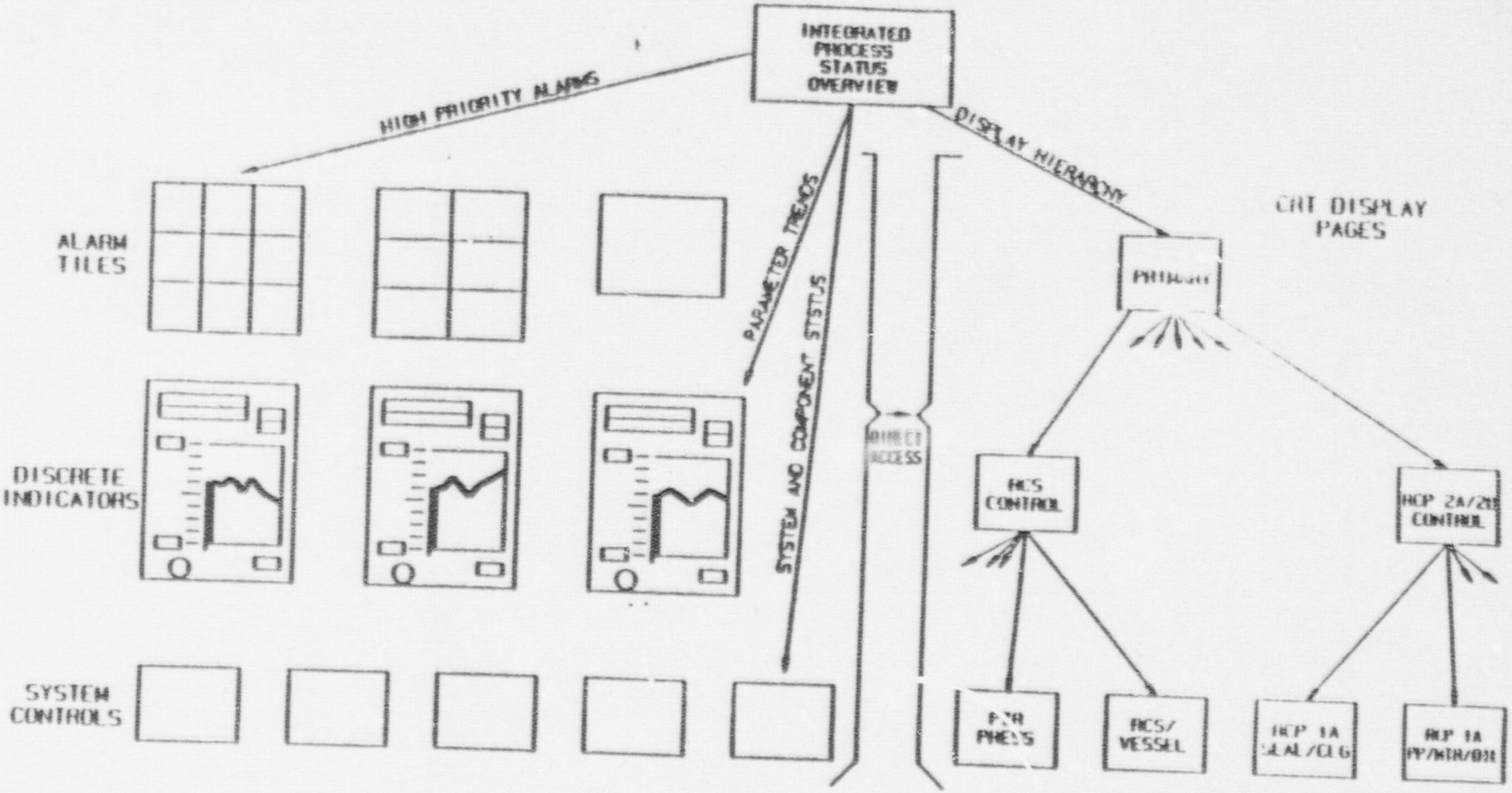
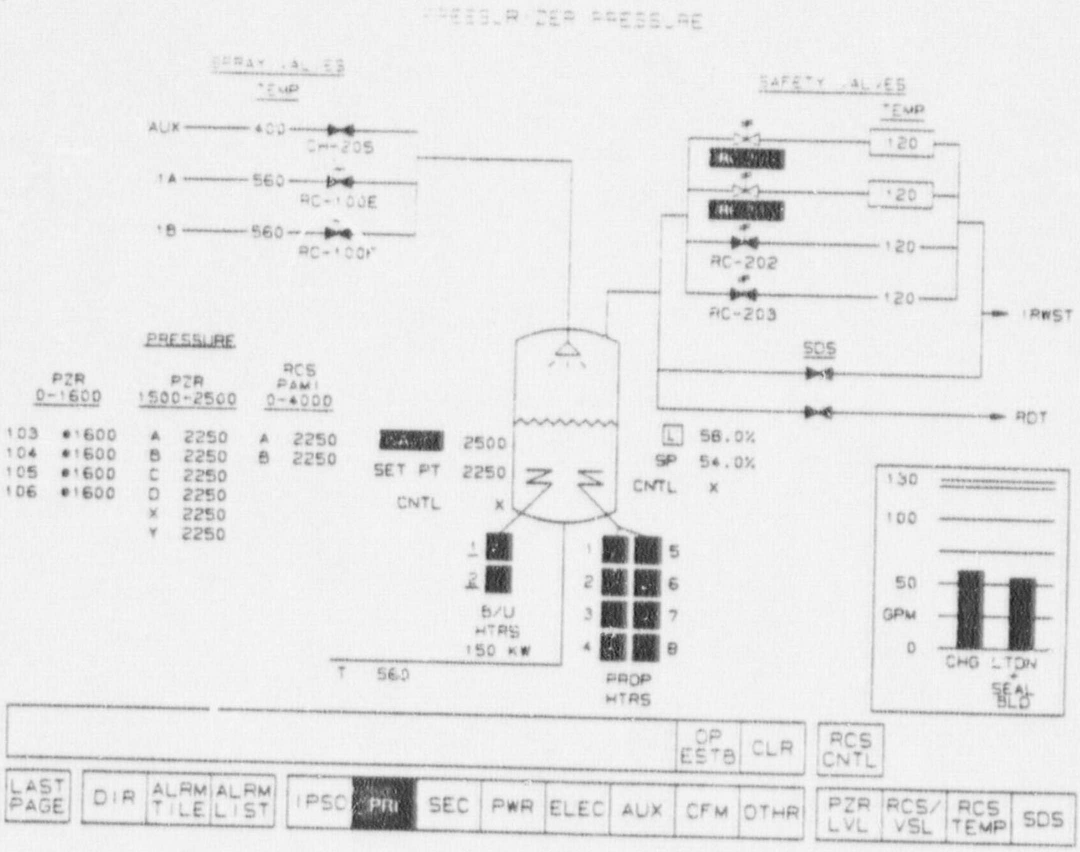


FIGURE 18.7.1-1
INTEGRATED INFORMATION PRESENTATION

FILE:SYSFIGS



CRT DISPLAY FOR PRESSURIZER INFORMATION

NUPLEX 80+ DESIGN BASIS FOR DISPLAY AND ALARM

1. REDUCE THE QUANTITY OF DATA THAT MUST BE MENTALLY PROCESSED BY AN OPERATOR, TO MINIMIZE "INFORMATION OVERLOAD":

   o SIGNAL VALIDATION PRIOR TO DISPLAY

   o REDUCE DATA THROUGH PARAMETER CORRELATION PRIOR TO DISPLAY

2. DISPLAY INFORMATION USING HIERARCHICAL PRESENTATION:

   o PLANT LEVEL OVERVIEW INFORMATION ON IPSO

   o KEY SYSTEM PARAMETERS ON DISCRETE INDICATORS

   o THREE-LEVEL CRT DISPLAY PAGE HIERARCHY

3. REDUCE THE NUMBER OF ALARMS GENERATED TO MINIMIZE OPERATOR "INFORMATION OVERLOAD":

   - o CROSS-CHANNEL SIGNAL VALIDATION PRIOR TO ALARM GENERATION
   - o ALARM LOGIC AND SETPOINTS CONTINGENT ON APPLICABLE PLANT MODE

4. DISPLAY ALARM WITH DISTINCT VISUAL CUEING IN ACCORDANCE WITH PRIORITY OF OPERATOR RESPONSE:

   - o PRIORITY 1 - IMMEDIATE ACTION
   - o PRIORITY 2 - PROMPT ACTION
   - o PRIORITY 3 - CAUTION
   - o OPERATOR AID - STATUS INFORMATION

5. ALLOW AN OPERATOR TO USE THE DISPLAYS DURING ACCIDENTS THAT HE USES DURING NORMAL OPERATION.

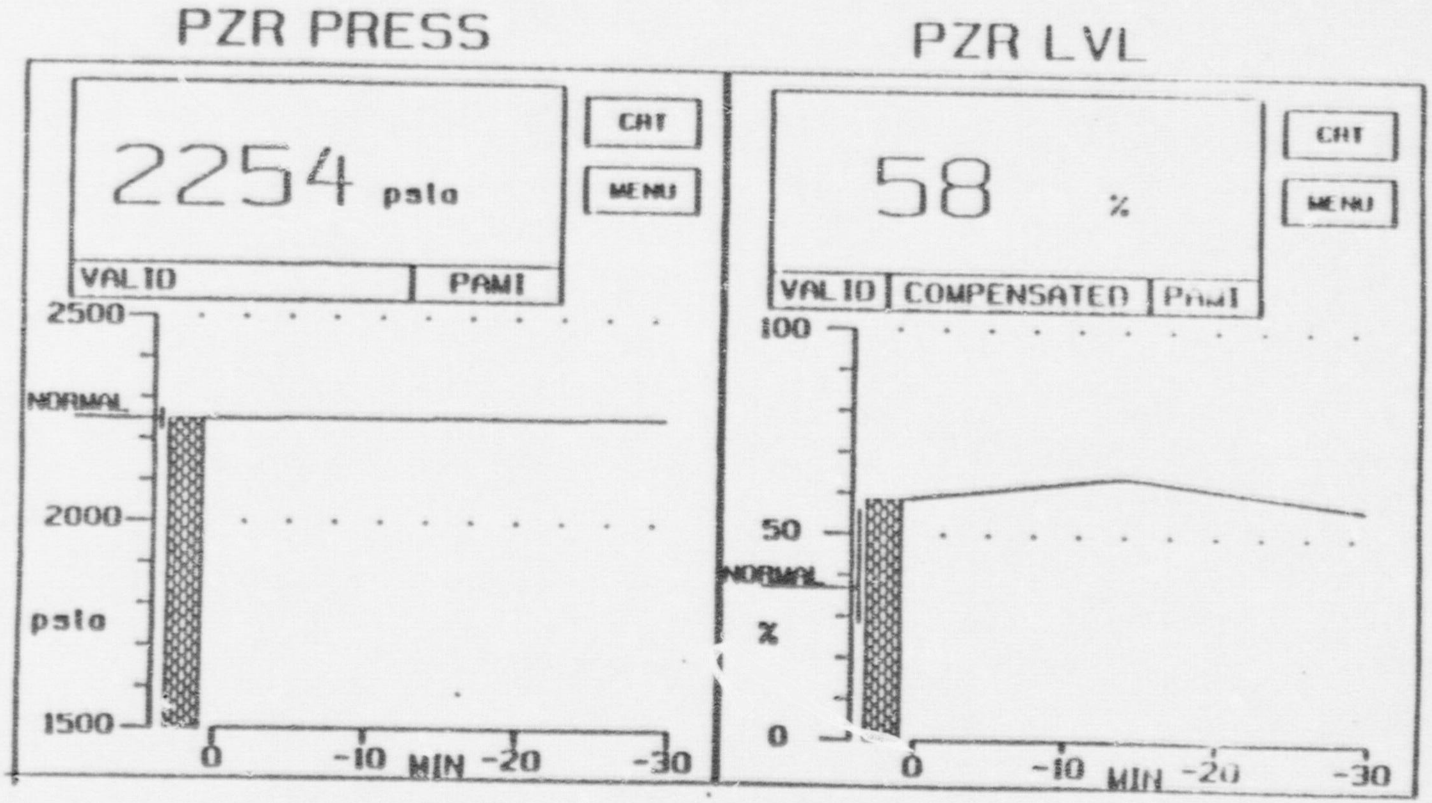
- o SEISMICALLY QUALIFIED INDICATORS CORRELATE NORMALLY USED SENSORS TO PAMI SENSORS
- o SPDS IS INTEGRATED IN NORMAL CRT DISPLAY SYSTEMS

6. PROVIDE REDUNDANCY AND DIVERSITY IN INFORMATION PROCESSING AND DISPLAY.

- o INFORMATION REQUIRED FOR OPERATION FOR 24 HOURS WITHOUT DPS IS ALSO PROCESSED AND DISPLAYED BY DIAS
- o TWO SYSTEM REDUNDANCY IS INVISIBLE TO OPERATORS THROUGH CONTINUOUS CROSS-CHECKING AND INTEGRATED OPERATOR INTERFACES
- o PRIORITY 1 AND 2 ALARMS ARE PROCESSED AND DISPLAYED BY TWO INDEPENDENT SYSTEMS

DISCRETE INDICATOR

NUPLEX 80+



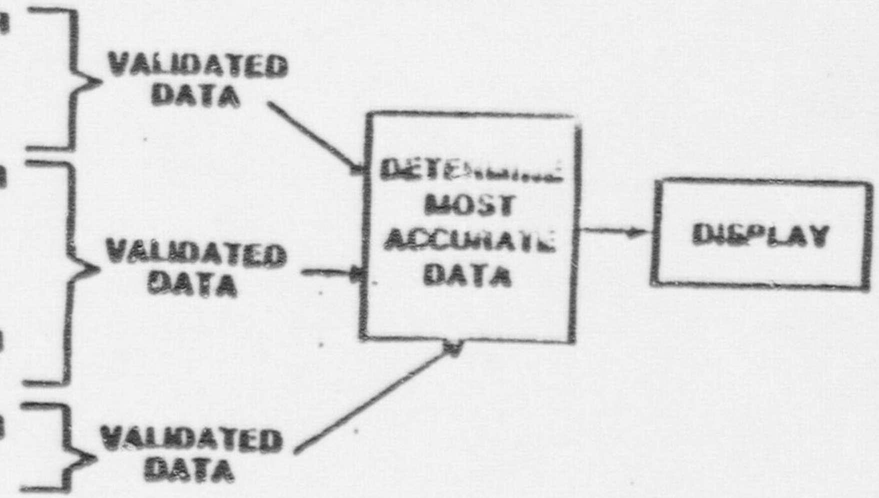
DISCRETE INDICATOR SHOWING NORMALLY INDICATED VALUES FOR PRESSURIZER PRESSURE AND LEVEL

DISCRETE INDICATOR VALIDATION APPLICATION

NUPLEX 80+

PRESSURIZER SENSORS	PRESSURE RANGE	CONVENTIONAL CONTROL ROOM INDICATION
P-103	0–1600 psia	RECORDER
P-104	"	"
P-105	"	"
P-106	"	"
P-101A	1500-2500 psia	INDICATOR
B	"	"
C	"	"
D	"	"
P-100X	1500-2500	INDICATOR
Y	"	"
P-190A	0-4000	RECORDER
B	"	"

NUPLEX 80+

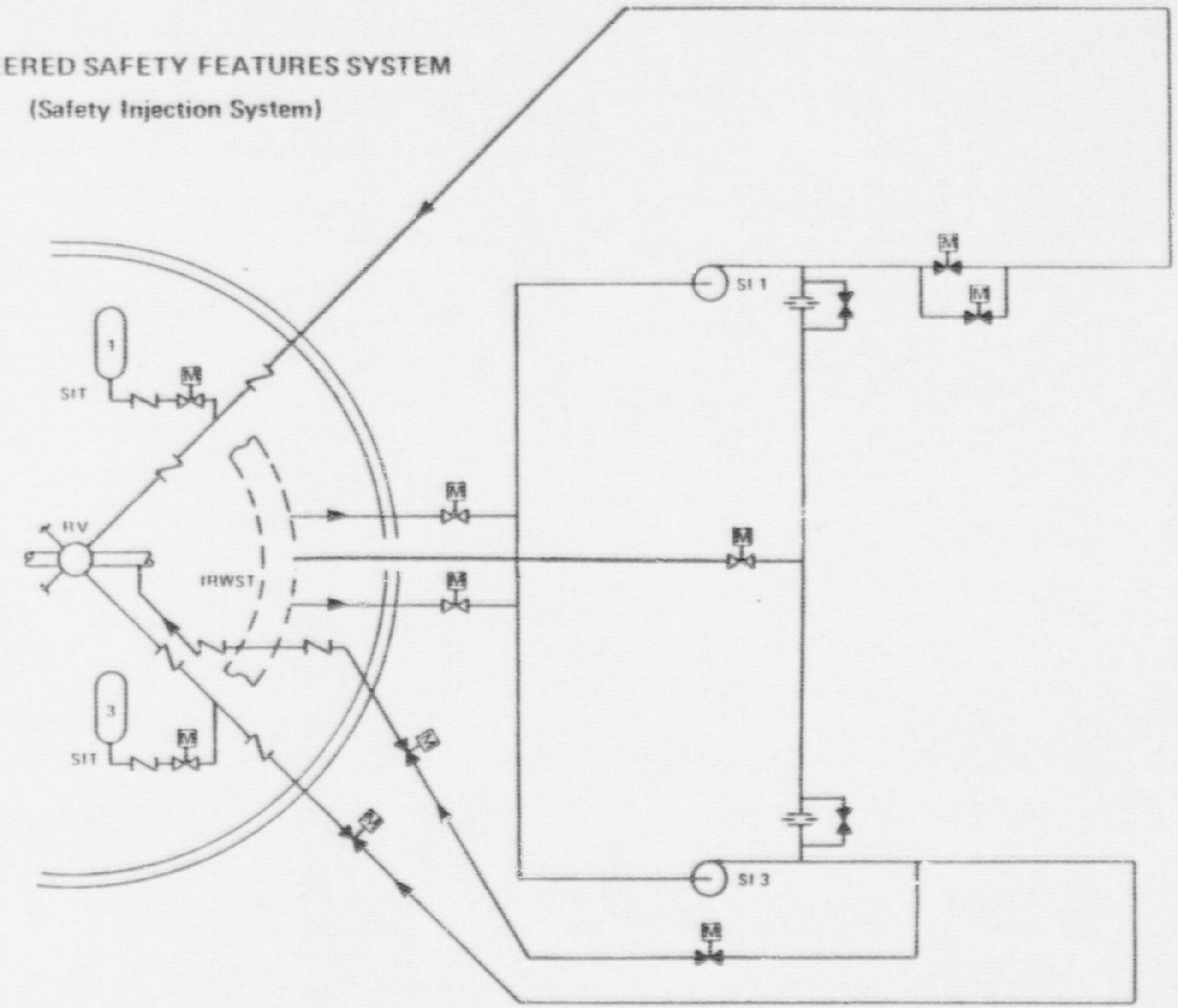


HIGHLY RELIABLE SAFEGUARDS SYSTEMS

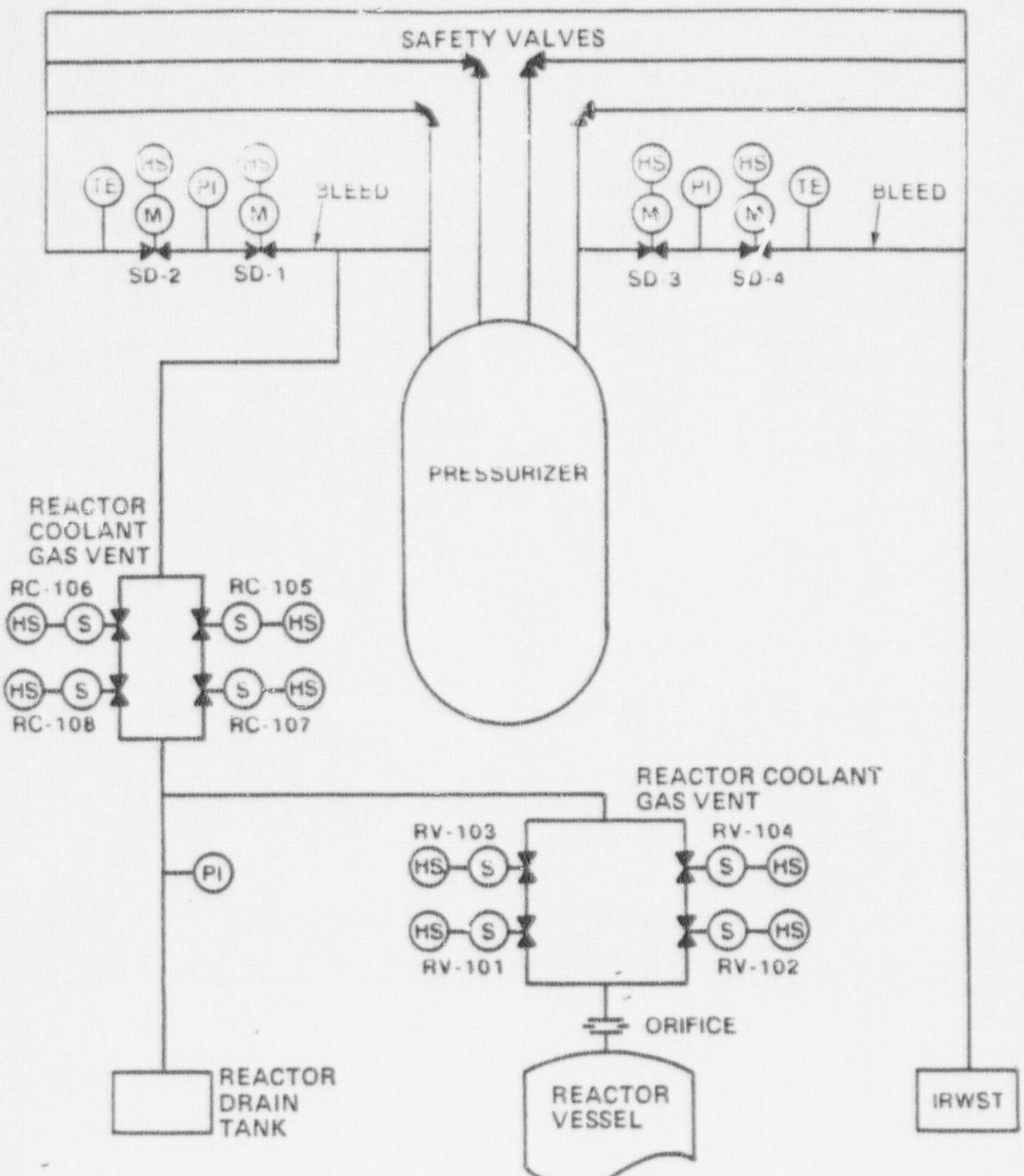
- 0 4 TRAIN EMERGENCY CORE COOLING SYSTEM
- 0 IN-CONTAINMENT REFUELING WATER TANK
- 0 SAFETY DEPRESSURIZATION SYSTEM
- 0 4 TRAIN EMERGENCY FEEDWATER SYSTEM
- 0 HIGHER PRESSURE SHUTDOWN COOLING SYSTEM
- 0 ALTERNATE EMERGENCY POWER SUPPLY

ENGINEERED SAFETY FEATURES SYSTEM

(Safety Injection System)

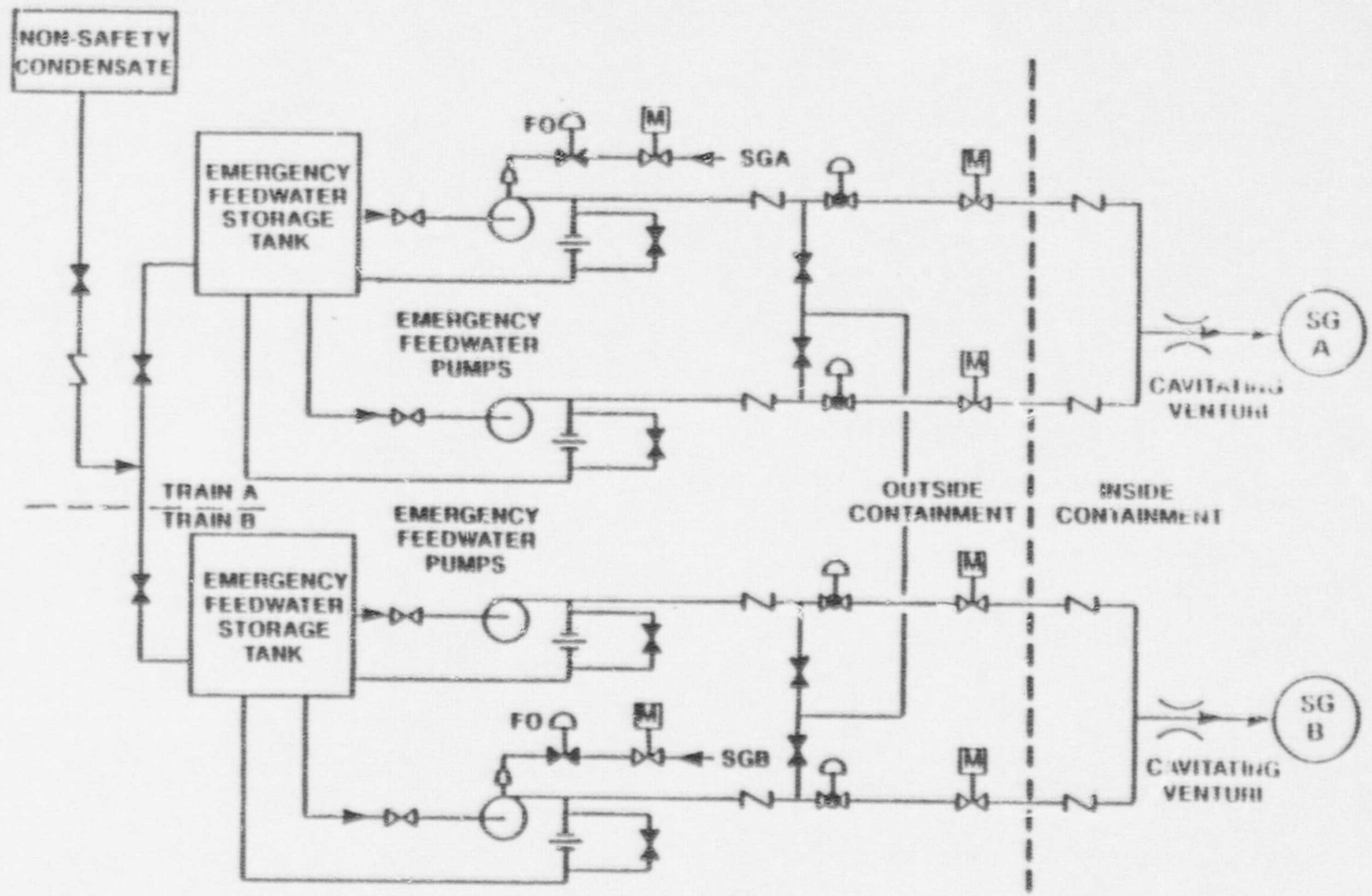


SYSTEM 80+™



SAFETY DEPRESSURIZATION AND VENT SYSTEM

SYSTEM 80+™

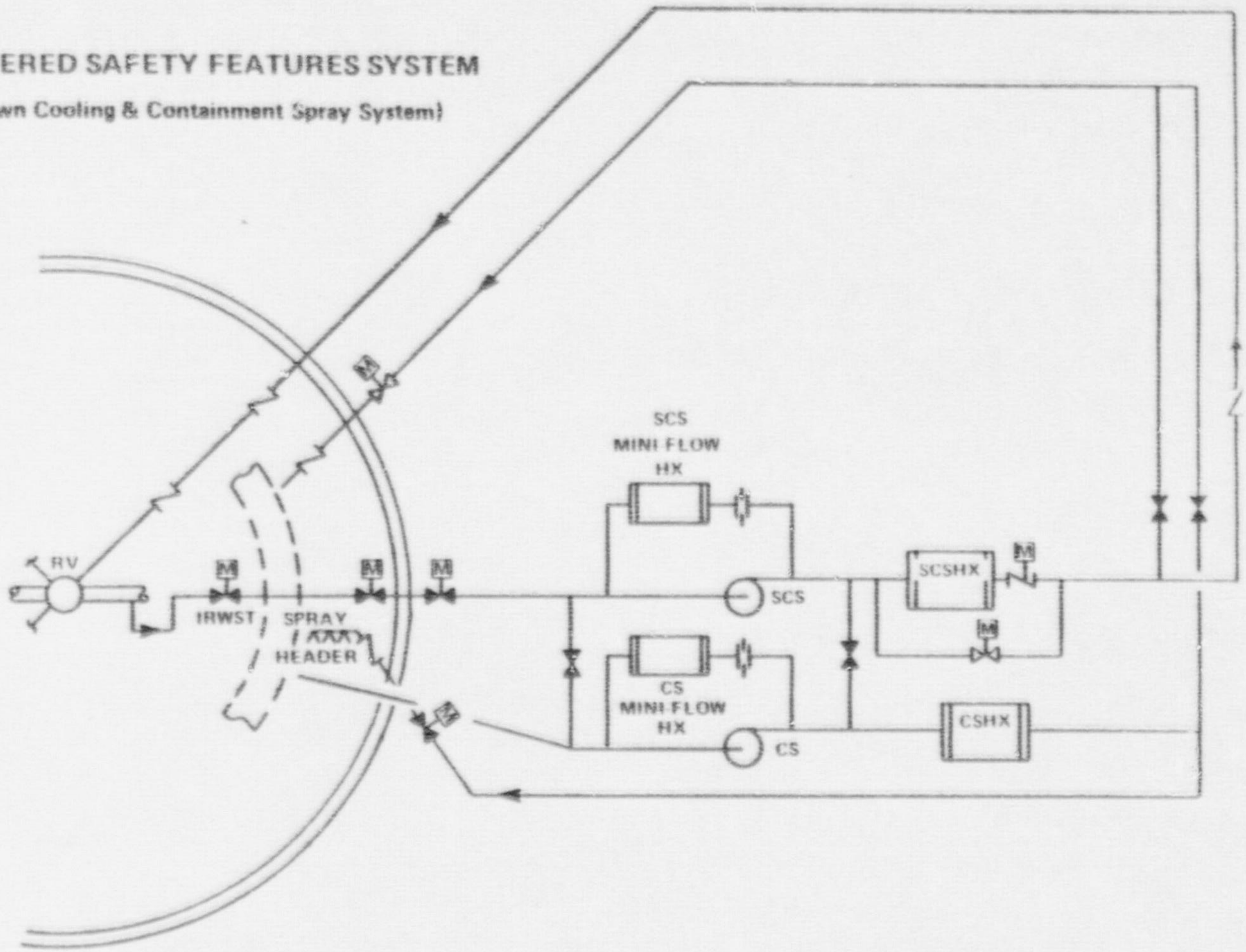


EMERGENCY FEEDWATER SYSTEM

SYSTEM 80+™

ENGINEERED SAFETY FEATURES SYSTEM

(Shutdown Cooling & Containment Spray System)



SYSTEM 80+™

SYSTEM 80+

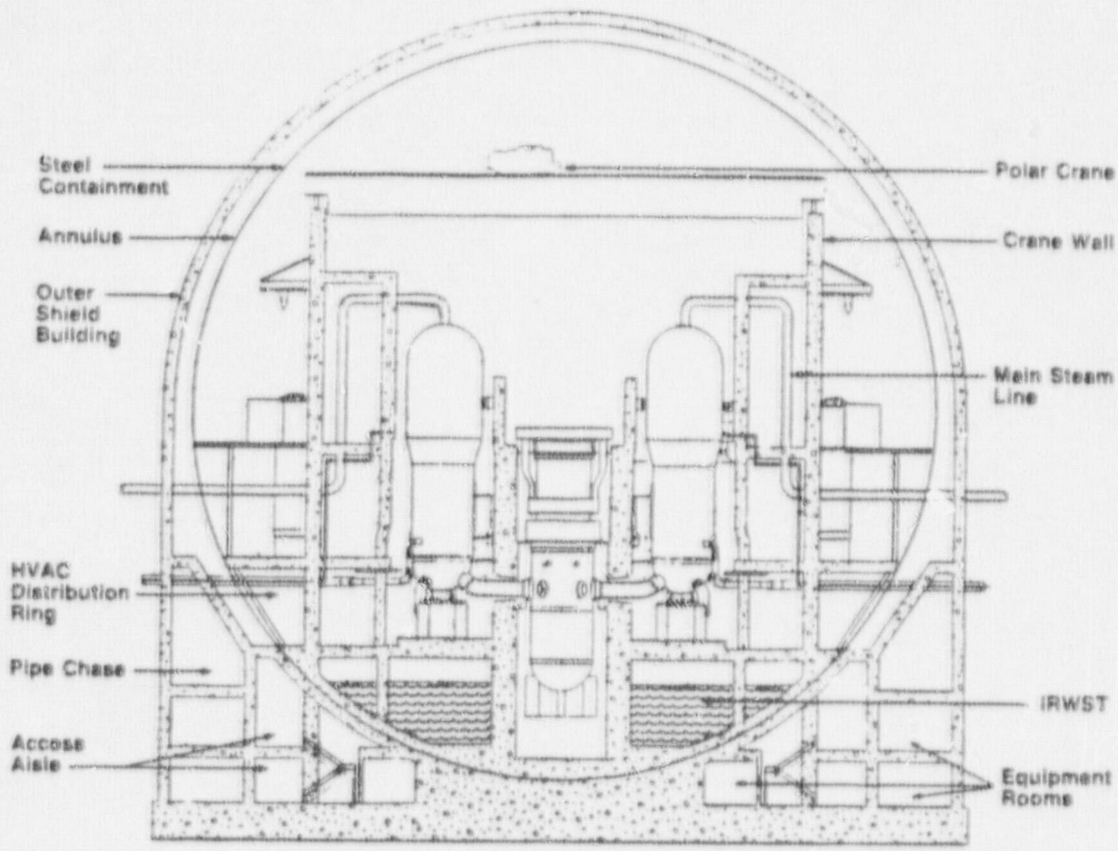
ENHANCEMENT FEATURES

AUXILIARY SYSTEMS

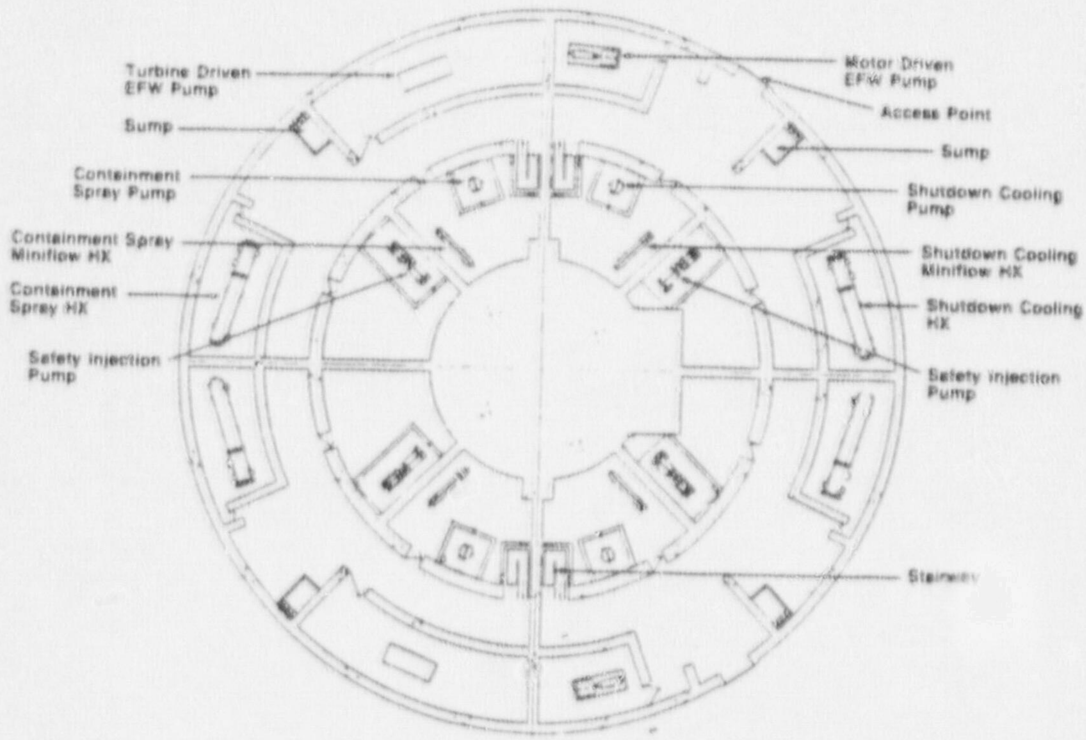
- NON-SAFETY CHEMICAL AND VOLUME CONTROL SYSTEM
- CENTRIFUGAL CHARGING PUMPS
- IMPROVED LETDOWN

LARGE, STEEL SPHERICAL CONTAINMENT

- DUAL CONTAINMENT
- 200 FT. DIAMETER
- INCREASED SPACE FOR MAINTENANCE & ACCESS
- DESIGNED TO MITIGATE SEVERE CORE DAMAGE
- SHADOW AREA HOUSES SAFEGUARDS SYSTEMS



CONTAINMENT BUILDING - ELEVATION VIEW



CONTAINMENT BUILDING - PLAN VIEW

CESSAR-DC SUBMITTAL SCHEDULE

- O GROUP A - NOVEMBER 1987
- O GROUP B - APRIL 1988
- O GROUP C - JUNE 1988
- O GROUP D - SEPTEMBER 1988
- O GROUP E - MARCH 1989 (END OF DESIGN PHASE)
- O GROUP F - SEPTEMBER 1989
- O GROUP G - JUNE 1990
- O GROUP H - SEPTEMBER 1990 (END OF ANALYSIS)

CESSAR-DC SUBMITTAL GROUP CONTENTS

A. GENERAL DESCRIPTIONS AND REQUIREMENTS, POWER CONVERSION SYSTEM, QUALITY ASSURANCE

B. REACTOR CORE, REACTOR COOLANT SYSTEM, CHEMICAL AND VOLUME CONTROL SYSTEM, PROCESS SAMPLING SYSTEM

C. SHUTDOWN COOLING SYSTEM, SAFETY INJECTION SYSTEM, EMERGENCY FEEDWATER SYSTEM

D. SITE ENVELOPE, SAFETY DEPRESSURIZATION SYSTEM, INSTRUMENTATION AND CONTROL SYSTEMS, HUMAN FACTORS ENGINEERING

E. CONTAINMENT SYSTEMS, LEAK-BEFORE-BREAK EVALUATION, REACTOR PROTECTIVE SYSTEM, ELECTRIC POWER, FUEL HANDLING SYSTEMS, RAD. WASTE SYSTEM, SABOTAGE PROTECTION, NUPLEX 80+ EVALUATION

F.* USI/GI RESOLUTION

G.* CONTAINMENT DESIGN AND SEISMIC ANALYSES, PROBABILISTIC RISK ASSESSMENT, DEGRADED CORE PERFORMANCE

H. SAFETY ANALYSES, TECHNICAL SPECIFICATIONS

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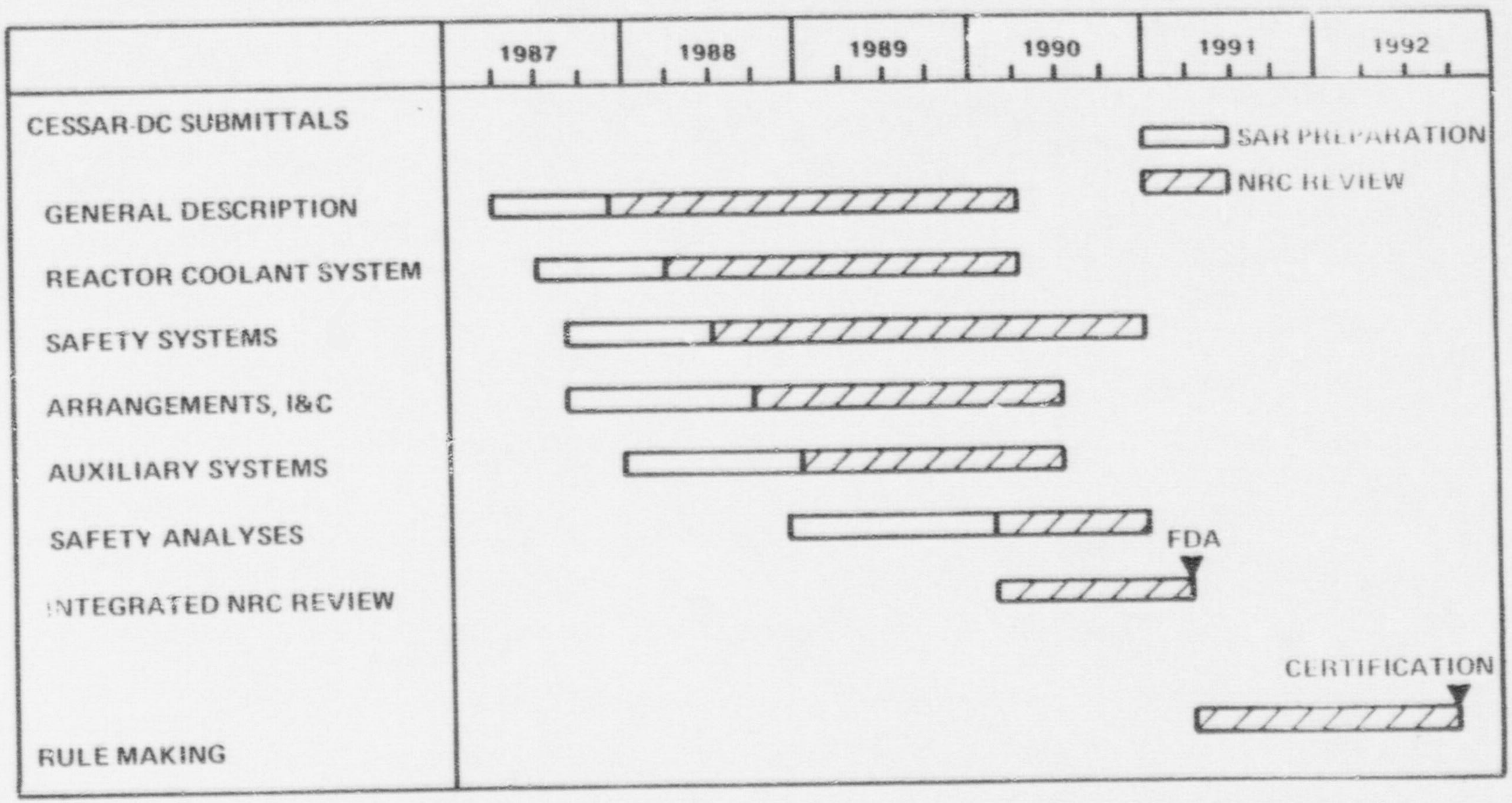
* INCLUDING RESULTS OF THE CESSAR-DC INTEGRATED REVIEW FOR NSSS AND BOP SYSTEMS.

SYSTEM 80+ CERTIFICATION SCHEDULE



SYSTEM 80+™

ENCLOSURE 2

SYSTEM 80+ PRA
STATUS

JUNE 6 - 7, 1989

COMBUSTION ENGINEERING

AND

BROOKHAVEN NATIONAL LABORATORY

SYSTEM 80+

TASK 3

PERFORM PROBABILISTIC RISK ASSESSMENT

TASK OBJECTIVE

- COMPLY WITH SEVERE ACCIDENT POLICY STATEMENT REQUIREMENT FOR PRA BY PROVIDING A LEVEL III PRA FOR ADVANCED SYSTEM 80 DESIGN
- DEMONSTRATE COMPLIANCE WITH EPRI ALWR MEAN CORE DAMAGE FREQUENCY GOAL OF 10^{-5}/YR.
- DEMONSTRATE COMPLIANCE WITH LARGE RELEASE GOAL OF 10^{-6}/YR.
- SUPPORT EVALUATION OF DESIGN CHANGES

SYSTEM 80+ PRA

PROBABILISTIC RISK ASSESSMENT

APPROACH

- o ESTABLISH BASELINE PRA FOR SYSTEM 80
- o USE PRA AS EVALUATION TOOL FOR ASSESSMENT OF DESIGN CHANGES
- o PREPARE LEVEL III PRA FOR SYSTEM 80+

SYSTEM 80+ PRA

DESIGN ISSUES ADDRESSED
IN FIRST HALF OF FISCAL 1989

- o COOLING WATER SYSTEM DESIGNS
- o ELECTRICAL DISTRIBUTION SYSTEM

SYSTEM 80+

SYSTEM 80+ PRA

COOLING WATER SYSTEM DESIGN

- o Baseline PRA Used Standby System for Cooling Safety Related Loads
  - 2 Trains, 1 Pump/Train
  - Separate system supplied non-safety loads
- o System 80+ Uses a Combined System to Supply Safety and Non-Safety Loads
  - 2 Divisions, 2 Pumps/Division, 1 Pump/Division normally operating
  - Non-safety loads shed on safeguards actuation
  - Selected based on Sensitivity Analyses by Duke and ARSAP
  - Consistent with EPRI requirements
- o Impact of Selected Cooling Water System Design on PRA
  - System more reliable source of cooling for safety loads,
  - New initiating event to be addressed, operating failure can cause trip and impair safeguards systems

SYSTEM 80+ PRA

ELECTRICAL DISTRIBUTION SYSTEM

- NEW ELECTRICAL DISTRIBUTION SYSTEM DESIGN SELECTED
  - COMPATIBLE WITH EPRI REQUIREMENTS
  - SLIGHT MODIFICATIONS SUGGESTED DUKE AND C-E
- DIFFERS FROM SYSTEM DESIGN ASSUMED FOR BASELINE PRA
  - 1 LESS GRID SUPPLY LINE
  - 13.8 KV LEVEL IN SUPPLY TO ESF BUSSES ELIMINATED
  - NUMBER OF 480V LOAD CENTERS REDUCED
  - 6 CLASS 1E 125 VDC BUSSES INSTEAD OF 4
  - EACH DG HAS DEDICATED BATTERY FOR START & CONTROL
  - 2 125 VDC CONTROL POWER SOURCES FOR EACH ESF COMPONENT

SYSTEM 80+ PRA

ELECTRICAL DISTRIBUTION SYSTEM DESIGN CHANGE IMPACT ON PRA

- Use of the Alternate AC Source Will Be Treated as Recovery Action
  - factor of .1 for loss of power cutsets
- Re Do All Electrical Supply System Models
  - front line system models and event sequences not requantified yet
- Anticipate Slight Improvement in System Reliabilities

SYSTEM 80+ PRA
PRELIMINARY CORE DAMAGE FREQUENCY
BY
INITIATING EVENT

INITIATING EVENT	CORE DAMAGE FREQUENCY (WITH RECOVERY)
Large LOCA	2.52E-7
Medium LOCA	2.88E-7
Small LOCA	4.33E-8
Loss of Feedwater	3.48E-8
Loss of Condenser Vacuum	6.71E-9
Other Transients	1.10E-7
Steamline Breaks	1.04E-9
S.G. Tube Rupture	1.68E-7
Loss of Offsite Power	4.42E-7
ATWS	2.14E-7**
Loss of CCW/SW	3.98E-8
Loss of 125 VDC Bus	5.00E-8**
Interfacing System LOCA	1.00E-7**
TOTAL	1.75E-6

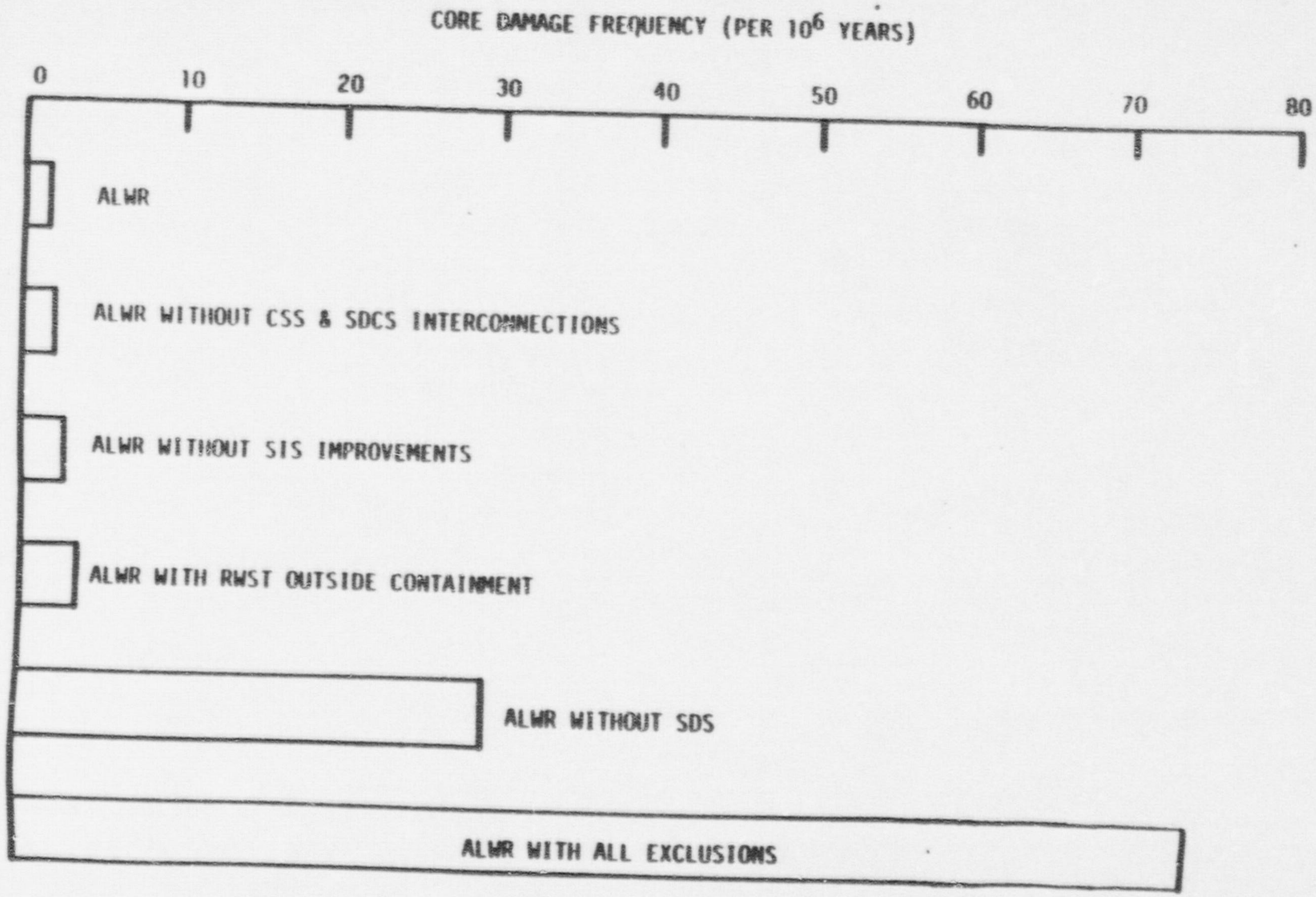
* No recovery

** Estimated

SYSTEM 80+ PRA

OVERALL CORE DAMAGE FREQUENCY

INTERNAL EVENTS	1.75E-6	
SEISMIC	7.9E-6	(ARSAP)
TORNADO STRIKE	3.1E-7	(ARSAP)
TOTAL	9.96E-6	



COMBUSTION ENGINEERING

CORE DAMAGE FREQUENCY
(WITH ESTIMATED RECOVERY)

	ALWR	ALWR W/O SDS	ALWR W/O HPSI IMP.	ALWR W/RWST OUTSIDE CTMT	ALWR W/O CSS & RHR INTERCON.
LARGE LOCA	2.52E-7	2.48E-7	2.52E-7	7.01E-7	2.48E-7
MEDIUM LOCA	2.88E-7	2.88E-7	3.94E-7	7.62E-7	2.88E-7
SMALL LOCA	4.33E-8	4.34E-8	1.27E-7	3.90E-7	7.02E-8
STGR	1.68E-7	4.45E-7	5.10E-7	5.10E-7	2.72E-7
LOSS OF OFF-SITE POWER	4.42E-7	3.91E-7	6.71E-7	7.38E-7	4.38E-7
LOSS OF CLG WATER	3.98E-8	2.63E-5	7.55E-8	7.84E-8	1.48E-7
ATWS	2.16E-7	2.12E-7	2.37E-7	2.38E-7	2.29E-7
LOSS OF FEED-WATER	3.48E-8	1.26E-6	5.55E-8	5.70E-8	9.75E-8
OTHER TRAN-SIENTS	1.17E-7	2.78E-7	1.46E-7	1.51E-7	1.38E-7
LARGE SEC. SIDE BREAK	1.04E-9	7.42E-8	1.42E-9	3.66E-9	2.30E-9
TOTAL	1.60E-6	2.95E-5	2.47E-6	3.63E-6	1.93E-6

IMPACT OF SUPPORT SYSTEMS ON CORE MELT FREQUENCY

INITIATING EVENT	Core Melt Frequency			
	SYSTEM 80 BASELINE	SYSTEM 80+ OLD COOLING	SYSTEM 80+ NEW COOLING	SYSTEM 80+ NEW ELECTRICAL
Large LOCA	1.57E-6/year	6.83E-7/year	2.52E-7/year	1.31E-7/year
Medium LOCA	3.59E-6/year	7.43E-7/year	2.88E-7/year	
Small LOCA	9.40E-6/year	1.22E-7/year	4.33E-8/year	6.10E-9/year
Steam Generator Tube Rupture	1.05E-5/year	2.66E-7/year	1.68E-7/year	
Loss of Offsite Power	3.78E-5/year	5.10E-7/year	4.42E-7/year	
Transients	1.17E-5/year	1.85E-7/year	1.52E-7/year	2.91E-8/year
Loss of Cooling Water	N/A	N/A	3.98E-7/year	
Large Secondary Side Breaks	9.04E-7/year	4.81E-9/year	1.04E-9/year	
ATWS	4.79E-6/year	2.14E-7/year	2.14E-7/year	2.14E-7/year
TOTAL	8.02E-5/year	2.73E-6/year	1.60E-6/year	

COMBUSTION ENGINEERING

SYSTEM 80+ PRA

ARSAP SUPPORT

- o External Event Evaluation
  - Qualitative evaluation eliminated all but seismic and tornado strike
  - Preliminary Quantification
    - . Tornado strike 3.1E-7/yr
    - . Seismic 7.9E-6/yr
- o Providing Assistance in Level II Analyses

SYSTEM 80+ PRA

LEVEL II ANALYSES

- Process Define
- Plant Damage State Parameters Defined
- Draft Set of Plant Damage States Defined
  - Third pass
  - In review by Duke and ARSAP
  - 216 preliminary damage states
- Preliminary Draft of Containment Event Tree Provided by Duke

SYSTEM 80+ PRA

PLANT DAMAGE STATE PARAMETERS

- In-Vessel Pressure at Core Melt
- RCS Leak Rate
- Point of Release (of RCS Inventory)
- Secondary Side Heat Removal Status
- Containment Scrubbing
- Containment Heat Removal
- Cavity Condition
- Containment Isolation

BNL REVIEW CONCERNS

- INITIATING EVENTS
  - Interfacing Systems LOCA (Item 2.a)
  - Loss of Secondary Cooling (Item 2.b, Table 1)
  - Plant Operational States (Item 2.c)
  - Loss of Off-Site Power/SBO (Item 2.d)

- METHODOLOGY
  - Conditional System Failure Probabilities versus Fault Tree Linking (Item 3)

- SYSTEM ANALYSIS AND ACCIDENT SEQUENCE ANALYSIS
  - AC Power Availability and Recovery (Item 4.a)
  - Alternate Secondary Heat Removal (Items 4.a, 4.b)
  - Aggressive Secondary Side Cooldown (Item 4.b)
  - Copies of Fault Trees (Item 4.c)
  - Where are Human Actions Addressed in Models (Item 4.d)
  - Documentation of Success Criterion and Mission Time (Item 4.e)
  - Impact of Support Systems on Dominant Core Damage Sequences (Item 4.f)
  - Conditional Unavailability of ESFAS Signals (Item 4.g)
  - Treatment of SGTR (Item 4.h)

BNL REVIEW CONCERNS
INITIATING EVENTS

- INTERFACING SYSTEMS LOCA
  - Methodology Being Reviewed
  - New Analysis for System 80+
- LOSS OF SECONDARY COOLING
  - Not Appropriate for System 80 Baseline (Standby Safety System)
  - Included for System 80+ Because of Design Change
- LOSS OF OFF-SITE POWER/SBO
  - Loss of Off-Site Power and SBO Sequences Combined
    - better treatment of diesel generator configuration
    - easier recovery analysis
  - Post-Trip Loop/SBO Like Sequences Covered in All Other Event Sequences

SYSTEM 80+

BNL REVIEW CONCERNS
INITIATING EVENTS (CONTD)

- o SPECIAL INITIATORS
  - Ground Rules A) CAUSE TRANSIENT
    B) DISABLE SAFETY SYSTEMS
  - "Loss of 125VDC Bus", "Loss of 4.16 Kv Bus" INCLUDED
  - "Loss of Instrument Air", "Loss of 480 VAC Bus" NOT INCLUDED
- o PLANT OPERATIONAL STATES
  - Only Power Operation Covered

BNL REVIEW CONCERNS
METHODOLOGY

- CONDITIONAL SYSTEM FAILURE PROBABILITY APPROACH
  - Use for System 80 Baseline
  - Provides Estimate of Core Damage Frequency and Dominant Contributors
  - Consistent with Level of Detail for Generic BOP used for System 80 Baseline

- FAULT TREE LINKING
  - Used for System 80+
  - Provides Core Damage Cutsets
    - Needed for extension to Level 2 analyses
  - Easier Recovery Analysis
  - Better Evaluation of Impact of Support Systems
  - Requires More Detail

BNL REVIEW CONCERNS
SYSTEM ANALYSIS AND ACCIDENT SEQUENCE ANALYSIS

o AC POWER AVAILABILITY AND RECOVERY

- Electrical Power Explicitly Modeled for all Systems
- Loop and SBO Sequences Combined
- Fault Tree Linking Used
- Recovery at Cutset Level
- Sequence Dependent Restoration Times Used
- Restoration Probabilities from EPRI Key Assumptions and Ground Rules Document

o ALTERNATE SECONDARY HEAT REMOVAL

- Not Possible for System 80+
- Startup Feedwater Pump Explicitly Modeled

BNL REVIEW CONCERNS
SYSTEM ANALYSIS AND ACCIDENT SEQUENCE ANALYSIS (CONTD)

- DOCUMENTATION RELATED
  - 3 Tiers for System 80+ PRA
    - A) CESSAR-DC summary
    - B) PRA report
    - C) Supporting files
  - System 80+ PRA Report Will Contain all Fault Tree Models and Sequences
  - Dominant Cutset for Top Fault Trees and Sequences will be Included
  - Mission Times/Success Criteria Specified in Report, Documented by Reference

ENCLOSURE 3

NRC STAFF AND BNL COMMENTS TO CE

1) When using the IRRAS II code for PRA, concern was expressed over whether IRRAS II was capable of handling large fault trees.

2) CE was asked to submit two selected fault trees for one sequence for auditing purposes.

3) The baseline PRA was generated from a generic BOP and didn't have sufficient detailed information. CE indicated that the System 80+ PRA would include design details of the plant including the BOP.

4) What are the special features that allow CE to meet the proposed safety goal of 25 rem beyond a one-half mile radius following a large release of radiation due to core melt?

5) CE should ensure that all potential problems and event sequences caused by the addition of new features have been addressed to ensure that new problem have not been introduced by such features.

6) CE should justify the use of the IRRAS II code and address the potential for non-conservative results.

7) How did CE model the common mode failures? Please provide additional documentation.

8) CE should include maintenance unavailability estimates. The PRA should provide some unavailability estimates for the most adverse train.

9) Since the Technical Specifications for the System 80+ are to be based on reliability assumptions, CE should ensure the assumptions used for developing the PRA and the Technical Specifications are the same.

10) Provide documentation on how each initiating event affects plant systems and response.

11) The frequency of the loss of offsite power seems low. CE should make use of site parameters.

12) Discuss any dependency of the actuation signals in the reactor protection system.

13) Discuss the impacts of single steam generator tube rupture verse multiple steam generator tube ruptures.

14) In the steam generator tube rupture event tree, CE should modify this event tree to account for ATWS sequence.

15) The NRC staff indicated that CE could request a copy of the risk codes currently used by the staff.

16) CE should provide an electrical power system distribution list including various electrical loads connected to the 125V and 4180V buses.