

Docket No. 50-373

JUN 6 1984

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LICENSEE: Commonwealth Edison Company

FACILITY: La Salle County Station, Unit 1

SUBJECT: SUMMARY OF MEETING WITH COMMONWEALTH EDISON COMPANY
TO DISCUSS FINE MOTION CONTROL ROD DRIVE (FMRD)
DEMONSTRATION

On May 16, 1983, representatives of the Commonwealth Edison Company and General Electric met with the Nuclear Regulatory Commission (Office of Nuclear Reactor Regulation) to discuss a contemplated experiment to be inserted into the La Salle County Station, Unit 1 reactor core. A list of attendees is provided in Enclosure 1.

This experiment consists of replacing one peripheral locking piston drive system in the La Salle Unit 1 core, the present design, with a new drive system identified as "fine motion control rod drive system." Enclosure 2 is the vu-graphs presented at the presentation by the General Electric Company. As indicated in the presentation, this drive mechanism has been in the developmental stage for many years and one form of this drive design has been used in boiling water reactors by the Japanese and Germans. General Electric is presently designing this drive mechanism to be incorporated into their advance boiling water reactor. The design consists of a diverse drive in that it uses an electric motor for shimming and hydraulic means for fast scram. The purpose of the experiment is to obtain radiation exposure of the drive mechanism in addition to some in-plant demonstration. The peripheral location was chosen to insert this drive to have minimal impact on operation. It was indicated by the General Electric personnel that this control drive in La Salle, Unit 1 will always be declared inoperable during startup of the reactor. After the core has attained a power above 20%, it will be completely pulled out. Therefore, the control drive will be either completely inserted or drawn out for this in-plant demonstration. General Electric indicated that a topical report will be submitted for this experiment, and that the duration of the experiment was for only one fuel cycle. The schedule for submitting this topical report was specified to be approximately December 1984. The staff indicated that if this experiment was being scheduled to be inserted during the first refueling outage, which is now projected for March 1985, the topical report for our review should be submitted much earlier, around early fall.

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P PDR

A. Bournia, Project Manager
Licensing Branch, No. 2
Division of Licensing

Enclosure:

As stated

DL:LB#2/PM

ABournia:bdm

6/6/84

DL:LB#2/BC

ASchwencer

6/6/84



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

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A handwritten signature in cursive script, appearing to read "A. Bournia".

A. Bournia, Project Manager
Licensing Branch, No. 2
Division of Licensing

Enclosure:
As stated

Meeting AttendeesNameAffiliation

Anthony Bournia
M.J. Jordan

NRR/DL/LB-2
USNRC/Senior Resident
La Salle, NPS

Charles McClain
Dr. Ernest Sylvester Jr.

NRC/ACRS
NRC/DSI/ASB

Jerry Wilson

NRC-ASB

Wayne Hodges

NRC-RSB

George Thomas

NRC-RSB

Kulin Desai

NRC-RSB

Jim Marshall

C.E. Co.

Robert L. Scott

CECO - SNED

Steve Tang

GE/CRD Syst. Engr.

Al Wang

GE Licensing

Raj Goel

NRC/DSI/ASB

Howard Richings

NRC/CPB

Jerry L. Mauck

NRC/ICSB

Rick Kendall

NRC/ICSB

Jose Calvo

NRC/ICSB

H. L. Brammer

NRC/DE/MEB

ENCLOSURE 2

AGENDA

INTRODUCTION

FMCRD FEATURES

IN-PLANT FMCRD SYSTEM EVALUATION AND DESCRIPTION

EQUIPMENT QUALIFICATION/TESTING

IN-PLANT DEMONSTRATION ACTIVITIES

SUMMARY

PURPOSE OF MEETING

- INTRODUCE A NEW CRD DESIGN
 - FMCRD ENHANCES STATE-OF-ART BWR TECHNOLOGY
 - DESTINED TO BE USED IN ADVANCED BWR PRODUCT LINE
- PRESENT OVERVIEW OF FINE MOTION CONTROL ROD DRIVE IN-PLANT DEMONSTRATION PROGRAM
- PROVIDE TECHNICAL DESCRIPTION AND EQUIPMENT QUALIFICATION INFORMATION
- REVIEW REQUIRED EXISTING SYSTEM MODIFICATION AND EQUIPMENT ADAPTION TO FACILITATE FMCRD IN-PLANT DEMONSTRATION
- DISCUSS LICENSING APPROACH TO BE USED FOR SAFETY EVALUATION
- ESTABLISH WORKING LEVEL LICENSING CONTACT
- OBTAIN NRC AGREEMENT OF OVERALL LICENSING APPROACH

BACKGROUND

- GE/HITACHI/TOSHIBA FMCRD COMPLETELY TESTED AND QUALIFIED
- CECO AND GE SIGNED FMCRD TEST AGREEMENT IN 8/83
- FMCRD TO BE FUNCTIONALLY VERIFIED IN SAN JOSE PRIOR TO SITE INSTALLATION
- IN-PLANT DEMONSTRATION TO BE CONDUCTED AT LASALLE UNIT 1
- DEMONSTRATION TO LAST FOR ONE FUEL CYCLE BEGINNING CYCLE 2
- AFTER ONE CYCLE DEMONSTRATION, REMOVE FMCRD FOR INSPECTION AND RESTORE ORIGINAL HCU

FMCRD IN-PLANT DEMONSTRATION OBJECTIVES

- DEMONSTRATE FMCRD PERFORMANCE IN OPERATING ENVIRONMENT
- DOCUMENT HANDLING METHODS DURING REACTOR INSTALLATION AND REMOVAL
- DETERMINE RADIATION LEVELS DURING SHUTDOWN/REMOVAL/DISASSEMBLE

LICENSING APPROACH

- SELECT A PERIPHERAL CONTROL ROD LOCATION FOR MINIMUM IMPACT ON SAFETY
- APPLY FOR SPECIAL TEST EXCEPTION
- MEET INTENT OF LPCRD OPERABILITY DEFINED BY TECH SPEC OR JUSTIFY ACCEPTABILITY BY ANALYSIS
- PRESERVE REACTOR COOLANT PRESSURE BOUNDARY INTEGRITY
- PREPARE LICENSING TOPICAL REPORT AND SUBMIT TO NRC IN 12/84
 - DEMONSTRATE OTHER LPCRD AND OVERALL SAFETY FUNCTIONS NOT AFFECTED
 - VERIFY FSAR SAFETY ANALYSIS REMAIN VALID
 - SATISFY INTENT OF SRP 3.9.4.

INPLANT FMCRD DEMONSTRATION

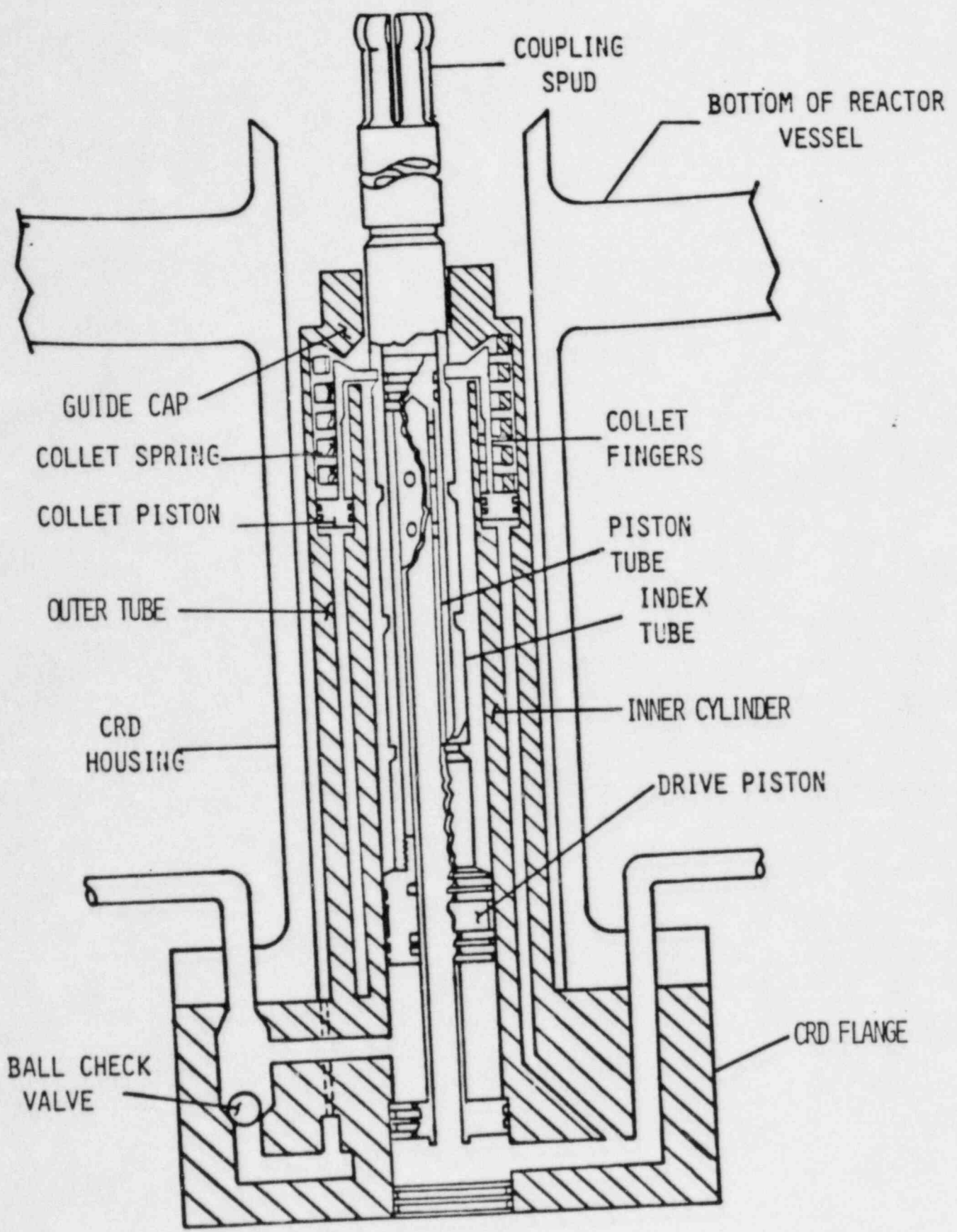
CRD DESCRIPTION

- FMCRD/LPCRD GENERAL DESCRIPTION
- FMCRD BACKGROUND
- FMCRD FEATURES
- FMCRD SAFETY FEATURES

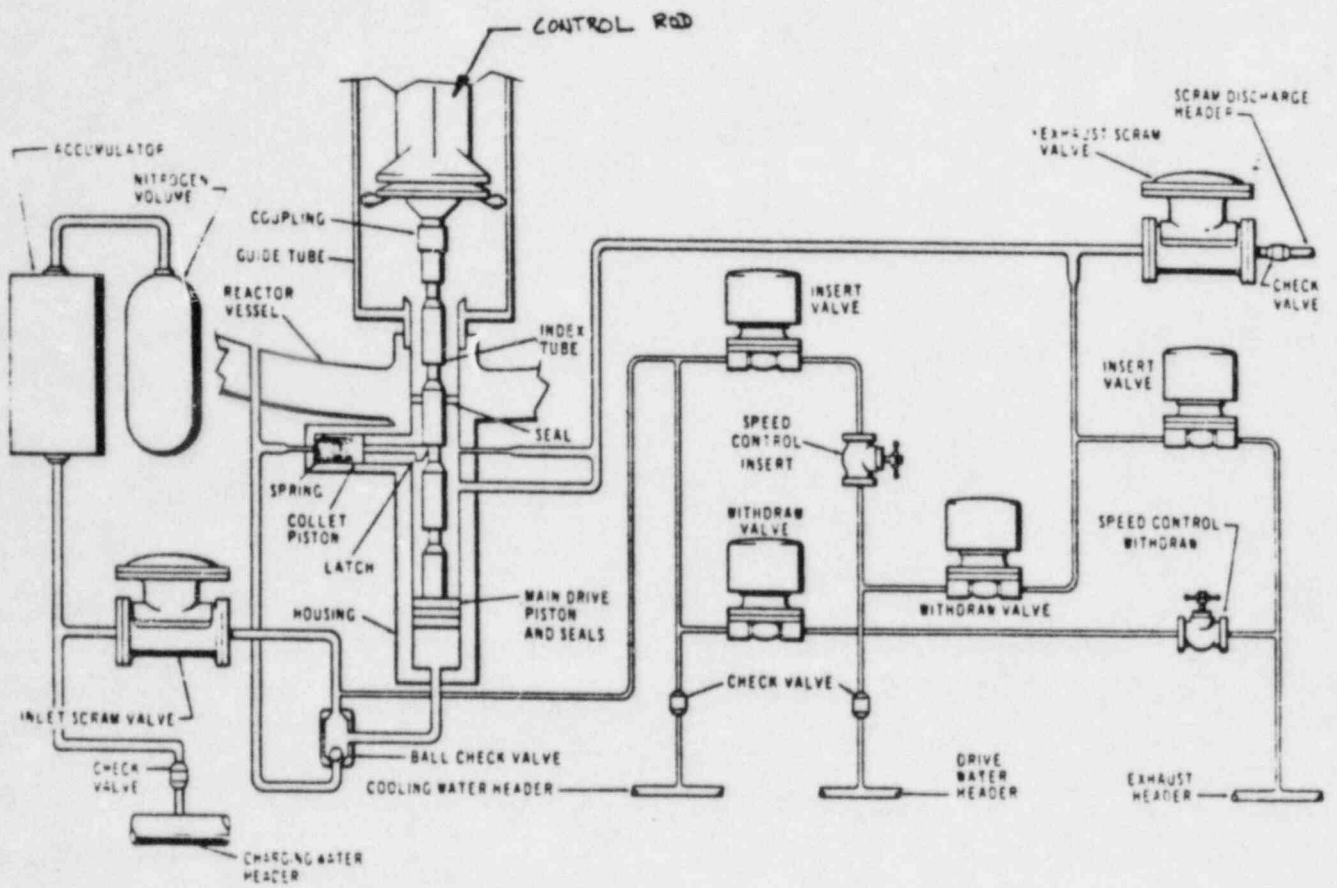
INPLANT FMCRD DEMONSTRATION

- INPLANT FMCRD COMPONENTS
- REACTIVITY EVALUATION
- PLANT CONTROLS INTERFACE
- PREOPERATIONAL/INSTALLATION ACTIVITY
- OPERATIONS/REMOVAL ACTIVITY

STEVE TANG
5/16/84



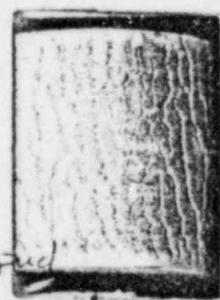
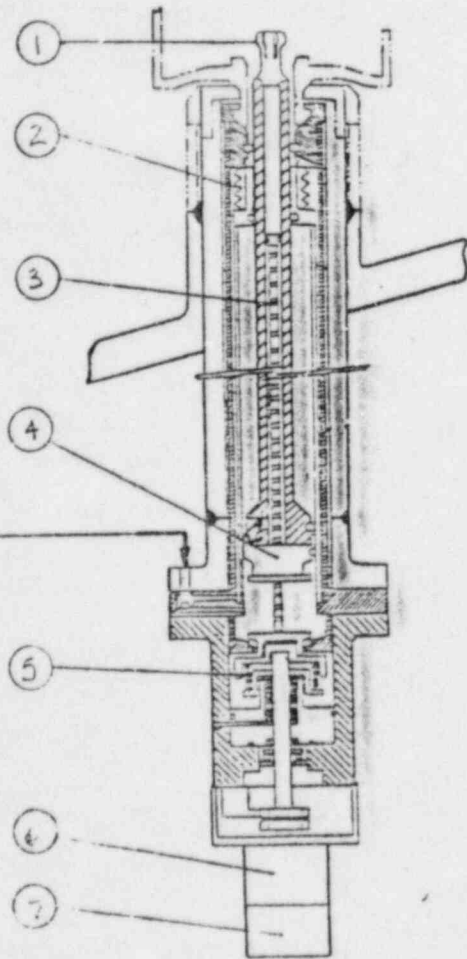
LOCKING PISTON DRIVE



Locking Piston Drive System

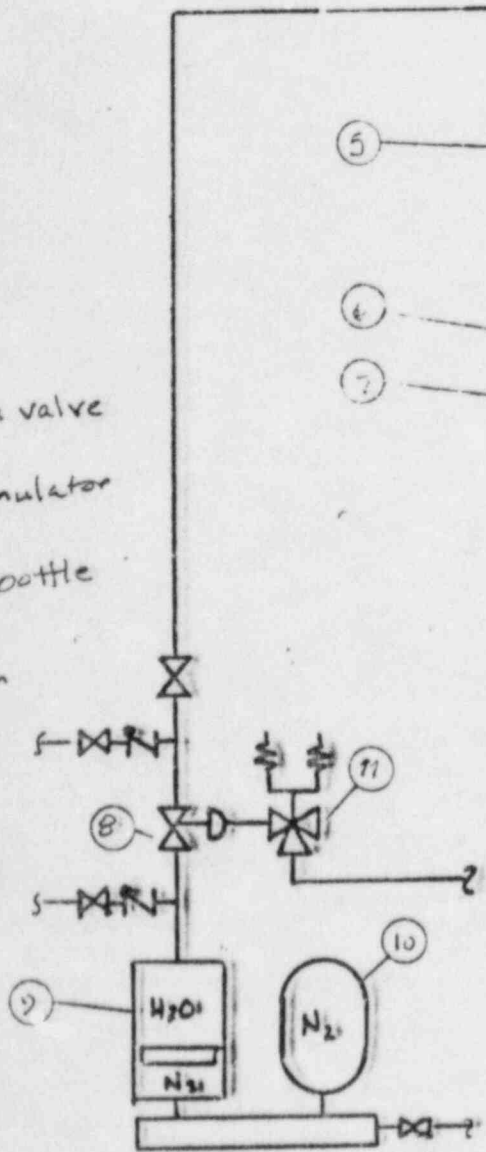
SYSTEM

Hydraulic scram
Electric actuation

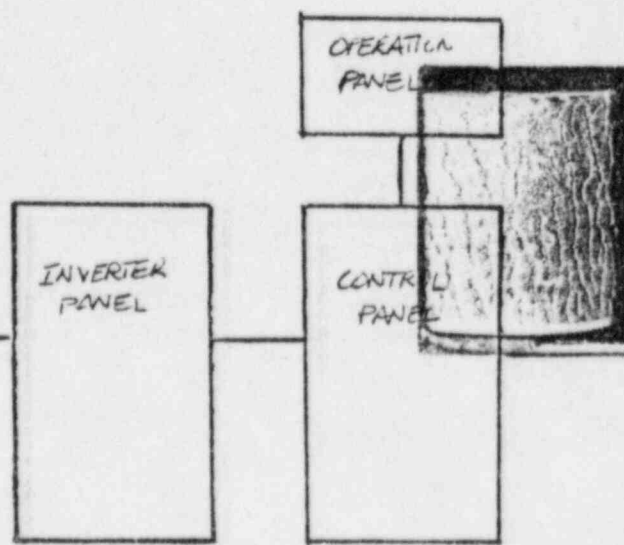


- ① Coupling Spud
- ② Disc spring buffer
- ③ Screw shaft
- ④ Ball nut
- ⑤ Weight detector
- ⑥ Motor
- ⑦ Synchros

- ⑧ Scram valve
- ⑨ Accumulator
- ⑩ N₂ bottle
- ⑪ Scram float valve

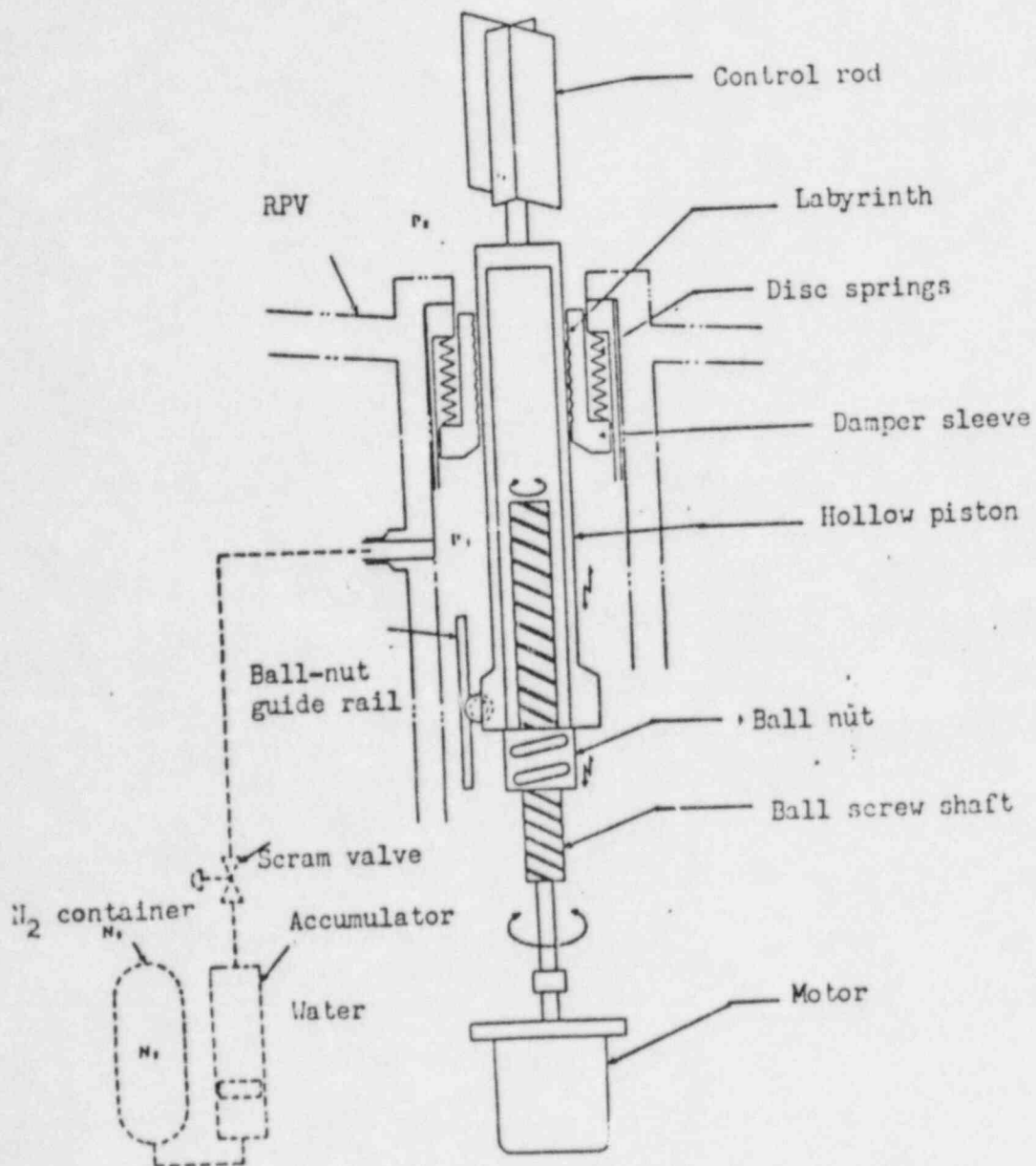


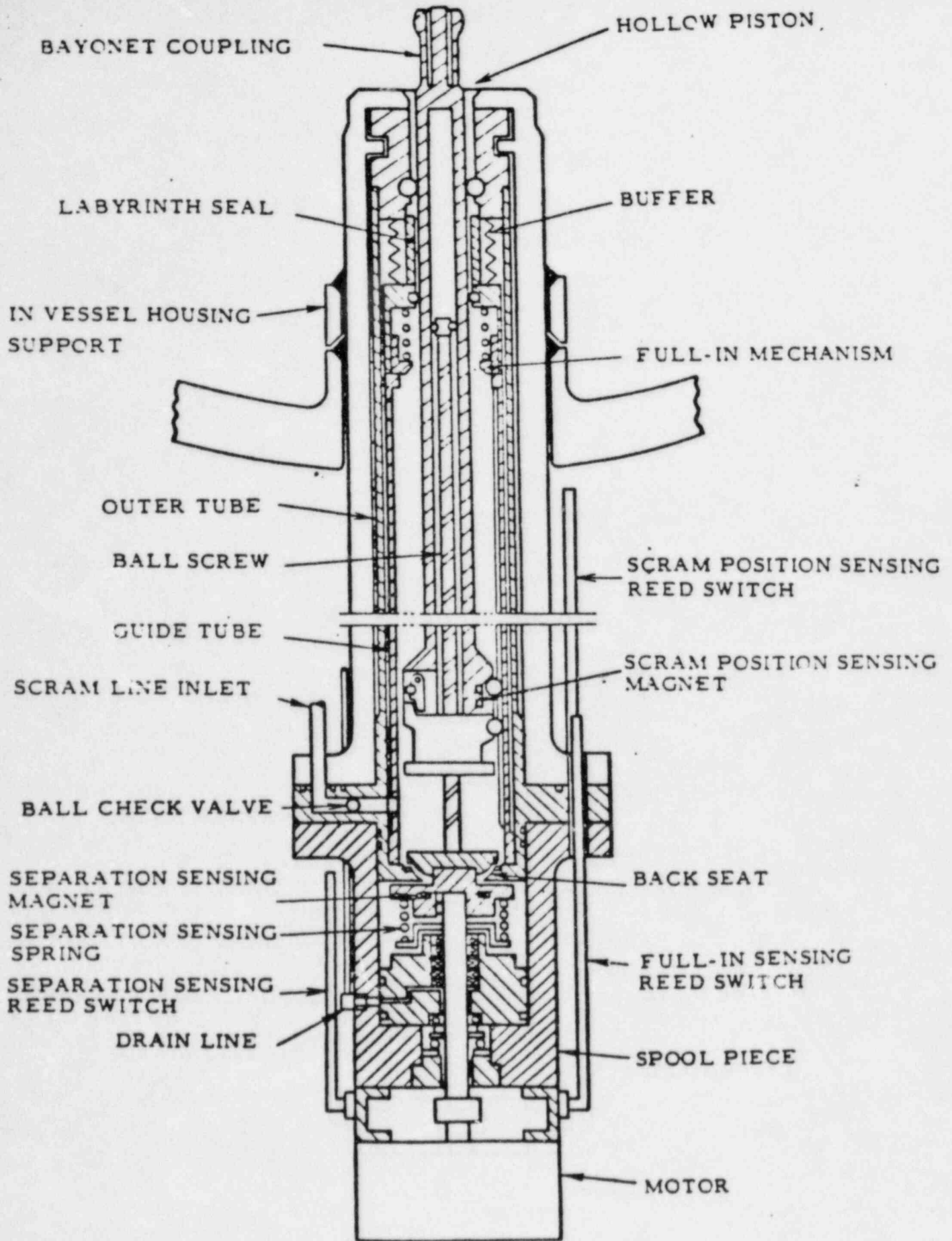
FMHCU



CONTROL PANELS

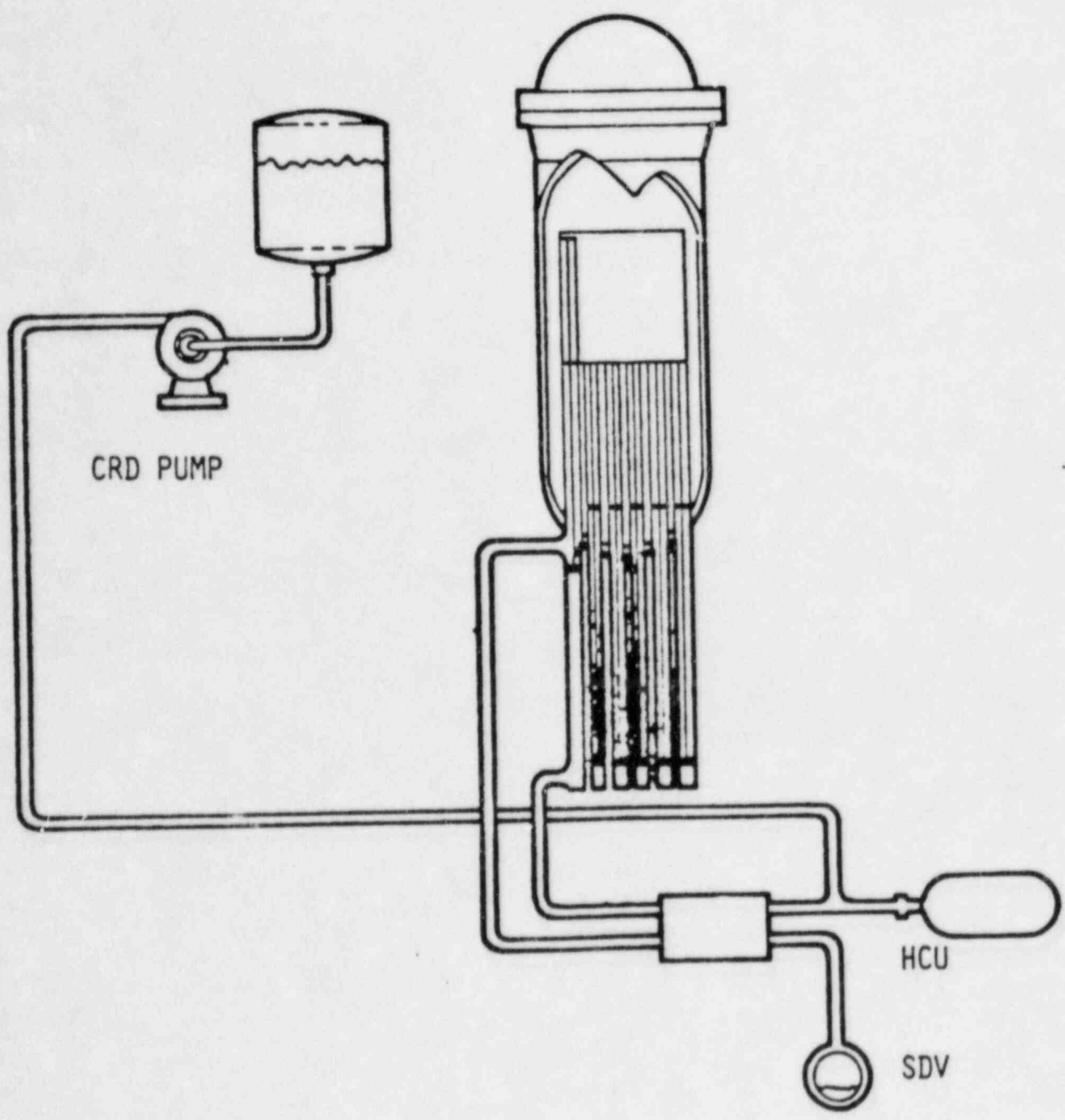
FMCRD SYSTEM



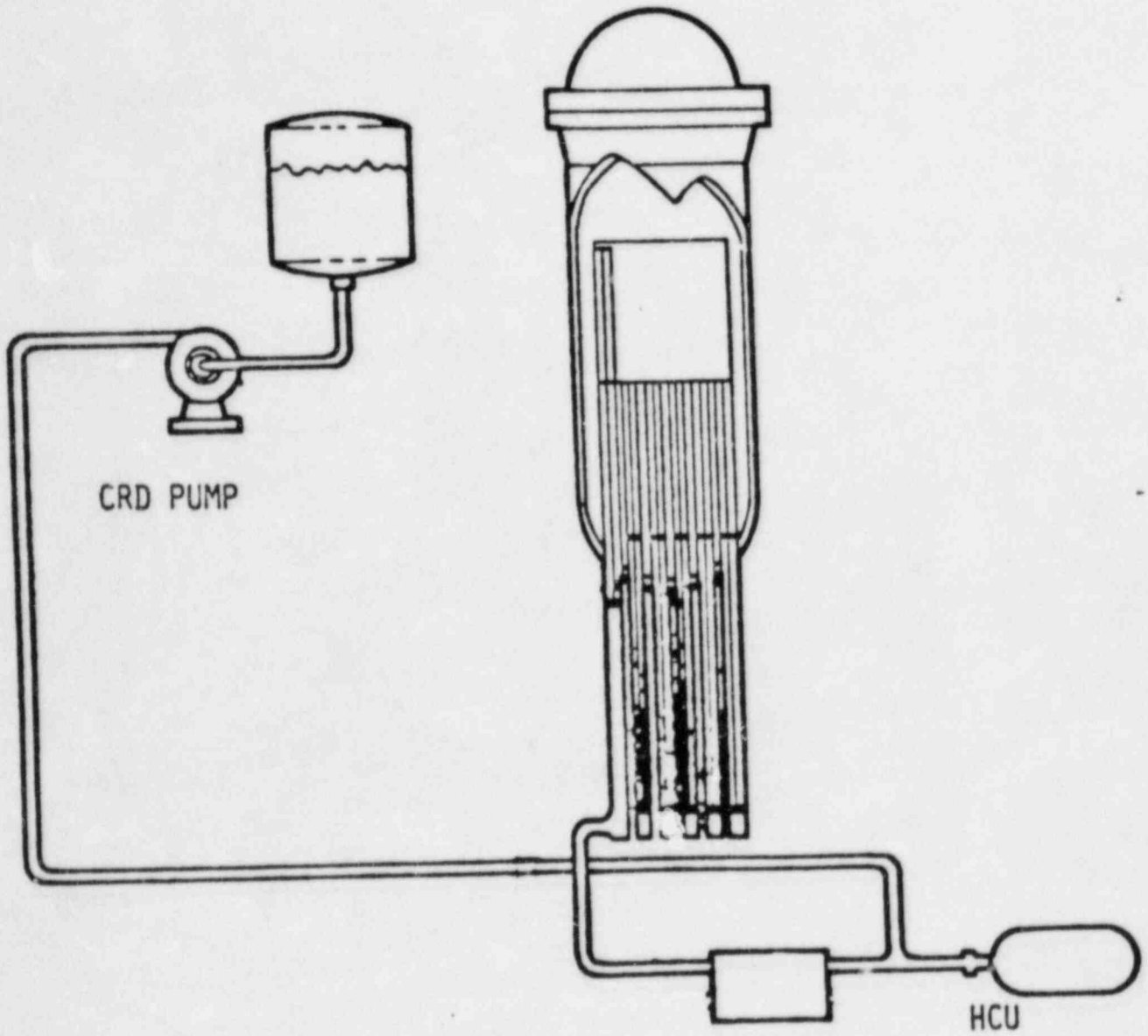


FMCRD (MODIFIED)

LPCRD HYDRAULIC SYSTEM



FMCRD HYDRAULIC SYSTEM



FMCRD BACKGROUND

GE'S DESIGN GOALS

- INCREASE PLANT OPERATIONAL FLEXIBILITY
- REDUCE OPERATION AND MAINTENANCE COSTS

FMCRD DEVELOPMENT HISTORY

- SCREW DRIVE BUILT BY GE IN LATE 50'S
- EUROPEANS CONTINUE WITH GE DESIGN (KWU, A-A); 86 PLANT YEARS OPERATING EXPERIENCE
- EVALUATION TESTS OF KWU FMCRD BY GE, 74-76
- GE/HITACHI/TOSHIBA HAVE FURTHER DEVELOPED FMCRD FOR ABWR APPLICATION
- ACCELERATED 40 YEAR LIFE TEST OF TWO FMCRD'S PERFORMED IN JAPAN
- FMCRD'S FULLY TESTED
 - CRUD
 - SEISMIC
 - MISALIGNMENT

FMCRD FEATURES

- REDUCED MAINTENANCE BY GRAPHITE SEAL ELIMINATION
 - OBJECTIVE, 2% CRDS/OUTAGE
 - REDUCED PERSONNEL EXPOSURE

- ELECTRIC STEPPING MOTOR; 3 MM CAPABILITY
 - ENHANCES FUEL PERFORMANCE
 - IMPROVES PLANT MANEUVERABILITY
 - PERMITS LARGE ROD GANGS FOR FAST STARTUP AND SCRAM RECOVERY

- CONTINUOUS POSITION INDICATION

- INTERNAL SHOOT-OUT SUPPORTS, FINAL DESIGN

- ELIMINATION OF SDV

- EASILY AUTOMATED

FMCRD EXTENDS
BWR CAPABILITIES

FMCRD SAFETY FEATURES

ENHANCED ATWS MITIGATION

- DIVERSE MEANS OF ROD INSERTION
- ARI COMPATIBLE

CRDA MITIGATION

- GANG ROD WITHDRAWAL CAPABILITY
- WEIGHING DEVICE SENSES SEPARATED BLADE (ROD BLOCK)

FMCRD DESIGNED
WITH SAFETY IN MIND

INPLANT FMCRD DESCRIPTION

- 41" LONGER
- DESIGNED TO BE COMPATIBLE WITH EXISTING LPCRD HOUSING
- SLIGHTLY REDESIGNED SHOOT-OUT AND LATERAL SUPPORTS REQUIRED
- PRESSURE BOUNDARY COMPONENTS DESIGNED AND BUILT TO ASME CLASS 1 STANDARDS

INPLANT FMCRD HCU DESCRIPTION

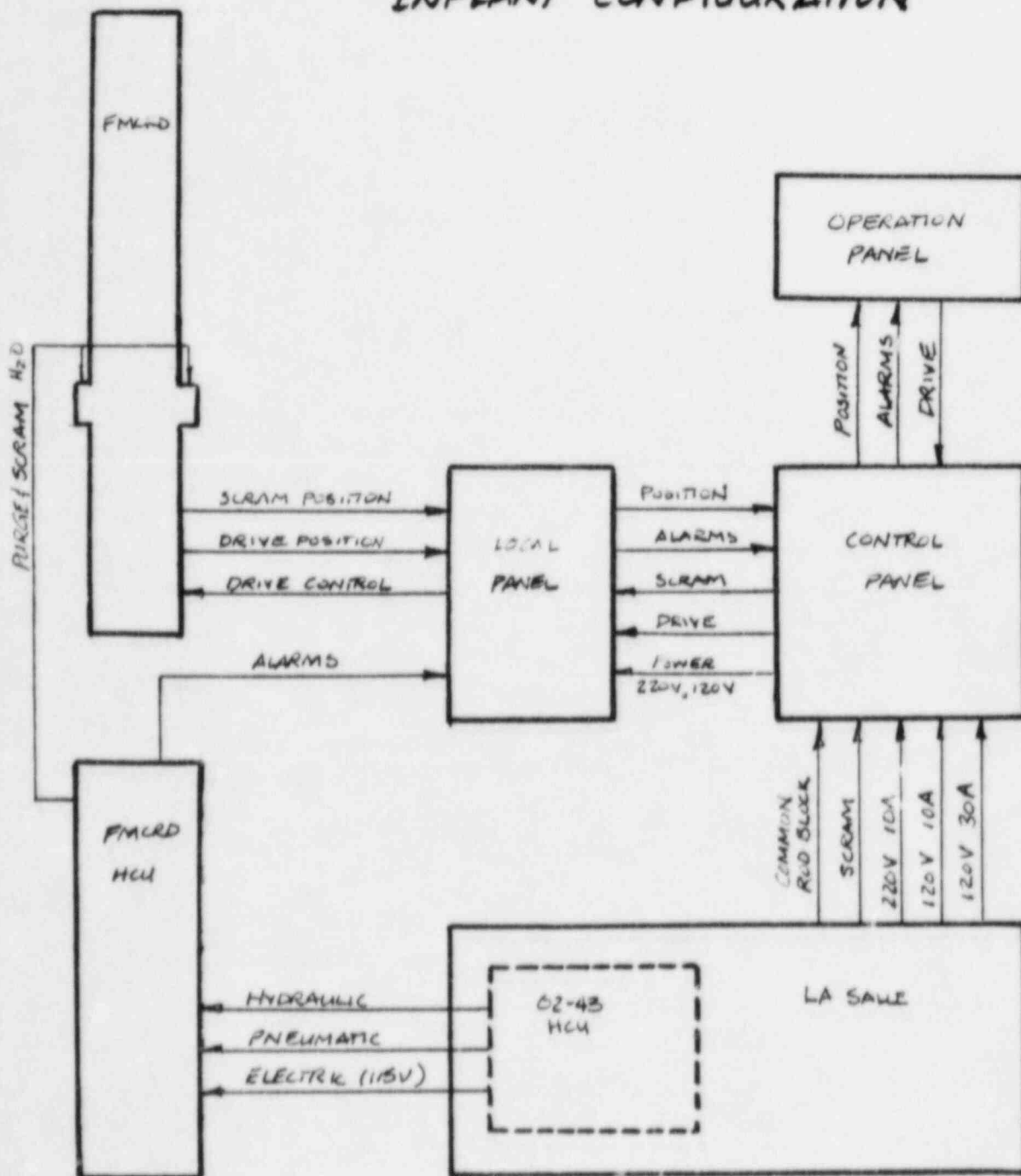
- LOCATED 15 FEET FROM Ø2-43'S PRESENT HCU
- 8.5" TALLER, 4.6" WIDER
- HYDRAULICS, PNEUMATICS FROM PRESENT HCU
- EXISTING INSERT/WITHDRAW LINE USED FOR FMCRD SCRAM INSERTION

GENERAL ELECTRIC CO.
Nuclear Energy Business Operations
ENGINEERING CALCULATION SHEET

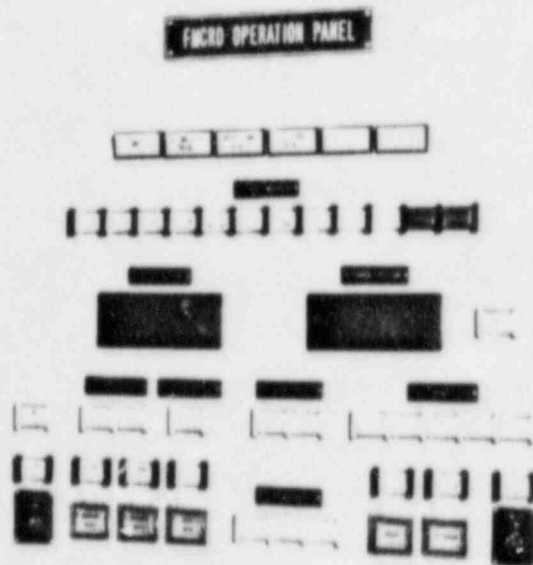
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INPLANT CONFIGURATION



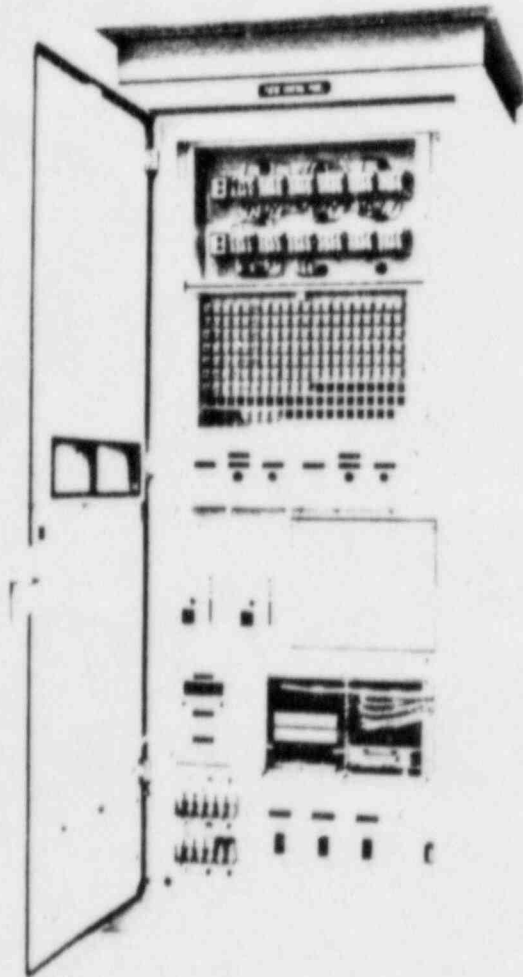
INPLANT FMCRD
CONTROL PANELS



OPERATION PANEL

- OPERATOR INTERFACE
- SMALL, 2' X 2' X 1.5' DEEP
- CONTROL ROOM LOCATION NEAR PRINCIPAL OPERATOR

CONTROL PANELS (CONT'D)



CONTROL PANEL

- CONTAINS LOGIC CIRCUITS AND POWER SUPPLY
- 7.5' TALL X 3.3' WIDE X 3' DEEP
- LOCATED ADJACENT TO CABLE SPREADING ROOM

CONTROL PANELS (CONT'D)

LOCAL PANEL

- CONVERTS CONTROL SIGNALS TO POWER
- SAME SIZE AS CONTROL PANEL
- LOCATED NEAR FMCRD HCU

INTERCONNECTING CABLE

- LOW VOLTAGE POWER AND SIGNAL CABLE SEPARATE
- 4Ø SINGLE CONDUCTOR DRYWELL PENETRATIONS REQUIRED

INPLANT FMCRD REACTIVITY EVALUATION

REACTIVITY WORTH OF PERIPHERAL ROD IS NEGLIGIBLE

ROD WITHDRAWAL ERROR

- PERIPHERAL CONTROL ROD NOT CONSIDERED BY R.B.M.
- INCONSEQUENTIAL FOR STARTUP, FULL POWER
- ROD FULLY INSERTED/DISABLED DURING REFUELING

CONTROL ROD DROP ACCIDENT

- WEIGHING DEVICE PROTECTION (ROD BLOCK)
- FMCRD ROD DROP INCONSEQUENTIAL FOR ALL OPERATING CONDITIONS

IMPACT ON SCRAM REACTIVITY IS NEGLIGIBLE

SHOOT-OUT PROTECTION SAME AS LPCRD

SHUTDOWN MARGIN MAINTAINED WITH FMCRD AND STRONGEST ROD WITHDRAWN

PLANT CONTROL SYSTEMS

- BYPASS RPIS AND RSCS
 - MONITOR POSITION WITH FMCRD OPERATIONS PANEL
 - RSCS ROD POSITION BYPASSED
 - ADMINSTRATIVELY RESTRICT ROD MOVEMENT BELOW LPSP (CONSISTENT WITH BPWS FOR AN INOPERABLE ROD)

- REPROGRAM RWM

- ADMINSTRATIVELY VERIFY ROD FULL-IN DURING REFUELING
 - INPUT SUBSTITUTE SIGNAL TO REFUELING INTERLOCKS

- SCRAM ENFORCED

- COMMON ROD BLOCKS ENFORCED

INPLANT FMCRD PRE-OPERATIONAL TESTING

INSPECT DRIVE UPON ARRIVAL

HYDROSTATIC TEST, ASME CODE

CONDUCT ACCELERATED 5 YEAR TEST

- COUPLING INTEGRITY
- STEP AND CONTINUOUS DRIVE
- SCRAM PERFORMANCE
- ALARM FUNCTIONS
- BEHAVIOR AT OFF NORMAL CONDITIONS

DISASSEMBLE AND INSPECT FOR WEAR

REFURBISH SEALS, PACKINGS

INSTALLATION ACTIVITIES

MODIFY CRD HANDLING EQUIPMENT

INSTALL CONTROL PANELS AND INTERCONNECTING CABLE

INSTALL FMCRD HCU AND INTERCONNECTING PIPING

REPLACE CRD WITH FMCRD

INSTALL UNDER VESSEL MODIFICATIONS

CONDUCT PRE-OP. CHECK

- CONTROLS
- COUPLING INTEGRITY
- STEP AND CONTINUOUS DRIVE
- SCRAM PERFORMANCE
- ALARM FUNCTIONS
- HCU HYDROTEST

OPERATIONAL MONITORING

ROD WILL BE EXERCISED DURING OPERATION AS A NORMAL Ø2-43
ROD

FMCRD AND REACTOR OPERATIONAL HISTORY

- TIP TRACE OUTPUT
- THERMAL OUTPUT, CORE FLOWRATE, AND REACTOR PRESSURE

REVERIFY FMCRD PERFORMANCE PRIOR TO REMOVAL

REMOVAL/RESTORATION

REMOVE FMCRD

- MONITOR RADIATION LEVELS IN PEDESTAL REGION
- FLUSH DRIVE, DISASSEMBLE AND INSPECT.
MONITOR RADIATION LEVELS

RESTORE SITE TO ORIGINAL CONDITION

- REINSTALL CRD, HCU, SHOOT-OUT STEEL
- REMOVE CONTROL PANELS
- RESTORE HANDLING EQUIPMENT TO ORIGINAL CONDITION

DISPOSE OF FMCRD EQUIPMENT

SUMMARY

- ONE FMCRD WILL BE INSTALLED AT LASALLE-1 AND DEMONSTRATED DURING CYCLE 2
- APPLY FOR SPECIAL TEST EXCEPTION TO FACILITATE FMCRD DEMONSTRATION
- FMCRD HAS ADDED SAFETY FEATURES
- FMCRD HAS NO IMPACT ON OTHER LPCRDs
- PERFORM SAFETY EVALUATION TO VERIFY SAFETY MARGIN NOT DEGRADED
- REACH AN AGREEMENT ON SAFETY ANALYSIS APPROACH AND SCOPE