81-437-000

Westinghouse Electric Corporation
Water Reactor Divisions

Nuclear Technology Division
Box 355
Pittsburgh Pennsylvania 15230

May 21, 1981
NS-TMA-2451

Mr. Victor Stello
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Phillips Building
7920 Norfolk Avenue
Bethesda, Maryland 20014

SUBJECT: Volume Control Tank Level Instrumentation

Dear Mr. Stello:

On May 21, 1981, Ed Jordan of your staff was notified by Westinghouse of the potential for an adverse control and protection system interaction. A single random failure in the Volume Control Tank level control system, in the absence of operator action could lead to a loss of redundancy in the high head safety injection system for certain plant designs.

The Westinghouse Water Reactor Division's Safety Review Committee concluded, on May 19, 1981, that this situation may not meet the intent of the Nuclear Regulatory Commission regulations related to separation of protection and control systems and single failure criteria as delineated in GDC-24 and IEEE-279 Section 4.7.3. This was deemed reportable to the NRC under 10CFR 21 for operating plants and 10CFR 50.55(e) for non-operating plants.

Attachment 1 presents the detailed information concerning the postulated event and recommended actions to address this concern. This information has been communicated to the utility owners of the affected plants which are listed in Attachment 2. If there are any questions regarding the attached, please contact D. W. Call at 412/373-5074.

Very truly yours,

T. M. Anderson, Manager
Nuclear Safety Department

DGB/kk
Attachments

cc: E. Jordan
R. Woods

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ATTACHMENT 1

Westinghouse has identified a potential control and protection system interaction concern involving the Volume Control Tank (VCT) level control system. Figures 1 and 2 show simplified schematics for 3 and 4 loop plants respectively. The postulated event is as follows:

Assume the plant is operating with a centrifugal charging pump performing the normal charging function. (Normally one of three available charging pumps is running with another as standby.) A failure of the VCT level control system causes the letdown flow to be diverted to the liquid holdup tank. The VCT liquid inventory decreases due to normal charging without any makeup to the VCT via letdown. Without operator intervention the VCT could empty causing the operating centrifugal charging pump to be damaged due to loss of suction fluid. If it is further assumed that one charging pump is out of service, as allowed by the Technical Specifications, there would then be only one remaining undamaged pump available to provide makeup to the reactor coolant system as required by letdown and reactor coolant pump seal leakage. The one remaining pump does not then meet the single failure criterion.

Following the failure in the VCT level control system, the operator would have approximately 10 minutes to transfer the charging pump suction from the VCT to the RWST or to simply stop the pump or to restore letdown to the VCT to prevent damage.

If no operator action occurs at this time, then the pump in operation could be damaged due to loss of suction, and the plant would continue to lose inventory due to letdown. However, this is a slow loss in water inventory. Automatic letdown isolation should occur. Even without letdown isolation or operator intervention, approximately two days would elapse prior to core uncovery. The operator would have considerable time to align the standby pump to the RWST.

It is Westinghouse's position that timely operator action can negate this scenario and positively address the identified concern. Plants are equipped with instrument readouts which would indicate the presence of this situation. In addition, the plants are equipped with numerous alarms which would be actuated at various times in the event. Table 1 shows the type of alarms which, in general, are available for information to the operator.

It is recommended that the plant procedures be reviewed to assure that the operator would be properly alerted to this situation and would take the appropriate action necessary to assure an adequate water supply to the charging pumps in the event of a VCT level control system failure.

Attachment 2

Operating Plants

3-Loop

San Onofre
Surry 1 & 2
Beaver Valley 1
Farley 1 & 2
North Anna 1 & 2

4-Loop

D. C. Cook 1 & 2
Salem 1 & 2
Sequoyah 1
Trojan
Zion 1 & 2

Non-Operating Plants

Beaver Valley 2
Shearon Harris 1, 2, 3, & 4
Virgil Summer

Braidwood 1 & 2
Byron 1 & 2
Catawba 1 & 2
Comanche Peak 1 & 2
Diablo Canyon 1 & 2
Jamesport 1 & 2
Marble Hill 1 & 2
McGuire 1 & 2
Millstone 3
Seabrook 1 & 2
Sequoyah 2
Vogtle 1 & 2
Watts Bar 1 & 2
*Calloway 1 & 2
*Wolf Creek

*May not be affected. VCT level system design change in progress.

TABLE 1

TYPES OF PLANT ALARMS

- High VCT Level
- Low VCT Level
- Full Letdown Flow Divert
- Refueling Water Transfer
- Automatic Makeup Start in VCT
- Low-Low VCT Level
- Low Charging Flow
- Low RCP Seal Injection Flow
- High Temperatures
- Low Pressurizer Level

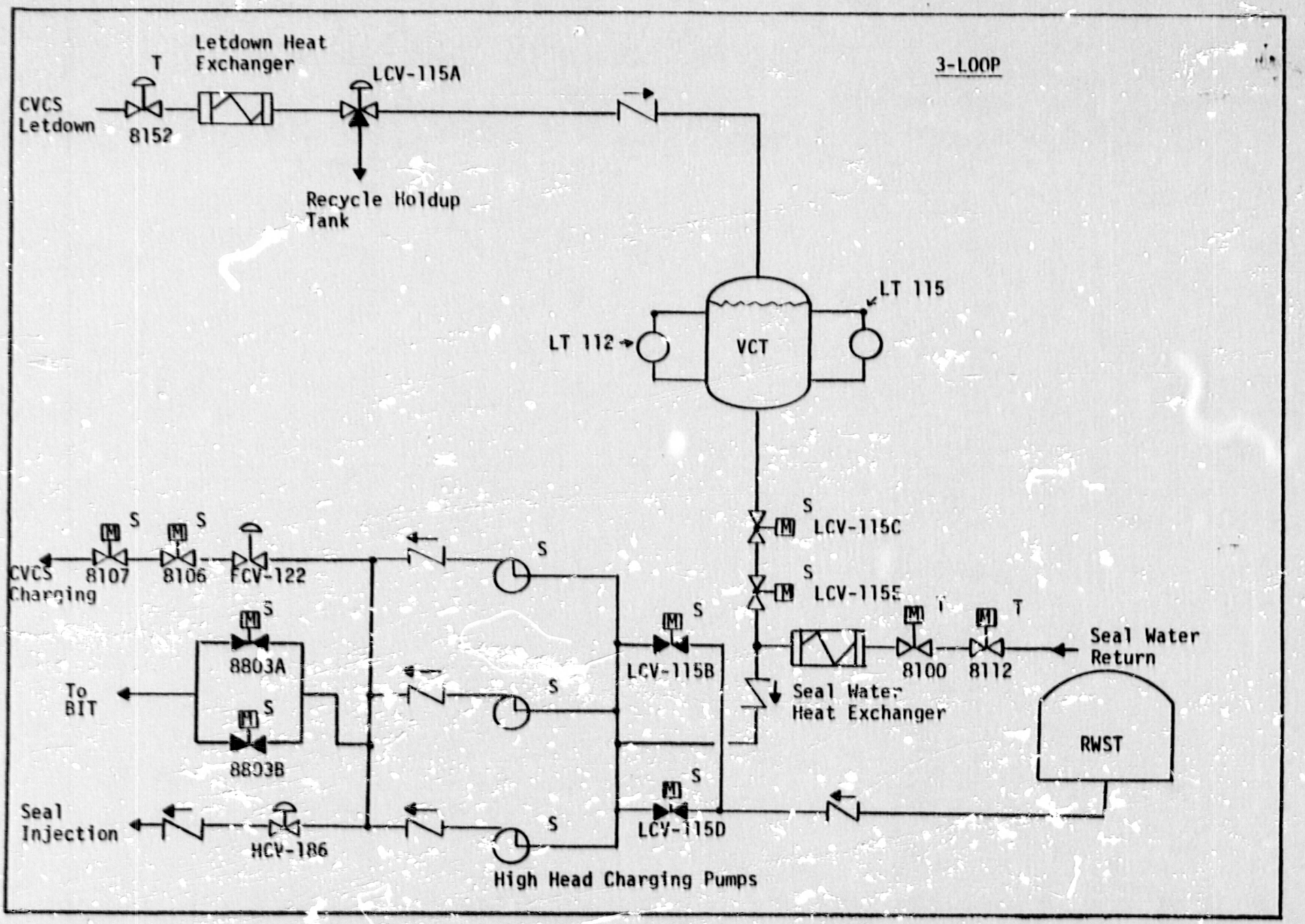
3-LOOP
Letdown Heat Exchanger
T
LCV-115A
CVCS Letdown
8152
Recycle Holdup Tank
LT 115
LT 112
VCT
S
LCV-115C
S
LCV-115E
T
T
Seal Water Return
8100
8112
Seal Water Heat Exchanger
RWST
CVCS Charging
8107
8106
FCV-122
S
S
S
8803A
S
To BIT
8803B
LCV-115B
S
S
LCV-115D
Seal Injection
HCV-186
High Head Charging Pumps

FIGURE 1

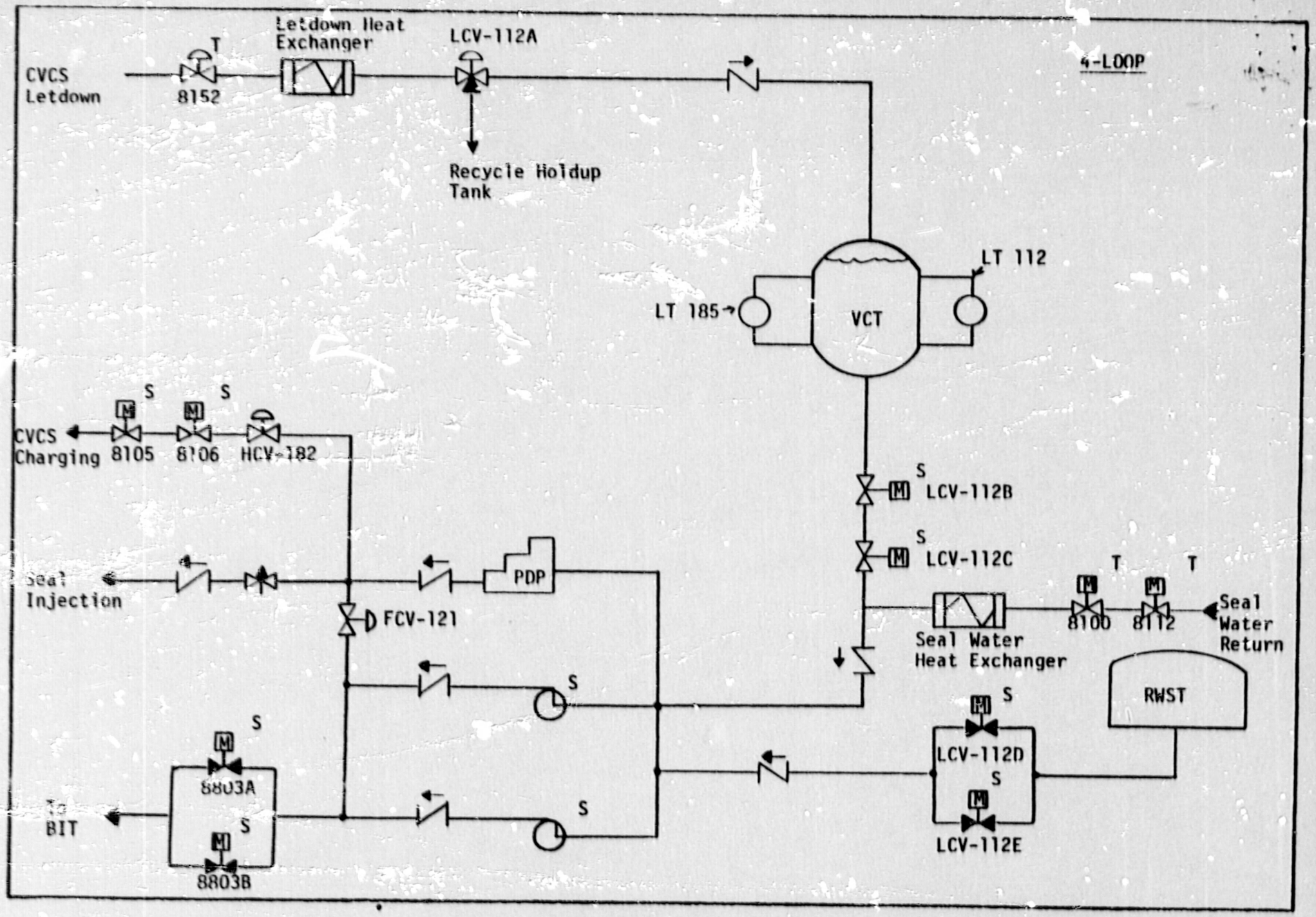
4-LOOP
CVCS
Letdown
T
8152
Letdown Heat
Exchanger
LCV-112A
Recycle Holdup
Tank
LT 112
LT 185
VCT
S
S
CVCS
Charging
8105
8106
HCV-182
S
LCV-112B
S
LCV-112C
T
T
Seal
Injection
PDP
FCV-121
Seal Water
Heat Exchanger
8100
8112
Seal
Water
Return
RWST
S
S
S
LCV-112D
S
8803A
S
To
BIT
S
LCV-112E
8803B

FIGURE 2

PART 21 IDENTIFICATION NO. 81-437-000 COMPANY NAME Westinghouse El

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ACTION:

PRELIMINARY EVALUATION OF THE ATTACHED REPORT INDICATES LEAD RESPONSIBILITY FOR FOLLOWUP AS SHOWN BELOW:

IE ☐ NRR ☐ NMSS ☐ OTHER ☐

EES

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