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Generic Letter 95-07
Potential Susceptibility Screening
HV-1/255F006
HPCI Injection Valve

Prepared: [signature] 11-15-95

Concurred: [signature]

GENERAL DISCUSSION & BACKGROUND

HPCI System Design and Operational Bases

The purposes and functions of the HPCI system are as follows:

- Provide sufficient coolant to the reactor vessel to prevent excessive fuel cladding temperatures in the event of a small-break LOCA which does not result in rapid depressurization of the reactor vessel (i.e., the low pressure core cooling systems would not be effective). This is a safety-related function for the HPCI system.

- Provide sufficient coolant inventory in the reactor vessel to allow for a complete plant shutdown until the reactor is depressurized to a level where the Low Pressure Coolant Injection (LPCI) system, or the Core Spray (CS) system can be placed into operation. This is a safety-related function for the HPCI system.

- Provide an alternate means of reactor shutdown pressure control through the release of steam to the suppression pool. This is a nonsafety-related function for the HPCI system.

- Fulfill the objectives of the Reactor Core Isolation Cooling (RCIC) system in the event that the RCIC system fails. These are nonsafety-related functions for the HPCI system.

The design of the Emergency Core Cooling systems for the SSES is to provide continuity of core cooling for the entire range of anticipated reactor pressure conditions. This is accomplished by providing multiple systems, each designed to cover a particular range of break sizes. Continuity of cooling is assured by providing appropriate operational overlap between the particular systems. It is also intended that for all modes of intentional or accidental reactor operation, there would be at least two systems available for providing adequate core cooling. This is accomplished by adding the High Pressure Coolant Injection (HPCI) system, the Core Spray system, and the Low Pressure Coolant Injection (LPCI) sub-system of the Residual Heat Removal system, in combination with the auto relief system.

Consequently, the size of the HPCI system was selected on the basis of providing sufficient core cooling to prevent excessive fuel cladding temperature, and to depressurize the reactor pressure vessel to the point at which the core spray system is effective. Startup and operation of the HPCI system is automatically initiated upon detection of either low water level in the reactor vessel or high drywell pressure. The low reactor water level is sensed by four level indicating switches (LIS-B21-1N031A, B, C and D) assigned to the NSSS Instrumentation system. The HPCI system is designed to pump water from the Condensate Storage Tank (primary source), or the suppression pool (safety-related secondary source) into the reactor vessel under conditions associated with small loss-of-coolant events which do not rapidly depressurize the reactor. The HPCI system is designed to provide rated flow of 5000 gpm independent of reactor pressure over the operating range of 1202 to 165 psia reactor pressure. The upper limit of 1202 psia corresponds to the maximum reactor relief valve setpoint pressure for the lowest group of valves with a setpoint tolerance of +1%. The lower limit bounds the reactor pressure at which the LPCI system (277 psi difference between reactor and drywell) and the CS system (289 psid) begin to operate. The LPCI system matches the HPCI system flow at 215 psid for a single pump in one loop and 260 psid for two pumps in one loop, and reaches rated flow at 20 psid. The Core Spray system reaches rated flow at 105 psid. By design, there is sufficient overlap for adequate cooling such that the Core Spray system is providing sufficient flow when the HPCI system trips on low reactor pressure.

The HPCI system injects cold water into the feedwater sparger to assure effective mixing. It is designed to be capable of making up inventory losses for liquid breaks below about 0.02 sq ft, thus maintaining reactor level. For break sizes between 0.02 and 0.4 sq ft, the HPCI system acts as an effective depressurizer by virtue of lowering the average temperature of the vessel contents. This accelerated depressurization rate will enable either the Core Spray system or the LPCI system to function earlier, before core damage can occur. The HPCI system is designed to provide injection down to a reactor pressure of 150 psig and ceases to function at 100 psig. This pressure is sufficiently overlapped by the static head of the Core Spray pumps (~300 psig) to ensure that depressurization occurs, permitting the Core Spray system to reach rated flow. The head of the LPCI pumps is such that they can deliver rated flow at 150 psig. By design, there is sufficient overlap for adequate cooling such that the Core Spray system is providing sufficient flow when the HPCI system trips on low reactor pressure.

The HPCI system is also shut down at a high reactor water level to prevent carryover of water into the main steamlines and reactor vessel safety/relief valves. In the event that a loss of reactor inventory lowers the coolant level to the HPCI start setpoint, the HPCI system must respond to supply makeup water to the reactor. Consequently, the HPCI system is designed for automatic restart after the turbine has been shut down on high reactor water level. However, SSES operating procedures direct the operators to take manual control of the system in order to prevent multiple starting and stopping of the system.

The HPCI system pump suction is also designed to transfer suction automatically from the CST to the suppression pool. The HPCI system suction source transfer function provides automatic transfer of the HPCI pump suction from the non-safety CST to the safety-related suppression pool if the CST level decreases to its low level setpoint, or if the suppression pool level increases to its high level setpoint. The basis for the CST transfer on low tank level is to have the HPCI system transfer suction from the CST prior to depleting its usable volume. The remaining volume is sufficient to provide the pump with water during the CST to suppression pool valve transfer time, and to have an additional volume to provide assurance that the fluid head above the tank outlet nozzle is sufficient to prevent vortex formation.

The basis for the suction transfer on high suppression pool level is to prevent the HPCI system from contributing to the further increase in the suppression pool level. The maximum suppression pool water level, 24 feet, is dictated by the need to maintain sufficient air space to accommodate the non-condensable gases that are blown down to the suppression chamber during an accident. A small break LOCA with HPCI injection may raise suppression pool level to 24 feet and therefore, the ability to swap over to the suppression pool suction is provided.

The HPCI system can also be used as a means of RPV pressure control by being placed in the "CST to CST Pressure Control Mode" provided that adequate core cooling is assured. This provides an effective and controlled manner to control RPV depressurization in lieu of periodically opening SRVs.

HV-1/255F006 Specific Design Bases

The HPCI injection shutoff valve is normally maintained in the closed position to provide positive isolation of the HPCI pump discharge piping from the Reactor Feedwater system when the HPCI system is in standby. It also provides this same isolation between the HPCI and Feedwater systems when HPCI is in the test or "CST To CST Pressure Control Mode". This valve has a safety function to open upon a HPCI initiation signal and remain open until a HPCI trip, isolation, or manual closing occurs. It has a closing safety function to provide containment isolation by closing upon receipt of a HPCI trip or isolation.

While closed the HV-1/255F006 could be subjected to two maximum pipeline pressures. The upstream side (from the HPCI pump to the F006 valve) is subjected to a potential maximum HPCI pump shutoff head of 1472 psig, occurring at the turbine overspeed resulting from a 5% controller tolerance. The downstream of F006 valve is subjected to the maximum pressure of the Feedwater system shutoff head conditions of 1300 psig (normal conditions would be 1140 psig on the downstream side).

When opening, the F006 valve could experience a maximum delta P of 1223 psig based on a reactor steam dome pressure of the lowest SRV setpoint + 3% tolerance (while the design basis is still +1%, the valves have been evaluated at +3%). This differential pressure ignores the reduction that would take place as a result of the HPCI pump coming up to speed. HPCI is required to deliver design flow to the reactor vessel within 30 seconds of event initiation. This requirement includes a 5 second allowance for receipt of the signal following a low reactor water level or high drywell pressure. This leaves 25 seconds for the valves to open and the turbine and pump to reach full rated flow. The F006 valve is required to reach full open within 20 seconds, while the ramp time for the turbine to reach full speed is 12 seconds.

SCREENING EVALUATION

Exclusion Screening

General Exclusion Criteria

1) Power Operated Gate Valve

YES --- Per reference 29.

2) Safety Function to Open

YES --- Per reference 18.

3) Open Safety Position

Skip due to Criteria 2 answered yes.

4) Open Safety Position, but can be closed

Skip due to Criteria 2 answered yes.

GENERAL EXCLUSION: NO

Thermal Binding Exclusion

1) Double Disc?

NO --- Valve is a flex wedge gate valve, per ref. 19.

2) Corrective Actions?

NO --- Valve has not had corrective actions which would preclude thermal binding.

THERMAL BINDING REVIEW REQUIRED: YES

System Transient/Thermally Induced Pressure Locking Exclusion

1) Solid Wedge?

NO --- Valve is a flex wedge gate valve per ref. 19.

2) Corrective Actions?

NO --- Valve has not had corrective actions which would preclude thermal binding.

PRESSURE LOCKING REVIEW REQUIRED: YES

Thermal Binding Screening(1-5)

1) Equilibrium Cool-Down

NO --- Per the valve drawing (ref. 19) the valve has a "SB" actuator and the disc and valve body are of the same material. Therefore, according to screening criteria item C-6 in reference 16, this valve is not susceptible to thermal binding following uniform cool-down.

2) Equilibrium Heat-Up

NO --- Per the valve drawing (ref. 19) the valve has a "SB" actuator and the disc and valve body are of the same material. Therefore, according to screening criteria item C-6 in reference 16, this valve is not susceptible to thermal binding following uniform heat-up.

3) Hot Thermal Shock

NO --- The F006 valve is normally closed and initially would be opened at the start of an event. During normal operation it could potentially experience "dead branch" heat-up from feedwater, however, this will occur gradually as feedwater heats up and would not represent a thermal shock. During a design basis accident/event, HPCI may be called upon to transfer to the pressure control mode or be shutdown as required by references 2 & 10. During these periods, the valve would not experience the sudden introduction of a hot fluid, since it would be in a "dead-leg".

Therefore, the F006 valve cannot experience "hot thermal shock" since the sudden introduction of a hot fluid while closed is not possible.

4) Cold Thermal Shock

NO --- Prior to closing the valve, it would be injecting either Condensate Storage Tank (CST) water or Suppression Pool water to the RPV. Of these two water sources, only the CST has the potential to be a cooler fluid during an accident and this is the preferred suction path at the start of an event. HPCI would only be swapped to the suppression pool after it had been taking suction from the CST for a period of time, and the suppression pool would represent the introduction of a warmer fluid prior to closure, rather than a cooler fluid. In either case, the sudden introduction of a cold fluid prior to closure would not be possible since the system would have been utilizing one of these water sources for a period of time prior to closure.

The only exceptions would be: 1) if the suction were initially from the suppression pool; or 2) if the suction were initially on the CST, swapped to the suppression pool, and then swapped back to the CST. In either case, the F006 valve would either remain open (in which case thermal binding would not occur) or it would be closed to perform pressure control. The F006 would only be closed for pressure control mode after HPCI is no longer required for RPV injection. Subsequent re-opening would not be required to perform HPCI's safety function, thus eliminating the need to consider thermal binding for this situation as a design requirement, since it represents long term recovery from an accident.

Therefore, the F006 valve cannot experience "cold thermal shock" since the sudden introduction of a cold fluid prior to closure is not possible for conditions pertinent to HPCI's design/operational basis.

5) Inter-system Single Failure

NO --- FSAR Section 6.3.1.1.2 item 1 states : "The ECCS conforms to all licensing requirements, and good design practices of isolation, separation, and common mode failure considerations." The HPCI DBD in section 2.0 further notes HPCI's compliance with the various General Design Criteria that reinforce the statement made in the FSAR.

System Transient Pressure Locking Screening (1-4)

1) Closed at Pressure / Depressurized / Opened

NO --- The automatic and manual operation of HPCI in response to a small break LOCA (HPCI's safety function) is such that the F006 valve cannot be closed at pressure, experience appreciable depressurization of both the upstream and downstream piping, and then be required to re-open. Following a small break LOCA, HPCI would be placed in service injecting to the RPV and would remain in service until the low pressure ECCS begins injecting.[1] Consequently, the opportunity for pressure locking is not present for this kind of valve operation; i.e., valve closed at pressure, both sides of the valve depressurized, and the valve subsequently re-opened.

[1] It is possible that HPCI could trip shortly after initiation due to high RPV water level, however depressurization of the downstream side of the F006 is not likely. This is because the trip would occur while the RPV is still at high pressure, and HPCI injects between the feedwater F032 and 1/24107 check valves. These valves in combination with high reactor pressure downstream of the 1/24107 valve will act to trap high pressure on the downstream side of the F006 valve.

The only potential for the F006 valve to be closed at pressure would be following a HPCI isolation and/or trip, a containment isolation, a manual shutdown or to place HPCI in the pressure control mode.

If the F006 valve is closed as a result of an isolation or trip, the maximum pressure the valve could experience when closure is achieved would be the greater of reactor pressure at the time of the trip, or pump discharge pressure as a function of turbine coastdown. Since by procedure the operators are instructed to take control of HPCI, if a HPCI trip takes place after they take control, it is likely that HPCI would be unavailable for use and pressure locking would not be relevant. Similarly, a containment isolation would not be expected to involve a subsequent re-opening. A manual shutdown would be similar to one or the other of the previously discussed modes.

For a transfer from injection to pressure control mode, the valve would be closed against the pressure associated with minimum flow. However, it will continue to remain pressurized on the pump side as a result of operation in the CST to CST mode and consequently will not be susceptible to pressure locking should the valve be re-opened for injection.

While the above discussion justifies that the F006 valve is not susceptible to the conditions that promote this form of pressure locking, the potential for pressure locking was previously discussed in SEA-ME-278 (ref. 17). That evaluation was based on calculation M-VLV-068 which evaluated a bonnet pressurized to feedwater pressure and the RPV at 150 psig and showed the valve could open. While M-VLV-068 does not meet the current methodology used for pressure locking and does not incorporate Power Uprate, it still demonstrates that the valve could overcome a significant bonnet pressurization and still open, thereby providing a level of confidence that the valve could open in the unlikely event that the downstream side of the F006 valve were to experience a slight depressurization.

Therefore, the F006 valve is not susceptible to pressure locking resulting from closure at pressure and subsequent re-opening.

2) Exposed to Pressurization / Depressurized / Opened

NO --- As previously discussed, the F006 valve is normally closed with feedwater pressure acting on the downstream side of the valve thereby pressurizing the bonnet. While this meets the first element of this criterion, the second element (subsequent depressurization) is not present for the following reasons. For a small break LOCA **(HPCI's design basis)**, the Feedwater side of the valve would not depressurize in the time it takes for HPCI to initiate injection. This is based on the fact the conditions that would initiate HPCI (i.e., reactor water level 2 or high drywell pressure) would not result in an immediate MSIV isolation, RWCU injection into the portion of piping between the feedwater check valves, and the rapid time in which HPCI comes up to speed. The F006 valve will begin to open 5 seconds after the initiation signal is received. At this point in time, the feedwater and RWCU systems would still be in operation or in the process of shutting down. Additionally, even if the MSIVs did go closed, their 5 second stroke time would mean that the downstream side of the F006 valve would see little or no reduction in pressure given coastdown of the feedwater pumps and the preceding discussion in response to question 2. Such a condition could occur as a result of a main steam line break outside of primary containment (this would be the HELB event for HPCI). Additionally, HPCI will remain in service until the low pressure ECCS take over RPV injection. This is also true for Station Blackout or ATWS events, where HPCI is either injecting or in pressure control mode.

Additionally, the potential for pressure locking was previously discussed in SEA-ME-278 (ref. 17). That evaluation was based on calculation M-VLV-068, which evaluated a bonnet pressurized to feedwater pressure and the RPV at 150 psig and showed the valve could open. While M-VLV-068 does not meet the current methodology used for pressure locking and does not incorporate Power Uprate, it still demonstrates that the valve could overcome a significant bonnet pressurization and still open, thereby providing a level of confidence that the valve could open in the unlikely event that the downstream side of the F006 valve were to experience a slight depressurization.

Therefore, the F006 valve is not susceptible to pressurization followed by depressurization and then opened.

3) Separated by Check Valve

NO --- There is no check valve between the F006 valve and feedwater; however, there are check valves between HPCI and the RPV. The above analyses demonstrate that high pressure will exist upstream of these check valves to act on the F006 valve, such that depressurization will not occur.

4) Inter-system Single Failure

NO --- FSAR Section 6.3.1.1.2 item 1 states : "The ECCS conforms to all licensing requirements, and good design practices of isolation, separation, and common mode failure considerations." The HPCI DBD in section 2.0 further notes HPCI's compliance with the various General Design Criteria that reinforce the statement made in the FSAR.

Thermally Induced Pressure Locking Screening (1-8)

1) Dead Branch Heating

YES --- In its standby position, the F006 valve is in a "dead" branch that is pressurized and in close proximity (≈ 4 feet) to a hotter process fluid in the form of feedwater. This configuration meets the criterion with regard to close proximity, and the potential for heating of trapped water. This is based on the manner in which pressurization and heating of the valve occurs. The following discussion provides the basis for this conclusion.

The fluid in close proximity to the F006 valve will undergo a gradual amount of heat-up concurrent with pressurization as the plant undergoes start-up prior to rolling the turbine. However, the feedwater line will ultimately achieve a temperature and pressure of 387.1°F and 1145 psig, respectively, once the steam is admitted to the turbine and power ascension begins. As noted, this evolution will be a gradual process where pressure is increased prior to feedwater heating. Based on GO-100-002, revision 23, the main turbine will not be rolled until reactor pressure is 955 psig and approximately 10-12% reactor thermal power. Prior to this, the feedwater line downstream of the F006 valve will have been pressurized during the entire startup process by RWCU, condensate, and feedwater. It will also undergo a minor amount of heating due to pump heat, RFPT hot seal leakoff, and steam seal evaporator drains. Thus prior to the feedwater experiencing any significant heat-up (i.e., from extraction steam), the bonnet will be pressurized to feedwater line pressure. In this condition the downstream side of the valve will be pressurized to feedwater pressure (1140 psig), the bonnet will be pressurized to essential feedwater pressure, and the upstream side of the valve is at keepfill pressure (150 psig). Following this, the valve will undergo heat-up from a nominal temperature of 100°F to 387°F. This will result in heating of the water trapped in the bonnet, which will result in a substantial increase of pressure within the bonnet. Since the valve is installed with the stem in a horizontal position, it is likely that some air will be trapped in the bonnet. However, since assuring the presence of a large enough air bubble to prevent pressurization is extremely difficult, and may not be possible given the large temperature difference and the fact that the bonnet will be pressurized prior to heating. This configuration represents the only condition under which the F006 valve could experience dead branch heating. It also represents the normal operational configuration for this valve with the plant at 100% power.

During the Unit # 2 MSIV Isolation transient of April 16, 1987, HPCI successfully injected to the RPV when the plant tripped from 100% power. This demonstrates that the valve was capable of opening after experiencing the dead branch heating described above. Additionally, the RCIC injection valve, which undergoes identical heat-up conditions, has been successfully stroked open numerous times on both units without evidence of pressure locking during quarterly valve exercising. While both of these conditions represent acceptable performance, they are extremely dependent upon the

specific valve configuration regarding seat conditions, torque switch settings and valve parameters. Additionally, recent GL89-10 modifications on Unit 2 have greatly changed the valve seating characteristics to lessen the seating thrust. Therefore, past operating experience of the F006 valve and extrapolation of RCIC valve history cannot be used to justify future operation of the F006 valve.

If one were to assume heat-up to normal feedwater temperature of 387.1°F from normal ambient of 100°F, the ensuing pressure build-up in the bonnet would be on the order of 40,000 psi (assuming no air entrapment or seat leakage). Such a condition would have manifested itself in valve damage after 10 years of operation, or would have prevented successful opening of the HPCI F006 valve on April 16, 1987. However, the presence of an air bubble, less than "perfect" seating, and packing leakage could have prevented catastrophic failure in the past. Furthermore, it is likely that the valve will not be heated to the full delta T of 287°F due to heat losses. It is possible that even with leakage and less heat up, the valve bonnet could experience sufficient pressurization to become pressure locked but not experience valve damage.

Therefore, the F006 valve is susceptible to thermally induced pressure locking from dead branch heating due to a temperature increase from 100°F to 387°F.

2) Bypass Line Heat-Up

NO --- A bypass warming line around the F006 valve does not exist, however, a bypass line does exist for use in performing the LLRT on the feedwater containment penetration. Since the valve in this line is closed, it does not contribute to heating of the F006 valve.

3) External Heat Source

YES --- With regard to process fluid, the only external heat source for the F006 valve would be the feedwater line discussed in the response to question 1.

Therefore, it is necessary to evaluate the potential for thermally induced pressure locking from heating the F006 valve, due to the feedwater pipe under accident ambient temperature conditions.

4) Variations in Room Temperature

NO --- As discussed in the preceding questions, HPCI would be in service (i.e., F006 valve open) until the low pressure systems take over as a result of design basis events. Therefore, the opportunity for subsequent heat-up due to variations in room temperature would not exist, even under EOP conditions, since the valves would be open at the time of room heat-up.

5) HELB

NO --- The event that results in HELB conditions is a Main Steam line break. For this event, the MSIVs will close terminating the break. This will result in a reactor SCRAM and initiation of RCIC and HPCI on Low Reactor Water level (-38" for HPCI). HPCI will inject to the vessel and will probably trip on high level shortly thereafter due to the nature of the event. HPCI will then re-start (either automatically or by the operators) and the operators will take manual control of the system to prevent further trips. Given the short timeframes involved between the event initiation and re-start of HPCI (on the order of minutes), it is not reasonable to assume any significant heat-up of the valve to cause thermal binding.

6) Condensation Accumulation

NO --- Valve is not in steam service.

7) Heat-Up Exposure While Closed

NO --- This does not describe a condition that is different from the above discussed questions.

8) Inter-system Single Failure

NO --- FSAR Section 6.3.1.1.2 item 1 states : "The ECCS conforms to all licensing requirements, and good design practices of isolation, separation, and common mode failure considerations." The HPCI DBD in section 2.0 further notes HPCI's compliance with the various General Design Criteria that reinforce the statement made in the FSAR.

POTENTIAL SUSCEPTIBILITY SCREENING RESULTS

Thermal Binding>>>>>>>>>>>>>>>>>>>>>>>>>> NO

System Transient Pressure Locking>>>>>>>>>> NO

Thermally Induced Pressure locking>>>>>>>>> YES

Determine pressure buildup due to an increase in temperature from 100°F to 387°F with an initial pressure in the bonnet of 1140 psig.

References

1. EO-200--32, REV. 7, "HPCI OPERATING GUIDELINES DURING STATION BLACKOUT"
2. EO-200-102, REV. 5, "RPV CONTROL"
3. EO-200-103, REV. 8, "PRIMARY CONTAINMENT CONTROL"
4. EO-200-104, REV. 8, "SECONDARY CONTAINMENT CONTROL"
5. EO-200-112, REV. 7, "RAPID DEPRESSURIZATION"
6. EO-200-113, REV. 7, "LEVEL/POWER CONTROL"
7. EO-200-114, REV. 7, "RPV FLOODING"
8. ES-152-001, REV. 7, "HPCI TURBINE ISOLATION, TRIP, AND INITIATION BYPASS"
9. ES-152-002, REV. 6, "HPCI SUCTION AUTO SWAPOVER BYPASS"
10. OP-152-001, REV. 21, "HIGH PRESSURE COOLANT INJECTION (HPCI) SYSTEM"
11. SO-152-002, REV. 19, "U1 QUARTERLY FLOW VERIFICATION"
12. SO-152-004, REV. 9, "QUARTERLY HPCI VALVE EXERCISING"
13. SO-152-005, REV. 8, "EIGHTEEN (18) MONTH HPCI FLOW VERIFICATION"
14. SO-152-014, REV. 4, "HIGH PRESSURE COOLANT INJECTION COLD SHUTDOWN VALVE EXERCISING"
15. TP-152-009, REV. 10, "HPCI PUMP PERFORMANCE VERIFICATION"
16. EC-VALV-1033, REV. 0, "GENERIC LETTER 95-07: PRESSURE LOCKING AND THERMAL BINDING SCREENING AND SUSCEPTIBILITY EVALUATION ASSUMPTIONS AND CRITERIA"
17. SEA-ME-278, REV. 3, "SAFETY RELATED INPO SOER 84-7 DETAILED EVALUATION"
18. EC-VALV-0570, REV.1, "GENERIC LETTER 89-10 MOV DESIGN BASIS, PRIORITY 2 VALVES"

19. FF110100 SHEET 1701, REV. 10, VENDOR DRAWING (ANCHOR/DARLING) FOR HV1/255F006 VALVE

20. P&ID M-155 SHEET 1, "HIGH PRESSURE COOLANT INJECTION"

21. P&ID M-141 SHEET 2, "NUCLEAR BOILER"

22. DBD004, REV. 1, "SSES DESIGN BASIS DOCUMENT FOR HIGH PRESSURE COOLANT INJECTION"

23. SPECIFICATION M-1510, REV. 3, "POWER UPRATE - DESIGN CONTROL OPERATING AND DESIGN PARAMETERS"

24. C-1815, SHEET 9, REV. 4, "EQUIPMENT QUALIFICATION HARSH ENVIRONMENTAL ZONES"

25. DBB-119-1, REV. 8, "FEEDWATER"

26. DBB-219-1, REV. 5, "FEEDWATER"

27. DBB-120-1, REV. 8, "HPCI"

28. DBB-220-2, REV. 2, "HPCI"

29. EC-VALV-1034, REV. 0, "GENERIC LETTER 95-07: PRESSURE LOCKING AND THERMAL BINDING EVALUATION SCOPE OF SAFETY-RELATED POWER-OPERATED GATE VALVES"

ATTACHMENT 2

A/DV Shop Order No. EZ661-2 Fax, 2/6/96

Anchor/Darling

Valve Company

701 FIRST STREET
P.O. BOX 3428
WILLIAMSPORT, PA 17701-0428
(717) 327-4800
TELEX: 759063

February 6, 1996

PENNSYLVANIA POWER & LIGHT
P.O. No. 6-92755-6

A/DV Shop Order No. EZ661-2

BODY/BONNET CAVITY VOLUME
14"-900# Flexible Wedge Gate Valve
Drawing No. 93-13709
Valve S/N E5853-8
Tag No. HV1(2)55F006

The total fluid volume of the valve S/N E5853-8 with the valve closed, between the seats, in the body/bonnet area up to the packing, is 2,907 in^3.

Prepared By: D. S. O'Connor
D. S. O'CONNOR
Project Engineer

Date: 2/6/96

Reviewed By: F A Bensinger
F. A. BENSINGER, P.E.
Manager - Engineering

Date: 2/6/96

ATTACHMENT 3

PLI- 72446, "Unit 1 Cycle [7] Core Follow Report A2 Sequence -- (5/17/92 to 8/7/92) and Cycle Summary"

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PP&L

September 15, 1992

J. R. Doxsey SSES

SUSQUEHANNA STEAM ELECTRIC STATION
UNIT 1 CYCLE 8 CORE FOLLOW REPORT
A2 SEQUENCE -- (5/17/92 to 8/7/92)
AND CYCLE SUMMARY
CCN 741021 FILE A7-8B
PLI-72446

References: 1) Recorded Calculation NFE-1-07-030, "Unit 1 Cycle 7 Core Follow Analysis,".

2) Recorded Calculation NFE-1-07-034, "U1C7 Target Rod Patterns for Power Operation."

The attached figures summarize the core follow results (i.e., core power, thermal margins and core reactivity, etc.) for the Unit 1 Cycle 7 (U1C7) A2 sequence operation from May 17, 1992 to August 7, 1992.

Unit 1 achieved a 67.2% operating capacity factor during the A2 sequence. The cycle capacity factor 'to date' is 67.2%. The design window for U1C7 is currently under evaluation.

This cycle of operation at the SSES is the first cycle in which the POWERPLEX CMS with CPM-2/PPL input is being used. The calculated results obtained from POWERPLEX agree well with SIMULATE-E/PPL calculated results. All of the POWERPLEX calculated thermal limits are within the calculated uncertainties.

If you have any questions, please call me at ext. 7976

J. J. Geosits

J. J. Geosits
Nuclear Fuels Engineering

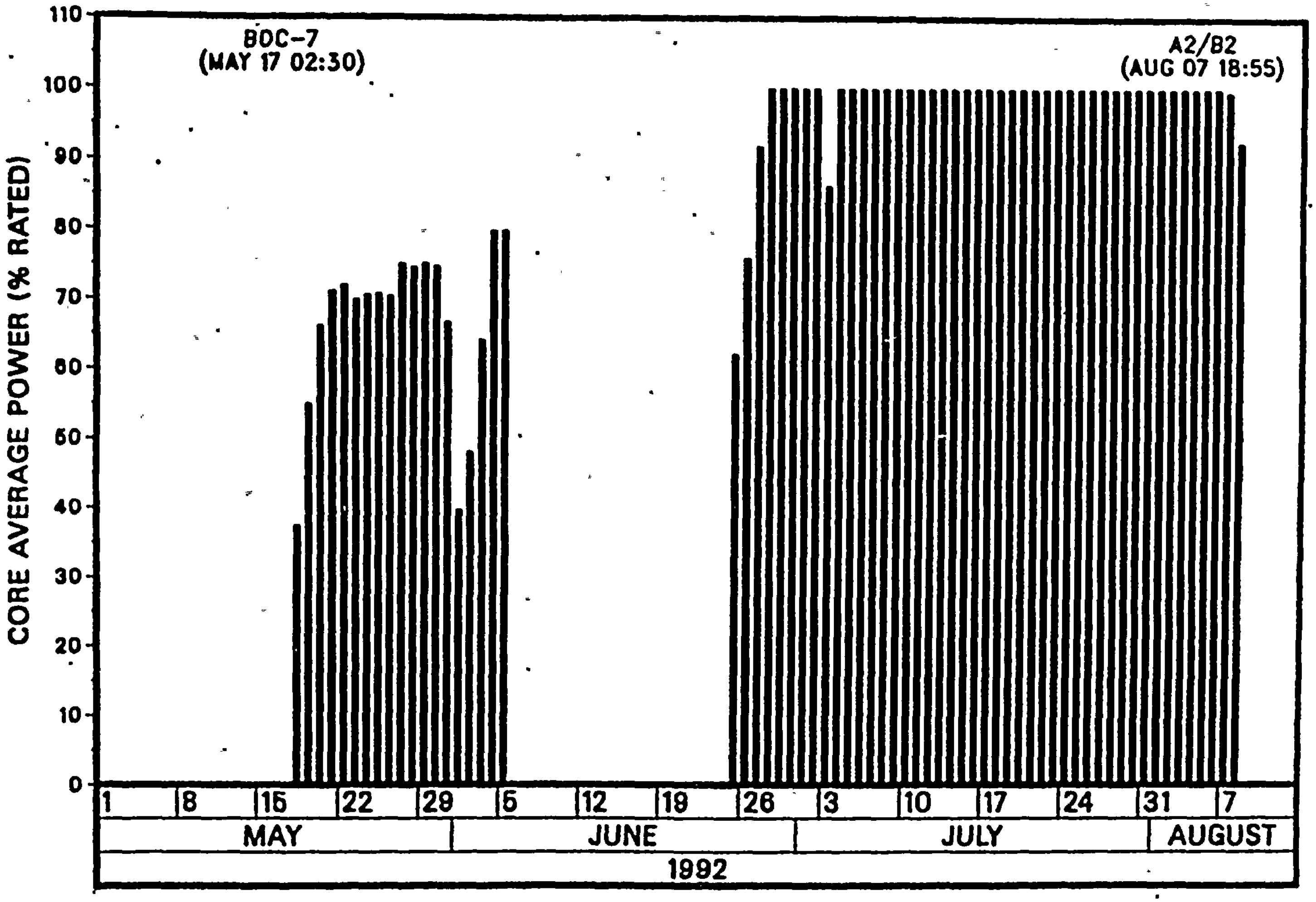
PHL/el
mel379i.jjg

cc:	J. M. Kulick	A9-3	E. R. Jebsen	A6-3
	P. J. Moran	SSES	~~F. E.~~ Grim	A9-3
	A. J. Roscioli	A9-3	K. C. Knoll	A9-3
	C. R. Lehmann	A9-3	J. S. Stefanko	A9-3
	W. J. Weadon	A9-3	J. P. Spadaro	A9-3
	G. T. Jones	A6-2	NR File	A6-2

Take Care PP&L

UNIT 1 CYCLE 7 CORE THERMAL POWER

Daily core thermal power production during the previous sequence is shown below. Operation at a consistently high level of power production is important to achieve the Unit 1 electrical generation goal. Operation at a constant power level provides equilibrium operating data which can be used to continue benchmarking PP&L methods and codes.



This Sequence: During the A2 sequence, the Unit was limited to less than 80% power for the first quarter of the sequence because of demineralizer and recirculation system problems. The Unit was shutdown for the second quarter of the A2 sequence to repair the A Feedwater pump and replace the offgas guard beds. Unit 1 achieved a 67.2% operating capacity factor for this sequence of operation.

FIGURE 1

EC-052-1029 Pg 58