September 7, 1984

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
THE CLEVELAND ELECTRIC ILLUMINATING COMPANY	)	Docket Nos. 50-440 50-441
	)	
(Perry Nuclear Power Plant, Units 1 and 2)	)	

AFFIDAVIT OF FRANK R. STEAD
ON THE DESIGN OF THE INITIATION
FUNCTION OF THE STANDBY LIQUID CONTROL SYSTEM

STATE OF OHIO)
: ss
COUNTY OF LAKE)

Frank R. Stead, being duly sworn, deposes and says as follows:

1. I, Frank R. Stead, am Manager of Nuclear Engineering of The Cleveland Electric Illuminating Company. My business address is 10 Center Road, Perry, Ohio 44081. In my position, I have responsibility for the system design of all nuclear systems of the Perry Nuclear Power Plant, including the Standby Liquid Control System. A summary of my professional qualifications and experience is attached hereto as Exhibit "A." I have personal knowledge of the matters set forth herein and believe them to be true and correct.

2. The Standby Liquid Control System ("SLCS") has been included in the Perry design since the construction permit stage. The Perry Preliminary Safety Analysis Report ("PSAR") discussed the SLCS and stated that it was manually initiated. PSAR, § 4.2.3.4 (Exhibit "B" hereto).

3. The Final Safety Analysis Report ("FSAR") from its first submission to NRC included the SLCS in the Perry design. As tendered to the Staff in June 1980 and docketed in January 1981 the FSAR described the SLCS as having manual initiation. See, for example, FSAR §§ 7.4.1.2[1/] and 9.3.5.2,[2/] Figure 7.4-2 (Exhibit "C" hereto). Additional information on SLCS initiation was included in subsequent revisions of the FSAR; in all cases the information continued to show a manually initiated SLCS system. For example, in Amendment 11, dated February 15, 1983,[3/] a detailed discussion of modifications to prevent and mitigate the consequences of anticipated transients without scram ("ATWS") was provided, including further information on SLCS initiation. See, for example, FSAR § 15C.5.II.[4/]

1/ "The SLCS is initiated by the control room operator by turning a keylocked switch for system A, or a different keylocked switch for system B to the 'RUN' position." FSAR, p. 7.4-6.

2/ "The standby liquid control system (see Figure 9.3-19) is manually initiated in the main control room ...." FSAR, p. 9.3-19.

3/ The draft version of this amendment was transmitted to the NRC on January 26, 1983.

4/ "The standby liquid control system (SLCS) action is to be initiated manually in a failure to scram condition in accordance with Emergency Instructions." FSAR, p. 15C-5.

(Exhibit "D" hereto.) Already existing references (such as those cited above in FSAR §§ 7.4.2 and 9.3.5) remained, and continued to describe the SLCS design as having manual initiation.

4. The FSAR in its current status still shows the Perry SLCS design as including only manual initiation. See, e.g., FSAR §§ 7.4.1.2,5/ 7.4.2.2,6/ 7.4.2.3,7/ 9.3.5.2,8/ 15C.5.II,9/ and Tables 15C-3 to -7.10/ This is consistent with the entire history of the FSAR which always reflected manual SLCS initiation.

5. The Electrical Elementary Diagrams prepared by General Electric ("GE"), the vendor for Perry's nuclear steam supply system, and Gilbert Associates, Inc. ("GAI"), the plant's architect-engineer, for the SLCS originally reflected a manually initiated SLCS. GE Drawing No. 828E234CA Rev. 0 and GAI Drawing No. B-208-030, Rev. --. (GAI produces Perry-specific drawings for systems within GE's scope of design (i.e., the

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5/ "The SLCS is a backup independent method of manually shutting down the reactor ...." FSAR, p. 7.4-5.

6/ "SLCS is initiated by the control room operator." FSAR, p. 7.4-19.

7/ "The SLCS is initiated manually ...." FSAR, p. 7.4-26.

8/ The SLCS "is manually initiated." FSAR, p. 9.3-19.

9/ "The standby liquid control system (SLCS) action is to be initiated manually ...." FSAR, p. 15C-5.

10/ Sequences of events showing that "Operator initiates SLCS." FSAR, pp. 15C-13-19.

nuclear steam supply systems) based on the GE-furnished generic or plant specific documentation.)

6. CEI and GE were both aware that NRC was considering an ATWS rule and that the rule, when issued, might require automatic SLCS initiation. Automatic initiation was one of the ATWS design modifications considered by the NRC Staff in its ATWS report issued in 1978, NUREG-0460, "Anticipated Transients Without Scram For Light Water Reactors," Vol. 1-3 (1978). CEI believed then (and still believes) that the operators have the appropriate indications and training to promptly initiate SLCS if needed. Further, automatic SLCS initiation carries with it a high probability that an inadvertent initiation would occur at some point during plant operation, causing a costly and unnecessary outage. See, for example, CEI's letter to GE, dated February 22, 1980 (Exhibit "E" hereto).

7. As mentioned earlier, the SLCS first appeared in the Perry design when the PSAR was issued. However, GE was carrying out generic and plant specific ATWS analyses and design work both before and after the FSAR was submitted. The great bulk of this work was unrelated to SLCS initiation.11/ On December 20, 1979, GE presented an unsolicited proposal to CEI to prepare "reports analyzing the BWR during an ATWS event in accordance with the requirements of NUREG-0460, Volumes I-III

11/ The great majority of the work covered such features as Recirculation Pump Trip, Alternate Rod Insertion, feedwater runback and increased SLCS flow capacity.

and for work to support CEI concerning the NRC 'Early Verification' Program Reports (May and December 1979)". The proposal, referred to as Quotation 149, was accepted by CEI on January 24, 1980. The analyses initiated by GE in carrying out Quotation 149 were based upon the package of ATWS modifications subsequently referred to as Alternate 3A, which included (consistent with NUREG-0460) automatic SLCS initiation.12/

8. Following the publication of the NRC Staff's ATWS recommendations in March 1980 (Vol. 4 of NUREG-0460), GE on December 22, 1980 submitted to CEI a proposal, referred to as Quotation 149-A, for "design changes related to the [ATWS] matter currently being considered by the NRC." The proposal was based on the NRC Staff's Alternate 3A, set forth in NUREG-0460, Vol. 4, based on GE's belief that "Alternate 3A ... appears to be the modifications which the NRC will eventually apply to the BWR." One of the ATWS-related modifications described in Alternate 3A was automatic SLCS initiation. Thus, the scope of work for Quotation 149-A included an SLCS which "will be initiated automatically." Although the quotation referred to both "design services and associated equipment," the equipment was undefined (and unpriced) since the design work had not been undertaken.13/

12/ NEDE-25518, "Design Analysis and SAR Inputs for ATWS Performance and Standby Liquid Control System" (December 1981).

13/ The scope of work did include a list of ATWS hardware. However, the list was a "preliminary estimate" which was

(Continued next page)

9. CEI was concerned that an ATWS rule requiring the Alternate 3A modifications might be adopted by the NRC such that the changes required by the rule might impact Perry's fuel load schedule (then estimated at May 1983). With respect to the SLCS initiation portion of Alternate 3A, CEI wanted to retain manual initiation if the status of the ATWS rule and the fuel loading schedule permitted. To anticipate a possible ATWS rule, CEI proceeded with the entire Alternate 3A package, including automatic SLCS initiation. That way, automatic initiation could be installed if necessary. Because CEI had concerns with the schedules, scope and other aspects of Quotation 149-A, particularly its compatability with a May 1983 fuel load date, CEI rejected it by letter dated January 13, 1981. CEI then stated in a letter dated February 9, 1981 that it would accept the Quotation if these matters were resolved. GE resubmitted its proposal on April 13, 1981 (Quotation 149-B). (This proposal superceded Quotation 149-A.) The revised Quotation again included the entire Alternate 3A ATWS package. Quotation 149-B called for GE to generate a "standard ATWS design package", to apply that generic design to the specific project, and to provide equipment. As in Quotation 149-A, only a general estimate of overall equipment needs was supplied. (Exhibit

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(Continued)

very general (i.e. "20 switches", "8 meters", etc.) and consolidated the equipment needs for all ATWS changes in Alternate 3A including SLCS initiation.

"F" hereto [commercial information deleted].) CEI accepted Quotation 149-B on June 3, 1981. On November 9, 1981, GE submitted to CEI Quotation 149-D (Quotation 149-C did not relate to SLCS). Quotation 149-D quoted a price for all GE-scope ATWS equipment to implement Alternate 3A, including the few items related to automatic SLCS initiation.14/ CEI accepted Quotation 149-D on January 26, 1982.

10. During early 1982, GE continued its design and analytical work on the entire Alternate 3A package, including automatic SLCS initiation. CEI continued to monitor the ATWS regulatory situation. Based upon the overall status of plant construction, CEI decided to present the Alternate 3A package with manual initiation to the NRC Staff.

11. In June 1982, GE completed its design work under Quotation 149-B for automatic SLCS initiation and furnished the electrical elementary drawings to GAI. GE Drawing No. 828E234CA Rev. 3 (dated June 18, 1982). However, consistent with CEI's determination to retain manual initiation, at the June 29, 1982 meeting of the Advisory Committee on Reactor Safeguards subcommittee, CEI discussed manual initiation of SLCS. Tr. 281-2. And, at a July 20, 1982 meeting with the NRC Staff, CEI described the "systems upgrade for ATWS" as including "a manually operated standby liquid control system."

14/ The equipment listed which applied to automatic SLCS initiation were the 2 "Three Position Elctroswitch[s][sic]" and the 6 "Relay[s] (Agastat or equivalent)".

See NRC memorandum from Stefano to Schwencer, dated July 22, 1982 (Exhibit "G" hereto). Similarly, in an August 6, 1982 letter from CEI to GE (Exhibit "H" hereto) commenting on NEDE-25518, CEI directed that GE correct the report so that it would reflect manual SLCS initiation. Finally, in CEI's August 13, 1982 letter to the NRC (Exhibit "I" hereto), CEI's Vice President, System Engineering and Construction stated that while "the design includes both manual and automatic initiation capability, only manual initiation will be functional." Mr. Davidson's Affidavit addresses this letter in more detail.

12. Notwithstanding the manually initiated design described in the FSAR and CEI's expressed intent to retain manual initiation (while being prepared to convert to automatic if required by the final NRC ATWS rule), GAI's Electrical Elementary Drawings for the SLCS system were modified to show automatic SLCS initiation based on GE's June 1982 SLCS Electrical Elementary Diagrams. GAI Drawing No. B-208-030 Rev. F, dated August 2, 1982. GAI made similar changes in drawings for related systems.

13. Having heard the NRC Staff's reaction to CEI's ATWS proposals (including manual initiation) at the July 20, 1982 meeting, CEI on August 9, 1982, wrote to GE to request that GE's design return SLCS to manual initiation (Exhibit "J" hereto). GE forwarded preliminary modification diagrams ("modification kits") to CEI on November 8, 1982 (Exhibit "K" hereto). GE also transmitted at the same time a preliminary

draft of its revision to NEDE-25518 (renumbered NEDE-22276), which (among other things) reflected manual initiation of the SLCS. CEI made frequent requests to GE to expedite the issuance of final versions of the modification kits (see Exhibit "L" hereto). The appropriate GE drawings were effectively changed by Engineering Change Notice NJ 50426, dated December 28, 1983 (Exhibit "M" hereto), and the formal drawings were issued on January 13, 1984 (Drawing No. 828E234CA, Rev. 8). GAI made the corresponding changes in its drawings on February 16, 1984 (Drawing No. B-208-030, Rev. K). Similar changes to drawings of related systems have also been made.

14. In summary, the FSAR has always shown a manually initiated SLCS as the Perry design. GE was asked to perform design and analysis work including automatic initiation as part of the total Alternate 3A package as a precaution against the construction impact in the event that a final ATWS rule would require automatic initiation prior to fuel loading. At about the same time that GE was completing its drawings for SLCS automation, CEI was informing the ACRS and the Staff that its final ATWS package would include manual initiation. Shortly thereafter, on August 2, 1982 the GE drawings were incorporated into GAI's Perry specific drawings. On August 9, 1982, based on CEI's meeting with the NRC Staff, CEI requested GE to return GE's SLCS drawings to a manual configuration. The GE drawings were effectively changed in December 1983. In February 1984, the GAI SLCS drawings were revised to again reflect manual

initiation. Although GE and GAI drawings for a time showed an automatically initiated SLCS, CEI has always intended that the SLCS be designed for manual initiation if allowed by the final ATWS rule. In addition, CEI intended to be prepared to implement the final ATWS rule based on Alternate 3A (if that were adopted) with a minimum of impact on the construction and fuel loading schedule. The design and analytical work undertaken by GE for automatic initiation was to provide a contingency in case an ATWS rule might compromise CEI's ability to make its fuel load schedules. In conclusion, the Perry SLCS design provides for manual SLCS initiation and complies with the June 26, 1984 ATWS rule.

Frank R. Stead

Frank R. Stead

Subscribed and sworn to before
me this 7 day of September, 1984.

Patricia G. Dedek

Notary Public

My Commission Expires:

PATRICIA G. DEDEK, Notary Public
STATE OF OHIO (Lake County)
My Commission Expires April 16, 1985

RESUME OF
FRANK R. STEAD

EDUCATION AND TRAINING:

- Bachelor of Mechanical Engineering, Cleveland State University, 1970
- Master of Science Degree in Mechanical Engineering, Ohio State University, 1972
- Three-week In-Core Fuel Management Course, Purdue University, 1972
- Westinghouse Large Steam Turbine Operator Awareness Program, Dutton Mill, 1980

EXPERIENCE:

1965-Present - The Cleveland Electric Illuminating Company

Joined CEI in 1965 and held various engineering positions at CEI's Perry Project including Senior Design Engineer of Nuclear Fuels, gaining seven years experience in the Fuel Management area. Also held positions in Nuclear Licensing, Balance-of-Plant Equipment, and Civil Engineering. Most recently, rotated through several General Supervisor positions in Maintenance and Operations at CEI fossil plants.

In July 1982, named to present position of Manager, Nuclear Engineering Department, with responsibilities for operational support and modification engineering, reliability and design assurance, and nuclear licensing and fuel management at the Perry Nuclear Power Plant. Reports to the Vice President, Nuclear Operations Division.

PROFESSIONAL MEMBERSHIPS:

- American Society of Mechanical Engineers
- American Nuclear Society
- Registered Professional Engineer, State of Ohio

Exhibit "A"

the power of the gadolinia-urania rods is about 0.3 that of peak rod power. At the end of the initial cycle it is approximately 0.8 that of peak rod power. Later in life the power of the gadolinia-urania fuel rods decreases.

4.2.3.3.3 Safety Evaluation

The description shows that the gadolinia-urania fuel rods meet the design basis requirements.

4.2.3.3.4 Inspection and Testing

The same rigid quality control requirements observed for standard UO_2 fuel are employed in manufacturing gadolinia-urania fuel. Gadolinia-bearing UO_2 fuel pellets of a given enrichment and gadolinia concentration are maintained in separate groups throughout the manufacturing process. The percent enrichment and gadolinia concentration characterizing a pellet group are identified by a stamp on the pellet.

Fuel rods are individually numbered prior to loading of fuel pellets into the fuel rods: (1) to identify which pellet group is to be loaded in each fuel rod; (2) to identify which position in the fuel assembly each fuel rod is to be loaded; and (3) to facilitate total material accountability for a given project. Correct orientation of gadolinia-bearing rods within the fuel assembly is further assured by the longer upper end plug shanks for these rods.

The following quality control inspections are made:

a. gadolinia concentration in the gadolinia-urania powder blend is verified;

b. sintered pellet UO_2-Gd_2O_3 solid-solution homogeneity across a fuel pellet is verified by examination of metallographic specimens;

c. gadolinia-urania pellet identification is verified; and

d. gadolinia-urania fuel rod identification is checked.

All assemblies and rods of a given project are inspected to assure overall accountability of fuel quantity and placement for the project.

4.2.3.4 <u>Standby Liquid Control System</u>

4.2.3.4.1 Design Bases

a. <u>General Design Bases</u>

<u>Safety Design Bases</u>

The standby liquid control system shall meet the following safety design bases:

(1) Backup capability for reactivity control shall be provided, independent of normal reactivity control provisions in the

Exhibit "B"

nuclear reactor, to be able to shut down the reactor if the normal control ever becomes inoperative.

(2) The backup system shall have the capacity for controlling the reactivity difference between the steady-state rated operating condition of the reactor with voids and the cold shutdown condition, including shutdown margin, to assure complete shutdown from the most reactive condition at any time in core life.

(3) The time required for actuation and effectiveness of the backup control shall be consistent with the nuclear reactivity rate of change predicted between rated operating and cold shutdown conditions. A fast scram of the reactor or operational control of fast reactivity transients is not specified to be accomplished by this system.

(4) Means shall be provided by which the functional performance capability of the backup control system components can be verified periodically under conditions approaching actual use requirements. A substitute solution, rather than the actual neutron absorber solution, can be injected into the reactor to test the operation of all components of the redundant control system.

(5) The neutron absorber shall be dispersed within the reactor core in sufficient quantity to provide a reasonable margin for leakage or imperfect mixing.

(6) The system shall be reliable to a degree consistent with its role as a special safety system; the possibility of unintentional or accidental shutdown of the reactor by this system shall be minimized.

4.2.3.4.2 Description

The standby liquid control system (Figure 4.2-23) is manually initiated from the main control room to pump a boron neutron absorber solution into the reactor if the operator believes the reactor cannot be shut down or kept shut down with the control rods. Once the operator decision for initiation of the SLC system is made, the design intent is to simplify the manual process by providing a "key locked" switch. This prevents inadvertant injection of neutron absorber by the SLC system. However, insertion of control rods is expected to assure prompt shutdown of the reactor should it be required.

The "key locked" control room switch is provided to assure positive action from the main control room should the need arise. Standard power plant procedural controls are applied to the operation of the "key locked" control room switch.

The SLC system is required only to shut down the reactor and keep the reactor from going critical again as it cools.

The SLC system is needed only in the improbable event that not enough control rods can be inserted in the reactor core to accomplish shutdown and cooldown in the normal manner.

The boron solution tank, the test water tank, the two positive-displacement pumps, the two explosive valves, and associated local valves and controls are mounted in the containment vessel. The liquid is piped into the reactor vessel and discharged near the bottom of the core shroud so it mixes with the cooling water rising through the core (Section 5.4 and Subsection 4.2.2).

The boron absorbs thermal neutrons and thereby terminates the nuclear fission chain reaction in the uranium fuel.

The specified neutron absorber solution is sodium pentaborate ($Na_2B_{10}O_{16} \cdot 10H_2O$). It is prepared by dissolving stoichiometric quantities of borax and boric acid in demineralized water. A sparger is provided in the tank for mixing, using air. To prevent system plugging, the tank outlet is raised above the bottom of the tank.

At all times when it is possible to make the reactor critical, the SLC system shall be able to deliver at least 3840 gallons of 13.4% sodium pentaborate solution or equivalent into the reactor (Figure 4.2-24). This is accomplished by placing 4860 lb of sodium pentaborate in the SLC tank and filling with demineralized water to at least the low level alarm point, and can be diluted with water up to the overflow level volume to allow for evaporation losses or to lower the saturation temperature.

The saturation temperature of the recommended solution is 59°F at the low level alarm volume and approximately 49°F at the tank overflow volume (Figure 4.2-25). The equipment containing the solution is installed in a room in which the air temperature is to be maintained within the range of 60 to 105°F. In addition, a heater system maintains the solution temperature at 75 to 85°F to prevent precipitation of the sodium pentaborate from the solution during storage. High or low temperature, or high or low liquid level, causes an alarm in the control room.

Each positive displacement pump is sized to inject the solution into the reactor in 50 to 125 min, independent of the amount of solution in the tank. The pump and system design pressure between the explosive valves and the pump discharge is 1400 psig. The two relief valves are set slightly under 1400 psig. To prevent bypass flow from one pump in case of relief valve failure in the line from the other pump, a check valve is installed downstream of each relief valve line in the pump discharge pipe.

The two explosive-actuated injection valves provide assurance of opening when needed and ensure that boron will not leak into the reactor even when the pumps are being tested.

Each explosive valve is closed by a plug in the inlet chamber. The plug is circumscribed with a deep groove so the end will readily shear off when pushed with the valve plunger. This opens the inlet hole through the plug. The sheared end is pushed out of the way in the chamber; it is shaped so it will not block the ports after release.

The shearing plunger is actuated by an explosive charge with dual ignition primers inserted in the side chamber of the valve. Ignition circuit continuity is monitored by a trickle current, and an alarm occurs in the control room if either circuit opens. Indicator lights show which primary circuit opened.

The SLC system is actuated by a three-position key-locked switch on the control room console. This assures that switching from the "off" position is a deliberate act. Switching to either side starts an injection pump, actuates both of the explosive valves, and closes the reactor cleanup system outboard isolation valve to prevent loss or dilution of the boron.

A green light in the control room indicates that power is available to the pump motor contactor and that the contactor is open (pump not running). A red light indicates that the contactor is closed (pump running).

If a pump light, or explosive valve light indicates that the liquid may not be flowing, the operator can immediately turn the switch to the other side. which actuates the alternate pump. Cross piping and check valves assure a flow path through either pump and either explosive valve. The chosen pump will start even though its local switch at the pump is in the "stop" position for test or maintenance. Pump discharge pressure is also indicated in the control room.

Equipment drains and tank overflow are not piped to the radwaste system but to separate containers (such as 55-gal. drums) that can be removed and disposed of independently to prevent any trace of boron from inadvertently reaching the reactor.

Instrumentation consisting of solution temperature indication and control, solution level, and heater system status is provided locally at the storage tank.

4.2.3.4.3 Safety Evaluation

The standby liquid control system is a special safety system and is maintained in a standby operational status whenever the reactor is critical. The system is expected never to be needed for safety reasons because of the large number of independent control rods available to shut down the reactor.

However, to assure the availability of the SLC system, two sets of the components required to actuate the system - pumps and explosive valves - are provided in parallel redundancy.

The system is designed to bring the reactor from rated power to a cold shutdown at any time in core life. The reactivity compensation provided will reduce reactor power from rated to zero level and allow cooling the nuclear system to room temperature, with the control rods remaining withdrawn in the rated power pattern. It includes the reactivity gains that result from complete decay of the rated power xenon inventory. It also includes the positive reactivity effects from eleminating steam voids, changing water density from hot to cold, reduced Doppler effect in uranium, reducing neutron leakage from boiling to cold, and decreasing control rod worth as the moderator cools. The specified minimum final concentration of boron in the reactor core provides a margin of -0.05 Δk for calculational uncertainties and assures a substantial shutdown margin.

The specified minimum average concentration of natural boron in the reactor to provide the specified shutdown margin, after operation of the SLC system, is 600 ppm (parts per million) (Figure 4.2-26). Calculation of the minimum quantity of sodium pentaborate to be injected into the reactor coolant including recirculation loops, at 70°F and reactor normal water level. The result is increased by 25% to allow for imperfect mixing and leakage. An additional 250 ppm is provided to accommodate dilution by the RHR system in the shutdown cooling mode. This concentration will be achieved if the solution is prepared as defined in Subsection 4.2.3.4.2 and maintained above saturation temperature.

Cooldown of the nuclear system will require a minimum of several hours to remove the thermal energy stored in the reactor, cooling water, and associated equipment. The controlled limit for the reactor vessel cooldown is 100°F/h, and normal operating temperature is approximately 550°F. Use of the main condenser and various shutdown cooling systems requires 10 to 24 hours to lower the reactor vessel to room temperature (70°F); this is the condition of maximum reactivity and, therefore, the condition that requires the maximum concentration of boron.

The specified boron injection rate is limited to the range of 6 to 25 ppm/min. The lower rate assures that the boron is injected into the reactor in approximately two hours. This resulting reactivity insertion is considerably quicker than that covered by the cooldown. The upper limit injection rate assures that there is sufficient mixing so the boron does not recirculate through the core in uneven concentrations that could possibly cause reactor power to rise and fall cyclically.

The SLC system equipment essential for injection of neutron absorber solution into the reactor is designed as Category I (seismic) for withstanding the specified earthquake loadings (Section 3). The system piping and equipment are designed, installed, and tested in accordance with requirements stated in Chapter 3.

The SLC system is required to be operable in the event of a station power failure; therefore, the pumps, heaters, valves, and controls are powered from the standby a-c power supply or d-c power in the absence of normal power. The pumps and valves are powered and controlled from separate buses and circuits so that a single failure will not prevent system operation.

The SLC system and pumps have sufficient pressure margin, up to the system relief valve setting of approximately 1400 psig, to assure solution injection into the reactor above the normal pressure in the bottom of the reactor. The nuclear system relief and safety valves begin to relieve pressure above approximately 1100 psig. Therefore, the SLC system positive displacement pumps cannot overpressurize the nuclear system.

Only one of the two SLC pumps is needed for system operation. If one pump is found to be inoperable, there is no immediate threat to shutdown capability, and reactor operation can continue during repairs. The time during which one redundant component upstream of the explosive valves may be out of operation should be consistent with the following: (1) the probability of failure of both the control rod shutdown capability and the alternate component in the SLC system; and (2) the fact that nuclear system cooldown takes several hours while liquid control solution injection takes approximately two hours. Since this probability is small, considerable time is available for repairing and restoring the SLC system to an operable condition while reactor operation continues. Assurance that the system will still fulfill its function during repairs is obtained by demonstrating operation of the operable pump.

4.2.3.4.4 Inspection and Testing

Operational testing of the SLC system is performed in at least two parts to avoid inadvertently injecting boron into the reactor.

With the valves to and from the storage tank closed and the three valves to and from the test tank opened, demineralized water in the test tank can be recirculated by locally starting either pump.

The injection portion of the system can be functionally tested by valving the injection lines to the test tank and actuating the system from the control room. Both injection valves open on actuation. System operation is indicated in the control room.

After functional tests, the injection valve shear plugs and explosive charges must be replaced and all the valves returned to their normal positions.

After closing a local locked-open valve to the reactor, leakage through the injection valves can be detected by opening valves at a test connection in the line between the containment isolation check valves. Position indicator lights in the control room indicate that the local valve is closed for tests or open and ready for operation. Leakage from the reactor through the first check valve can be detected by opening the same test connection when the reactor is pressurized.

The test tank contains demineralized water for approximately 3 minutes of pump operation. Demineralized water from the makeup system or the condensate storage system is available for refilling or flushing the system.

Should the boron solution ever be injected into the reactor, either intentionally or inadvertently, then after making certain that the normal reactivity controls will keep the reactor subcritical, the boron is removed from the reactor coolant system by flushing for gross dilution followed by operating the reactor cleanup system. There is practically no effect on reactor operations when the boron concentration has been reduced below approximately 50 ppm.

The concentration of the sodium pentaborate in the solution tank is determined periodically by chemical analysis.

a. Redundant differential temperature and ambient temperature switches sense RCIC and RHR equipment area ventilation air inlet and outlet high temperature or high ambient temperature.

b. Redundant differential temperature and ambient temperature switches sense RCIC pipe routing area ventilation air inlet and outlet high temperature or high ambient temperature.

c. Redundant differential pressure transmitters sense RCIC or RHR/RCIC steam line high flow or instrument line break.

d. Redundant pressure transmitters sense RCIC turbine exhaust diaphragm high pressure. Both transmitters in one of two channels must sense high pressure to cause isoaltion.

e. A pressure transmitter senses RCIC low steam supply pressure.

The RCIC system may be isolated after initiation by the control room operator by actuation of a switch which causes the outboard steamline isolation valve to close.

7.4.1.2 <u>Standby Liquid Control System (SLCS)</u>

a. SLCS Function

The Standby Liquid Control System (see Section 9.3.5) instrumentation is designed to initiate injection of a liquid neutron absorber into the reactor. Other instrumentation is provided to maintain this liquid chemical solution well above saturation temperature in readiness for injection.

The SLCS is a backup method of manually shutting down the reactor to cold shutdown conditions from normal operation or form anticipated transient conditions when control rod insertion capability is lost.

Exhibit "C"

e. The neutron absorber will be dispersed within the reactor core in sufficient quantity to provide a reasonable margin for leakage or imperfect mixing.

f. The system is reliable to a degree consistent with its role as a special safety system; the possibility of unintentional or accidental shutdown of the reactor by this system is minimized.

9.3.5.2 System Description

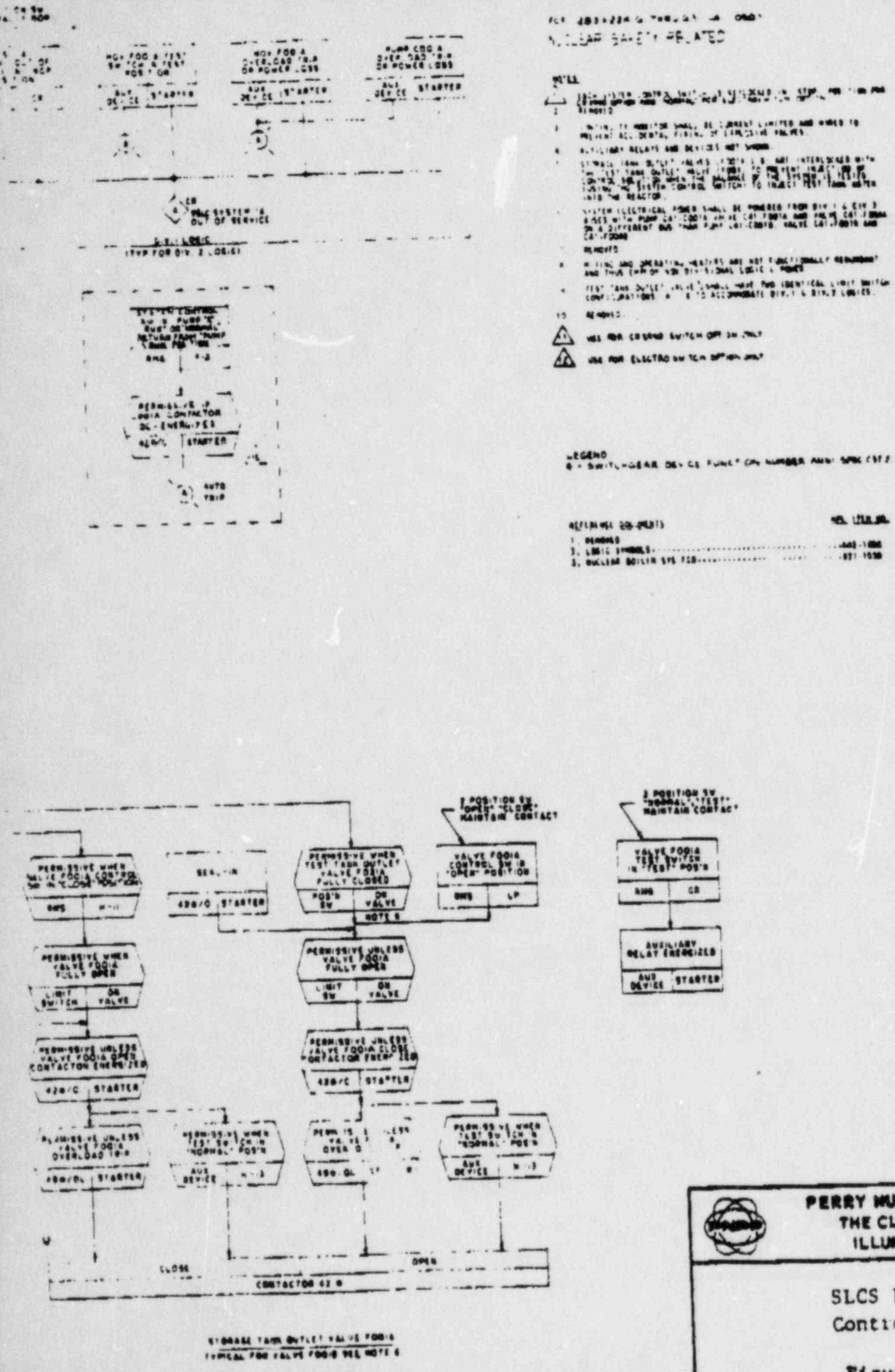
The standby liquid control system (see Figure 9.3-19) is manually initiated in the main control room to pump a boron neutron absorber solution into the reactor if the operator determines the reactor cannot be shut down or kept shut down with the control rods. Once the operator decision for initiation of the SLC system is made, the design intent is to simplify the manual process by providing a keylocked switch. This prevents inadvertent injection of neutron absorber by the SLC system. However, insertion of the control rods is expected to assure prompt shutdown of the reactor should it be required.

A keylocked switch is provided in the control room to assure positive action from the main control room should the need arise. Procedural controls are applied to the operation of the keylocked control room switch.

The SLC system is required only to shut down the reactor and keep the reactor from going critical as it cools.

The SLC system is needed only in the improbable event that not enough control rods can be inserted in the reactor core to accomplish shutdown and cooldown in the normal manner.

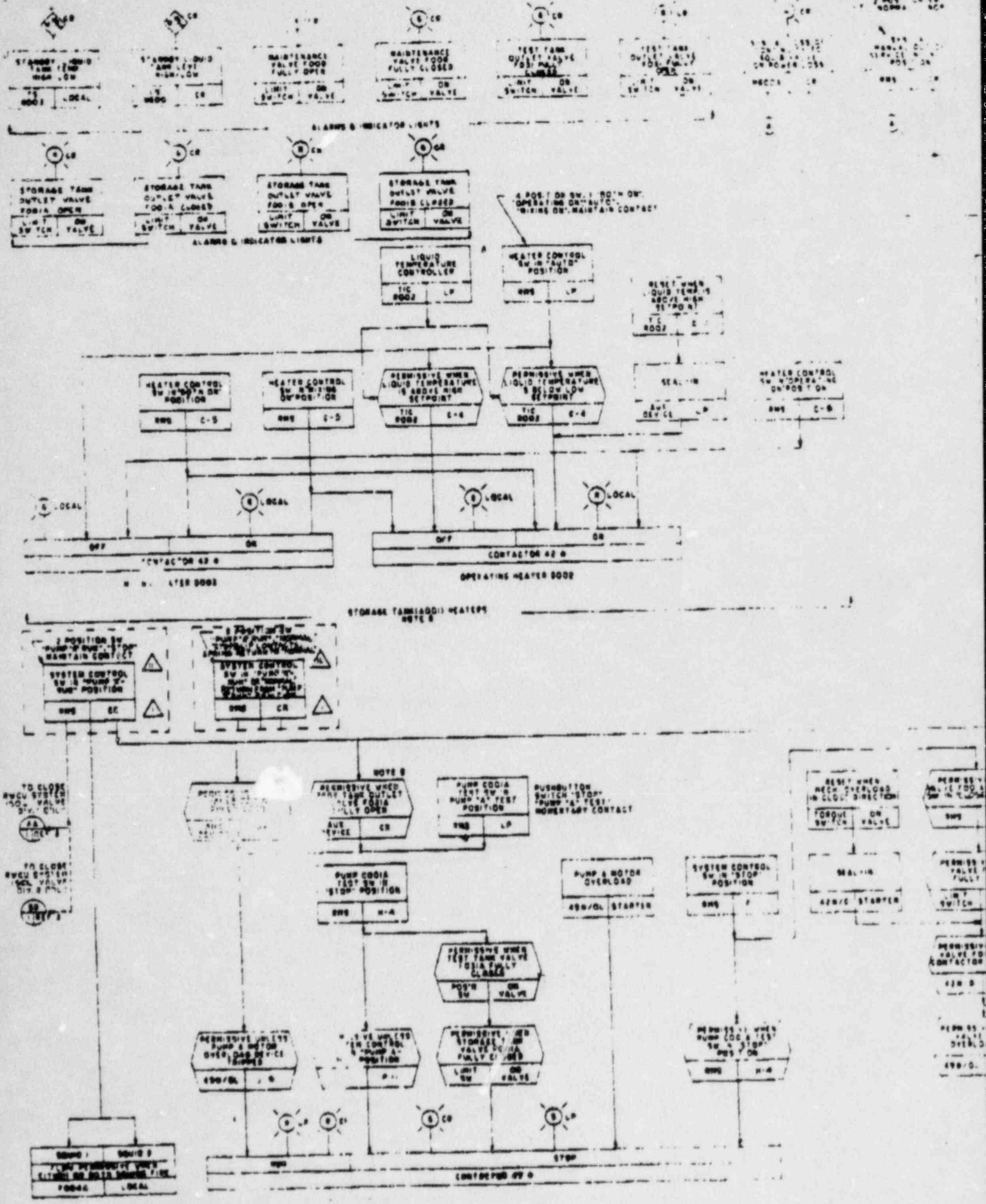
The boron solution tank, the test water tank, the two positive displacement pumps, the two explosive valves, the two motor operated tank shutoff valves, and associated local valves and controls are located in the containment. The liquid is piped into the reactor vessel and discharged near the bottom of the core shroud so it mixes with the cooling water rising through the core (see Sections 5.3, 3.9.3 and 3.9.5).



PERRY NUCLEAR POWER PLANT
THE CLEVELAND ELECTRIC
ILLUMINATING COMPANY

SLCS Functional
Control Diagram

Figure 7.4-2



EXPLOSIVE VALVES

LIQUID CONTROL PUMP C001A

TYPICAL FOR PUMP C001B

DIV LOGIC

The RPT design shall:

1. Meet IEEE 323-1974 and 344-1975, or be consistent with existing plant design requirements;

2. Meet IEEE 279, 379 and 384 (except for the Low Frequency Motor/Generator breakers);

3. Provide for inservice testability (except for action of final breakers).

c. Feedwater Runback

Upon the receipt of a high pressure signal from the RRCS logic including confirmation of no-scram, feedwater flow is to be limited, thereby reducing power and steam discharge to the suppression pool. The feedwater runback design shall:

1. Use control-grade equipment, and

2. Provide manual operation override to allow an increase in feedwater flow, if needed and available.

II. Standby Liquid Control System

The standby liquid control system (SLCS) action is to be initiated manually on a failure to scram condition in accordance with Emergency Instructions. Simultaneous operation of both pumps at full capacity (86 gpm total) will control the nuclear fission chain reaction and thereby maintain suppression pool temperatures within specified limits.

The SLCS design shall:

1. Provide a manual sodium pentaborate solution injection function for both loops simultaneously operated only from the Control Room;

Exhibit "D"

2. Provide for replenishment capability of the SLCS tank with mixed sodium pentaborate solution from outside the containment;

3. Provide capability for periodic functional tests;

4. Assure that no single active logic component failure can prevent its function; and

5. Meet IEEE 323-1974 and 344-1975 or be consistent with existing plant design requirements.

15C.6 SCRAM DISCHARGE VOLUME MODIFICATIONS

Additionally, control rod drive system scram discharge volume shall be modified to minimize the potential for failure of the scram function from unavailability of this volume. The design modification will consist of the addition of redundant instrument volume water level sensors to the control rod drive hydraulic system and instrument line piping modifications. The design change shall:

a. Provide redundant 1E sensors;

b. Provide redundant vent and drain valves.

15C.7 ATWS EVENT AND RESULTS

In order to study the reactor responses with the injection of the boron solution, the Alternate Rod Insertion (ARI) is deliberately ignored in this study, because with ARI, there is no need for boron injection. Consequently, five anticipated events are selected as initiative transients since they can result in highest responses in comparison with the safety criteria. These initiating transients are:

a. MSIV Closure Event - This transient when coupled with postulated normal scram system failure produces high RPV pressure, heat flux and suppression pool water temperature.

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PERRY NUCLEAR POWER PLANT PROJECT
FIELD CONSTRUCTION MANAGEMENT ORGANIZATION
CEI NUCLEAR ENGINEERING DEPARTMENT
AND KAISER ENGINEERS, INC.

February 22, 1980
PY-CEI/GEN-442

RECEIVED
FEB 22 1980
PNPP-SO/DC

Response to:
PY-GEN/CEI-1277

Mr. R. C. Mitchell (MC 392)
General Electric Company
175 Curtner Avenue
San Jose, California 95125

Perry Nuclear Power Plant Units 1 &
ATWS Cost and Schedule Impact

Dear Bob:

We have estimated the cost and schedule impact for Perry of the ATWS modification requirements of NUREG 0460 alternate 3 and 4. These estimates are based on the modification requirements applicable to Perry, given in attached Table I which was abstracted from your GEN/CEI-1277 letter.

For each of the modification categories within Alternate 3 and 4, we have determined whether Perry already complies or requires modification, and whether additional space is needed. This information is shown in attached Table II. In addition Table II presents our best estimate of the direct cost of these modifications, and the expected delay in operating license date. The single largest cost item is the SLC capacity increase of Alternate 4.

The direct costs of Table II are given as 1980 dollars, and include only the costs of engineering, equipment and installation. The additional costs that should be added to this include the indirect costs and the outage/delay costs.

The indirect costs include Contingency/Escalation/AFUDC which we estimate as 0.7X the direct costs, and Licensing/Operation/Maintenance which we estimate as 0.6X the direct costs.

In addition to these costs another major impact is the cost of lost revenues due to construction delays, and due to outages from inadvertent auto-boron-injection. As shown in Table II, we estimate significant construction delays mostly due to the Alternate 4 SLC hardware changes. These result in an estimated 12 week delay at a cost of $275,000 per day. We also believe there is a high probability for at least one inadvertent auto-injection during plant life, with either Alternate 3 or 4, resulting in a 10 day outage for boron cleanup at a cost of $500,000 per day.

The total of all ATWS modification costs for Perry are summarized in Table III. We believe these are realistic estimates, that are perhaps even on the conservative side. A simple comparison of the direct-plus-indirect costs of $4.37 million for Alternate 3 with $11.27 million for Alternate 4 shows the great additional expense of incorporating Alternate 4. We do not believe that the incremental safety benefits of Alternate 4 justify this great additional cost.

Exhibit "E"

We would be glad to supply additional details for this assessment. If you have any questions please call us.

Very truly yours,

Henry A. Putre

Henry A. Putre
Senior Design Engineer

HAP/fab

Attachment 3

cc: G. W. Groscup
B. L. Barkley
L. O. Beck
P. B. Gudikunst
J. A. Kline
SO/DC-
NDS
D. R. Green

GENERAL ELECTRIC

ELECTRIC UTILITY SALES DIVISION

GENERAL ELECTRIC COMPANY, 1000 LAKESIDE AVENUE, CLEVELAND, OHIO 44114
Phone (216) 523-6000

nuclear Steam Supply System

RE: PERRY NUCLEAR POWER PLANT
UNITS 1 & 2
ANTICIPATED TRANSIENTS WITHOUT SCRAM
QUOTATION NO. 149-B

NSSS SP-301

149-B

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APR 13 1981
PERRY PROJECT
PURCH. DEPT.

April 13, 1981

SAFETY-RELATED

Cleveland Electric Illuminating Company
Perry Nuclear Power Plant
P. O. Box 97
Perry, Ohio 44081

FILE PERRY PROJECT
PRF- SP-301

Attention: Mr. D. J. Zupan

Dear Don:

General Electric is pleased to offer this revised quotation, relating to the Alternate 3A ATWS design, for:

1. ATWS Design Work
2. Project Design Services
3. ATWS Equipment

This quotation supersedes Quotation No. 149-A and in accordance with your February 9, 1981 letter requotes this on the basis of a generic and unique breakdown.

GE's scope of work for ATWS Design Work is described in Section 3.1 of the attached scope of work document. Section 3.2 describes GE's scope of work for Project Design Services, and Section 4 describes the estimated scope of Equipment supply.

PRICE

The price for performance of Generic ATWS Design Work is for the Perry Project, if at least e other utilities accept this quotation by submitting signed copies of an Amendment before June 15, 1981. If at least other utilities accept this quotation by submitting signed copies of an Amendment before June 15, 1981, the price per project will be). The price will be subject to adjustment in accordance with the attached Amendment.

Exhibit "F"

GENERAL ELECTRIC

Unique Project Design Services will be performed on a Time and Material (T&M) basis, using GE's standard T&M rates and charges in effect when the work is performed. The quantity of Project Design Services required will depend upon whether the prescribed equipment is installed before or after fuel loading. If installation is before fuel loading, we estimate manhours will be required resulting in an estimated total billing of approximately This option is available for Units having a fuel loading after July 1, 1983. However, considering your May, 1983 fuel loading date, we are presently making the arrangements necessary to support that date. If installation follows fuel loading, we estimate manhours will be required with an estimated total billing of $ Both billing estimates are based upon January 1981 billing rates.

We will advise you of the firm price to be paid for Equipment when that Equipment is defined. The price will be established in accordance with our then standard pricing practices. The current estimate of the Equipment price is $ per unit. The price will be subject to adjustment in accordance with the attached Amendment.

PAYMENT TERMS

The terms of payment for ATWS Design Work will be those in the following table:

DEPOSIT	PERCENT	DUE	CUMULATIVE PERCENT

Payment for T&M Project Design Services will be due within 30 days of invoice for work performed.

PROPRIETARY INFORMATION

GE anticipates that design work performed under this quotation will result in information that must remain proprietary to GE. The provisions of Article XVII (Information) of our NSSS Contract will apply.

TERMS AND CONDITIONS

The terms and conditions for ATWS Design Work and ATWS Equipment will be those of the attached Amendment. Project Design Services will be performed in accordance with Article XXVII (Additional Services) of the NSSS Contract.

(B)

QUOTATION VALIDITY

This quotation will remain valid until June 15, 1981, and our obligation to perform the work as outlined in this quotation is conditioned upon acceptance of this quotation by CEI and five additional utilities by June 15, 1981.

We encourage your prompt review of this important matter, and we will be pleased to discuss any questions you may have regarding this quotation for the ATWS work defined in the Technical Description. In addition, we have a team available to visit you personally to discuss all aspects of this quotation, should you so desire.

Very truly yours,

W. FRANK MIOTTI - GENERATION SALES/SR. APPLICATION ENGINEER

WFM/llg

cc: Mr. H. A. Putre, CEI
Mr. L. O. Beck, CEI

From 4-3-81 Quote 1493

A

SCOPE OF WORK FOR

ANTICIPATED TRANSIENTS WITHOUT SCRAM

ALTERNATE 3A

DESIGN AND EQUIPMENT

4/3/81

SECTION 1
INTRODUCTION

This document describes General Electric's proposed scope of work for ATWS Design Work, Project Design Services and supply of ATWS Equipment

a. allow BWR performance to meet acceptance criteria described in Appendix B including consideration of an ATWS event without ARI;

b. have a reliability objective of 0.96 per demand;

c. use control-grade equipment; and

d. provide manual operation override to allow an increase in feedwater flow, if needed and available.

2.6 Standby Liquid Control System

The standby liquid control system (SLCS) action is to be initiated automatically on receipt of signals indicating an ATWS event is in progress. Simultaneous operation of both pumps at full capacity (86 gpm total) is required to maintain suppression pool temperatures within specified limits.

The SLCS design will:

a. provide an automatic ATWS injection function for both loops simultaneously;

b. provide a manual ATWS injection function for both loops simultaneously operated only from the Control Room;

c. require replenishment capability of the SLCS tank with mixed sodium pentaborate solution from outside the containment;

d. consider the hydrodynamic pulsation effects of two-pump operation;

e. require automatic SLCS injection through the HPCS lines (BWR/5 and BWR/6) or through the jet pump instrument lines (BWR/4).

f. provide automatic Reactor Water Cleanup System isolation;

g. provide for periodic functional tests of the system in both the manual and the automatic ATWS injection modes;

h. minimize undesired injection of the borated liquid into the vessel by design of the logic and sensors to have a low failure rate;

i. accommodate the containment pressure and temperature environment during the period of needed ATWS operation, and for BWR/6 during any predicted operation of containment spray;

j. meet requirements 1.1 through 1.9 of Appendix A;

k. meet the criteria of Appendix B, in conjunction with other ATWS functions, excluding the ARI;

l. include actuation circuits which have a reliability objective of 0.99 per demand and which are separate from RPS and containment isolation circuits;

m. have a reliability objective for delivering boron at full capacity of 0.95 per demand;

n. assure that no single active logic component failure can prevent its function; and

o. use equipment, qualified either by analysis or test, to assure meeting the predicted conditions associated with the ATWS event.

2.7 Containment Ventilation Isolation Valves

To prevent radiological releases to the environs if there are significant fuel failures, the containment ventilation isolation valves are to be closed upon high containment radiation. This isolation logic is to be separate from the RPS.

The containment isolation interface specifications will:

a. require conformance with Appendix B for the ATWS events given in Appendix C;

b. specify that an electrical failure in the RPS, that could prevent a scram, will not prevent the containment isolation function; and

c. specify that use of circuits and valves, qualified by either analysis or test, to assure meeting the predicted conditions associated with the ATWS event.

2.8 Scram Discharge Volume Modifications

Control rod drive system scram discharge volume modifications will be designed to minimize the potential for common mode failure of the scram function due to drain line failure and thus unavailability of this volume. The design modification will consist of the addition of instrument volume water level sensors to the control rod drive hydraulic system and instrument line piping modifications. The design change will:

cc: W Coleman

RECEIVED
JUL 29 1982
OFFICE OF
D. R. DAVIDSON

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

JUL 22 1982

Docket No. 50-440/441

MEMORANDUM FOR: A. Schwencer, Chief
Licensing Branch No. 2
Division of Licensing

FROM: J. Stefano, Project Manager
Licensing Branch No. 2
Division of Licensing

SUBJECT: SUMMARY REPORT ON STAFF MEETING WITH CEI -- PERRY CONTINGENCY PLANS FOR ATWS

The subject meeting was held on July 20, 1982 in conference room MNBB 6110 at the request of CEI. The list of attendees is enclosed.

CEI advised the staff of its intent to install a systems upgrade for ATWS in Units 1 and 2 different from the design docketed in the FSAR and which the staff found acceptable in the Perry SER. Generally, system upgrade for ATWS will include: a manually operated standby liquid control system which doubles the flow rate capability of the current design (from ~~44-88~~ 43-86 gpm); safety grade feedwater/recirculation pump trips, level sensors and pressure sensors; an alternate control rod insertion capability; a modified scram discharge volume. A final design, currently being completed by GE, is expected by November 1982. Within the next two weeks, CEI plans to document to the staff a summary overview of the design changes for ATWS to be installed in the plant, and a specific date when the final design will be submitted for staff approval.

John J. Stefano, Project Manager
Licensing Branch No. 2
Division of Licensing

Enclosure:
Attendance List

cc: H. Abelson, LB#2
N. Fioravanta, ASB
G. Thomas, RSB
J. Mauck, ICSB
R. Stevens, ICSB
J. Clifford, PRTB
R. Tedesco, AD/L

Exhibit "G"

Perry

Mr. Dalwyn R. Davidson
Vice President, Engineering
The Cleveland Electric Illuminating Company
P. O. Box 5000
Cleveland, Ohio 44101

cc: Gerald Charnoff, Esq.
Shaw, Pittman, Potts & Trowbridge
1800 M Street, N. W.
Washington, D. C. 20006

Donald H. Hauser, Esq.
The Cleveland Electric Illuminating Company
P. O. Box 5000
Cleveland, Ohio 44101

Resident Inspector's Office
U.S. Nuclear Regulatory Commission
Parmly at Center Road
Perry, Ohio 44081

Donald T. Ezzone, Esq.
Assistant Prosecuting Attorney
105 Main Street
Lake County Administration Center
Painesville, Ohio 44077

Daniel D. Wilt
Wegman, Hesiler & Vanderberg
7301 Chippewa Road, Suite 102
Brecksville, Ohio 44141

Ms. Sue Hiatt
OCRE Interim Representative
8275 Munson
Mentor, Ohio 44060

Terry Lodge, Esq.
915 Spitzer Building
Toledo, Ohio 43604

John G. Cardinal, Esq.
Prosecuting Attorney
Ashtabula County Courthouse
Jefferson, Ohio 44047

Enclosure 1

MEETING TO DISCUSS CEI ATWS CONTINGENCY PLAN

July 20, 1982

Name	Firm
R. T. George	PECo.
T. Shannon	PECo.
J. Nelson	Quadrex
E. Shelton	Bechtel Power
R. W. Skuarek	PSEGG
S. W. Vail	Bechtel Power
H. L. Hrenda	CEI
W. E. Coleman	CEI
R. C. Mitchell	GE
E. M. Buzzelli	CEI
T. C. Houghton	KMC
C. W. Veprek	
H. C. Pfefferler	GE
D. T. Shen	GE
R. Stevens	NRC/ICSB
J. Clifford	NRC/DHFS/PTRB
N. Fioravante	NRC/NRR/DSI/ASB
G. Thomas	NRC/DSI/RSB

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August 6, 1982

PY-CEI/GEN-597

Mr. R. C.Mitchell
Project Manager
General Electric Company
175 Curtner Avenue
San Jose, CA 95125

Re: Perry Nuclear Power Plant
Units #1 and #2
Review of NEDE 25518

Dear Mr. Mitchell:

The attachment to this letter provides comments to the subject report. The report was reviewed for consistency with the Perry plant design and current GE RRCS design documents, as well as for reference to the automatic initiation of SLCS flow and RWCU isolation.

Because of uncertainty in the eventual method of SLCS initiation, it is suggested that references to the method be deleted from the body of the report. The method of actuation should be described in one section only, to minimize future changes.

The remaining comments are apparently due to system design changes made since the report was written. If a revision to this report is in progress, the comments should be checked against this revision.

It is requested that a corrected final report be provided by October of this year, to support the planned submittal of the ATWS mitigation design information to the NRC.

Very truly yours,

H. L. Hrenda

H. L. Hrenda
Responsible Engineer

H. A. Putre

H. A. Putre
Senior Engineer

HLH/iw

Attachment

cc: E. M. Buzzelli - R230
D. R. Green - W225
H. A. Putre - W240
NDS File C22/41.2/SP-M

Exhibit "H"

The purpose of this attachment is to provide CEI comments to NEDE-25518, "Design Analysis and SAR Inputs for ATWS Performance and Standby Liquid Control System, Perry Plant," dated December, 1981.

1. <u>Page 1 - 1 - Footnote 1, Item 4</u> - Delete. Should be "Automatic annunciation of ATWS event."

2. <u>Page 1 - 1 - Footnote 1, Item 5</u> - Delete. This is not provided by the RRCS design.

3. <u>Section 4.1.3, 2nd Paragraph</u> - The SLCS pumps are not redundant. Operation of both pumps is required.

4. <u>Criterion 29</u> - SLCS valves and pumps are not redundant.

5. <u>APCS B 3-1 and MEB 3-1</u>

   a. First Paragraph - The SLC system is not located in its own compartment.
   b. Second Paragraph, Second Sentence - The system is required under transient as well as normal full power operation.

6. <u>Section 5.1.9</u> - Modify to describe manual SLCS initiation.

7. <u>Section 5.1.12</u> - Clarify extent of two-phase mixture inside the shrould. As written, it appears that the entire volume inside the shrould is two-phase mixture.

8. <u>Table 5.2, Note 2, Last Line</u> - Clarify ππtailππ .

9. <u>Table 5.3.1</u>

   a. Sequence 4 - Add recirc runback (LFMG).
   b. Sequence 8 - Should be LFMG tripped, time should be 29 seconds.
   c. Sequence 13 - Should be "SLCS initiated."

10. <u>Table 5.4.1</u>

    a. Sequence 4 - Add recirc runback (LFMG).
    b. Sequence 8 - Time should be 26 secons. Add recirc pump trip.
    c. Sequence 9 - Delete
    d. Sequence 12 - Should be "SLCS initiated."

11. <u>Table 5.5-1</u>

    a. Sequence 3 - ARI and SLCS logic is not triggered by a failure to scram.

12. Table 5.6.1

    a. Sequence 7 - Recirc pumps are runback (LFMG). Recirc pump trip activates with feedwater limit.
    b. Sequence 11 - Add recirc pump trip.
    c. Sequence 16 - Should be "SLCS initiated."

13. Table 5.7.1

    a. Sequence 15 - Should be "SLCS initiated."

14. Table 5.7.2

    a. Sequence 11 - Level 2 is an ATWS setpoint. Will an LFMG trip occur?
    b. After sequence 12 - LFMG trip, if not in sequence 11.
    c. Sequence 16 - Should be "SLCS initiated."

15. Table 5.9.1

    a. Sequence 4 - Recirc pumps are runback (LFMG).
    b. Sequence 8 - LFMG is tripped, time is 29 seconds (same as sequence 9).
    c. Sequence 13 - Should be "SLCS initiated."

16. Table 5.12.1

    a. Sequence 4 - Recirc pumps are runback (LFMG).
    b. Sequences 8 and 9 - LFMG is tripped, FW is runback at 29 seconds.
    c. Sequence 13 - Should be "SLCS initiated."

17. Table 5.14.1

    a. Sequence 4 - Recirc pumps are runback (LFMG).

18. Table 5.14.2

    a. Sequence 4 - Recirc pumps are runback (LFMG).

19. Table 5.15.1

    a. Sequence 4 - Recirc pumps are runback (LFMG).
    b. Sequence 8 - Recirc pumps are tripped (LFMG) and FW runback at 29 seconds.
    c. Sequence 14 - Should be "SLCS initiated."

20. Table 5.15.2

    a. Sequence 4 - Recirc pumps are runback (LFMG).
    b. Sequence 8 - LFMG trip and FW runback are initiated at 29 seconds.
    c. Sequence 13 - Should be "SLCS initiated."

iw

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lwyn R. Davidson
E PRESIDENT
TEM ENGINEERING AND CONSTRUCTION

August 13, 1982

Mr. A. Schwencer, Chief
Licensing Branch No. 2
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Perry Nuclear Power Plant
Docket Nos. 50-440; 50-441
ATWS Mitigation Design Features

Dear Mr. Schwencer:

In a meeting on July 20, 1982, between CEI and members of NRR, we discussed our plans for changing several systems associated with the mitigation of a postulated ATWS event. The Perry Nuclear Power Plant (PNPP) construction schedule and the current ATWS rulemaking schedule have made it necessary for us to anticipate potential future requirements. We believe it to be in our best interest to modify the current design and install these systems during our construction as opposed to waiting until the construction of these systems impacts our construction schedule or operations. The inclusion of these systems is based on the proposed rulemaking and is not based on a belief by CEI that these systems are needed to mitigate an ATWS event. As such, we maintain our support of industry comments on the proposed ATWS rule.

The basic changes to be made to the Perry plant include the following:

(1) An increased flow capacity for the Standby Liquid Control System from 43 gpm to 86 gpm. This will involve increasing the size of both pumps' suction lines as well as changing the reactor vessel injection point to the HPCS header. Although the design includes both manual and automatic initiation capability, only manual initiation will be functional. The existing pumps will be used.

(2) An upgrade to safety grade of the Recirculation Pump Trip initiation circuitry.

(3) A control grade feedwater runback feature.

(4) An Alternate Rod Insertion system which is redundant to the Reactor Protection System scram logic.

Exhibit "I"

The details of the above described design will be submitted as an amendment to the Perry FSAR by January 1983.

We believe that this design along with appropriate emergency operating procedures and training adequately address the ATWS issue for PNPP.

Very truly yours,

Dalwyn R. Davidson

Dalwyn R. Davidson
Vice President
System Engineering and Construction

DRD:WEC:mb

cc: Jay Silberg, Esq.
John Stefano
Max Gildner

P.O. BOX 97 ■ PERRY, OHIO 44081 ■ TELEPHONE (216) 259-3737 ■ ADDRESS-10 CENTER ROAD

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August 9, 1982

PY-CEI/GEN-598

Mr. R. C. Mitchell
Project Manager
General Electric Company
175 Curtner Avenue
San Jose, CA 95125

Re: PNPP Units #1 and #2
Quotation No. 149A
Request for Modification

Dear Mr. Mitchell:

As previously discussed, to prevent inadvertent injections of boron into the reactor vessel, it has been determined that the automatic SLCS initiation and RWCU isolation provided by the subject quote should be replaced by a manual initiation system. Because of uncertainty concerning the final ATWS mitigation system requirements this change should not be incorporated on the panels prior to delivery. The manual initiation system design should detail the changes required to the documents and equipment so that these changes can be made after equipment delivery in the event manual initiation of the SLCS is allowed by the final ATWS rule, or if no rule is issued prior to startup of the Perry Plant.

The manual initiation design should include annunciators to ensure the operator is informed of the event and is able to determine the necessity for SLCS initiation and RWCU isolation within the 120-second period available. The operator will make this determination based on the APRM readings and/or rod position indication after the 25-second delay associated with ARI operation. Since the SLCS initiation/RWCU isolation time has not been changed no further plant analysis should be required. An assessment should be made of the impact of this change on system reliability.

To support licensing schedules, it is requested that this design be completed and issued by September 15, 1982. Additional manhours should be provided by T&M estimate by August 23, 1982. General Electric is authorized to proceed on this design subject to approval of the estimated manhours.

Very truly yours,

H. L. Hrenda

H. L. Hrenda
Responsible Engineer

H. A. Putre

H. A. Putre
Senior Engineer

HLH/iw

cc: E. M. Buzzelli - R230
D. R. Green - W225
E. C. Willman - W250
NDS File 41.2/C22/SP-M
PO/DC - R290

Exhibit "I"

file A w/ letter

GENERAL ELECTRIC

NUCLEAR POWER

SYSTEMS DIVISION

GENERAL ELECTRIC COMPANY, 175 CURTNER AVE., SAN JOSE, CALIFORNIA 95125
MC 392, (408) 925-2755

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NOV 12 1982
DOCUMENT CONTROL

November 8, 1982
PY-GEN/CEI-1752

Responds to: PY-CEI/GEN-598
INFORMATION

RECEIVED
NOV 16 1982

FROM: DOC. CONTROL DATE: 11/15/82
COPIES TO: [illegible]

Mr. P. A. Nichols
Cleveland Electric Illuminating Co.
P.O. Box 84-10 Center Road
Perry, OH 44081

Attention: H. L. Hrenda

Dear Mr. Nichols:

SUBJECT: MANUAL SLCS INITIATION MODIFICATION DOCUMENTS

This letter transmits two copies each of the following documents in response to CEI's request for modification of the ATWS 3A design for manual initiation of SLCS.

23A1325	Redundant Reactivity Composite Requirement - Design Specification
944E671	Modification Diagram - RRCS (FCD)
944E672	Modification Diagram - RRCS (ELEM)
944E673	Modification Diagram - SLCS - (ELEM)
944E674	Modification Diagram - SLCS - (FCD)
NEDE-22276	Design Analysis and FSAR Inputs for Modified ATWS Performance and Standby Liquid Control system

Please note that the four modification diagrams have not been design verified. This status is indicated by their revision level "A". Design verification has been ordered; and verified documents will be transmitted within two weeks. These will be identified by Rev. 0.

Exhibit "K"

GENERAL ELECTRIC

The reference letter also requests an assessment of the impact of this change on system reliability. We find that we are unable to make such an assessment for lack of adequate human factors input. We note in your letter PY-CEI/GEN-612 that CEI has retained a human factor consultant. We would like to suggest they be requested to provide appropriate input information before we complete this task.

Very truly yours,

R. C. Mitchell

R. C. Mitchell
Project Manager
Perry Nuclear Power Plant

RCM:pab/J11089

Attachment

cc: P. B. Gudikunst w/o att.
J. J. Larsen w/o att.
W. F. Miotti w/o att.

THE CLEVELAND ELECTRIC ILLUMINATING COMPANY

6-2
REV. 1-82

MEMORANDUM SO/7921

☐ I no longer wish to receive this material.

TO J. J. Larsen ROOM
GE-NEBO

FROM E. C. Willman DATE July 22, 1983
PHONE 5238 ROOM W240
SUBJECT Manual Initiation of Standby Liquid Control System C41

Please write a FDDR to remove the following cables from FDI WNVB:

C22A-XX-110	C22A-XX-119
C22A-XX-111	C22A-XX-120
C22A-XX-112	C22A-XX-121
C22A-XX-113	C22A-XX-122
C22A-XX-114	C22A-XX-123
C22A-XX-115	C22A-XX-124
C22A-XX-116	C22A-XX-125
C22A-XX-117	C22A-XX-126
C22A-XX-118	C22A-XX-142

This will remove features not required for our manual initiation concept for the Standby Liquid Control System C41.

DR Green

D. R. Green
Senior Project Engineer

ECW/iw

cc: J. H. Bellack
E. C. Christiansen - TW3
R. E. Coleman - R230
P. A. Nichols - W250
F. R. Stead - S245
Electrical File
PO/DC - R290

Exhibit "L"

DRG

THE CLEVELAND ELECTRIC ILLUMINATING COMPANY

REV. 1-82

MEMORANDUM

☐ I no longer wish to receive this material

TO D. R. Green ROOM W225 FROM E. C. Willman DATE September 28, 1983
PHONE 5238 ROOM W240
SUBJECT Status of Standby Liquid Control System C41 Design Change

At the present time GE has made very little progress on removing the automatic initiation of the Standby Liquid Control System (SLCS) C-41. They have still not issued the modification kit to the elementary diagrams that we requested in September, 1982, except on a preliminary basis. We have repeatedly asked that a design reviewed mod kit be issued. A promise was made by GE that this would be done at the last quarterly meeting on July 18 and 19, 1983. Repeated requests for issuance of the mod kit have brought no results.

On July 22, 1983, we requested GE to prepare a FDDR to remove the cables that were involved with automatic initiation (see attached). This effort in conjunction with GAI's incorporation of the mod kit would complete the design change. As of this date no significant effort has taken place on this FDDR and GE-San Jose has informed me it is on hold.

GE is now requesting approval of a work authorization of $80,000 to complete the design change and bring all affected documents up-to-date. I discussed this some time ago with Bob Mitchell and at that time he estimated this to be a $2,000 to $4,000 effort. Also, this was just for revising drawings to include the mod kit. No indication was given that extra effort would be required to have a complete design change.

The work authorization includes the following:

1. Issue Revised Redundant Re-activity Control System (RRCS) Design Specification and Data Sheet.
2. Issue revised balance of plant information document,
3. Update Operations and Maintenance Manual.
4. Revise Manual Action Procedure.
5. Revise RRCS Elementaries and Functional Control Diagrams.
6. Revise SLCS elementaries and Functional and Control Diagrams.
7. Prepare New RPCS Panel Schematic and Connection Diagram.
8. Change the Programmed Read Only Memory (PROM) in the RRCS Panel.
9. Prepare FDI's to implement cable and PROM changes in the control room.

In addition, I pointed out to GE that number 8 is software and there must also be a hardware change. They agreed but had no cost estimate for the hardware. This item (8) also accounts for approximately one-third of the entire effort. GE is estimating 17 weeks to complete the work authorization.

From the preceding discussion you can see that we have made very little progress since July. GE has not met their promises and virtually ignored our requests. We need to determine if proceeding in the manual direction is still correct. If so, we will have to approve the work authorization. Management attention will be required to ensure GE's prompt completion of the effort.

ECW/iw

E Willman L+A
file L+A
ECC L+A

GENERAL ELECTRIC

NUCLEAR POWER SYSTEMS DIVISION
GENERAL ELECTRIC COMPANY • 175 CURTNER AVENUE • SAN JOSE, CALIFORNIA 95125
MC 399, (408) 925-2755

December 29, 1983
PY-GEN/GAI-2002

Responds to: N/A
INFORMATION

Mr. P. B. Gudikunst
Gilbert Associates, Inc.
P.O. Box 1498
Reading, PA 19603

RECEIVED
JAN 5 1984

Dear Mr. Gudikunst:

SUBJECT: ATWS MANUAL SLC INITIATION

Attached is an advanced issued copy of ECN NJ50426 showing changes to Standby Liquid Control elementary 828E234CA. The ECN essentially returns the elementary to Revision 2 except for the trip of the pumps on low tank level and the relocation of pump and valve control from the containment to a local MCC.

Very truly yours,

E. C. Wood for

R. C. Mitchell
Project Manager
Perry Nuclear Power Plant

RCM:rm/A12299

Attachment

cc: J. J. Larsen
W. F. Miotti
P. A. Nichols, w/att.
File: C41

FROM: DOC. CONTROL	DATE: 1-4-84	
COPIES TO:	RCM	
P Nichols	R Robinson	
R Salt		
B Woodworth		
R Jaquin		
J Beck		

Exhibit "M"