

September 7, 1984

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UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of )  
 )  
THE CLEVELAND ELECTRIC )  
ILLUMINATING COMPANY )  
 )  
(Perry Nuclear Power Plant, )  
Units 1 and 2) )

Docket Nos. 50-440  
50-441

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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<sup>1/</sup> and 9.3.5.2,<sup>2/</sup> 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,<sup>3/</sup> 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<sup>4/</sup>

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- <sup>1/</sup> "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.
- <sup>2/</sup> "The standby liquid control system (see Figure 9.3-19) is manually initiated in the main control room ...." FSAR, p. 9.3-19.
- <sup>3/</sup> The draft version of this amendment was transmitted to the NRC on January 26, 1983.
- <sup>4/</sup> "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,<sup>5/</sup> 7.4.2.2,<sup>6/</sup> 7.4.2.3,<sup>7/</sup> 9.3.5.2,<sup>8/</sup> 15C.5.II,<sup>9/</sup> and Tables 15C-3 to -7.<sup>10/</sup> 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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<sup>5/</sup> "The SLCS is a backup independent method of manually shutting down the reactor ...." FSAR, p. 7.4-5.

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

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

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

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

<sup>10/</sup> 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.<sup>11/</sup> 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

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<sup>11/</sup> 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.<sup>12/</sup>

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.<sup>13/</sup>

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

<sup>13/</sup> 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 compatibility 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.<sup>14/</sup> 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."

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<sup>14/</sup> 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