



UNITED STATES
NUCLEAR REGULATORY COMMISSION
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MEMORANDUM FOR: Guy A. Arlotto, Director, DE
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Brian W. Sheron, Director, DRPS

FROM: Eric S. Beckjord, Director
Office of Nuclear Regulatory Research

SUBJECT: GENERIC ISSUE NO. 125.II.13, "OPERATOR JOB AIDS"

The findings of the Davis-Besse Incident Investigation Team, as reported in NUREG-1154, "Loss of Main and Auxiliary Feedwater Event at Davis-Besse Plant on June 9, 1985," were reviewed by the staff to identify potential generic issues and make recommendations regarding the need for staff actions. Twenty-nine separate subtasks were identified as long-term actions for prioritization. This memorandum addresses the prioritization of one of these subtasks: Issue 125.II.13, "Operator Job Aids."

The prioritization of this issue shows that the safety concern has been addressed by the INPO Training Accreditation Program which was endorsed in March 1985 by the Commission Policy Statement on Training and Qualification of Nuclear Power Plant Personnel. Therefore, Issue 125.II.13 will be DROPPED from further consideration.

The enclosed prioritization evaluation will be incorporated into NUREG-0933, "A Prioritization of Generic Safety Issues," and is being sent to the regions, other offices, the ACRS, and the PDR, by copy of this memorandum and its enclosures, to allow others the opportunity to comment on the evaluation. All comments should be sent to the Advanced Reactors and Generic Issues Branch, DRA, RES (Mail Stop NL/S 169). Should you have any questions pertaining to the contents of this memorandum, please contact Ronald Emrit (492-3731).

Eric S. Beckjord, Director
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Enclosure:
Prioritization Evaluation

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ENCLOSURE

PRIORITIZATION EVALUATION

Generic Issue 125.II.13: Operator Job Aids

ITEM 125.II.13: OPERATOR JOB AIDS

DESCRIPTION

As a result of the Davis-Besse loss of feedwater event, described in NUREG-1154,886 a number of potential new generic issues were identified. In a DHFT memorandum900 of September 19, 1985, it was suggested that an assessment be made of the availability of appropriate job aids to obviate operators having to rely heavily on memory in emergency or "crisis" conditions. In a DSRO memorandum1072 of June 12, 1986, it was requested that DHFT evaluate this issue for inclusion in the Human Factors Program Plan (HFPP) or perform an analysis of the issue to determine its priority.

Safety Significance

In the Davis-Besse occurrence, two operator-related problems were encountered which were involved in the sequence of events that transpired. The first problem occurred when the secondary side operator, anticipating the automatic trip of the Steam Feedwater Rupture Control system (SFRCS), which would start the AFW system, elected to perform a manual trip. However, the operator selected and actuated the wrong pair of pushbuttons from a set of five pairs and, instead of initiating an SFRCS trip for low water in the steam generators, obtained a trip for low steam pressure. This action isolated both steam generators from the AFW system by closing the isolation valves. At about the same time, both AFW pump turbines tripped on overspeed. Recovery of AFW pumps due to the overspeed trips could not be accomplished by actions in the control room.

The second problem was encountered when two equipment operators were unable to reset the AFW pump turbine trip throttle valves and promptly restore feedwater delivery to the steam generators. Both equipment operators, while having a reasonable amount of nuclear power plant experience, had never previously performed the task of resetting, latching and opening the turbine trip throttle valves, particularly under full operating pressure. One equipment operator had successfully reset and latched the No.2 trip-throttle valve but, due to the high friction caused by large differential pressure across the valve gate, removed only the mechanical slack in the valve mechanism and did not open the valve. The other operator had latched but did not reset the No. 1 trip-throttle valve and had partially opened the valve, but was fearful of applying more torque to open the valve further. The turbine, as a result, was operating at 2/3 its normal speed, which did not provide enough discharge pressure to inject water into the steam generator. It was not until the assistant shift supervisor came into the pump room that the operators knew that the trip-throttle valves were not opened enough. At about the same time, another, more experienced, equipment operator arrived with a valve wrench; using this tool he successfully opened the No.2 valve then also reset and opened the No. 1 valve.

It is conceived that operator aids could have reduced the likelihood of the first operator error and decreased the time required for the equipment operators to open the turbine trip-throttle valves. "Operator aids" is a

term which applies to a broad category of items which assist the operators, physically or mentally, in accomplishing their tasks. Operator aids may be markings or codings, tags, tools or devices to physically assist the operator, the layout or arrangement of equipment items, and the equipment design features including provision for human interface. Examples of operator aids which could have assisted the control room and equipment operators include, but should not be limited, to the following:

- (a) The markings on the SFRCS pushbuttons could have described the results of actuation rather than the trip which they generate. For example, instead of low steam pressure trip, the inscription might read SG feedwater isolation; and instead of low water level trip, they might be labeled AF initiation.
- (b) Since a valve wrench is required to open the trip-throttle valves under pressure, a valve wrench might be permanently stored in the AFW pump rooms for use in emergencies.
- (c) Since there existed some confusion about resetting and latching the trip-throttle valves, linkage guidance or instructions could be depicted on the AFW pump room walls to guide the unfamiliar. The mechanical linkage could also have been color-coded or conspicuously marked.

Again, the preceding are only examples of operator aids and are not intended to be an exhaustive list of all such operator aids which could have enhanced the operators actions in the Davis-Besse event. Other generic issues that are related to the safety concern of this issue include: 125.1.7.a, "Recovery of Failed Equipment"; 125.1.7.b, "Realistic Hands on Training"; and 125.11.10, "Hierarchy of Impromptu Operator Actions."

There certainly is no dispute that operator job aids can enhance an operator's ability to perform his task. However, any attempt to define what job aids are needed on a generic basis is very difficult. Even more difficult are efforts to quantify the risk reduction which can result from efforts to improve or provide absent job aids. Any attempt at quantification would be very arbitrary and without much justification. Operator job aids is not a solution that stands on its own merit, but is supportive of other human factors elements such as staffing, qualifications, and training. While the availability of operator job aids may enhance an operator's ability to accomplish his task, the absence of job aids only reduces the reliability of human performance and does not necessarily imply operator failure.

The presence or absence of operator job aids becomes a factor which is considered in the job task analysis and upon which training requirements are established. Provisions are included in the INPO-managed training accreditation program to ensure that the feedback from operating events such as the Davis-Besse event are included in utility training programs. In addition, a portion of the operator job aids is to be addressed in the resolution of the man-machine interface Issue HF5.1, "Local Control Stations."

CONCLUSION

The prioritization of this issue shows that the safety concern has been addressed by the INPO Training Accreditation Program which was endorsed in March 1985 by the Commission Policy Statement on Training and Qualification of Nuclear Power Plant Personnel. Therefore, this issue will be DROPPED from further consideration as a separate issue.

REFERENCES

- 886. NUREG-1154 "Loss of Main and Auxiliary Feedwater Event at the Davis-Besse Plant on June 9, 1985," U.S. Nuclear Regulatory Commission, July 1985.
- 900. Memorandum for H. Thompson from W. Russell, "Comments on Draft List of Longer Term Generic Actions as a Result of the Davis-Besse Event of June 9, 1985," September 9, 1985.
- 1072. Memorandum for W. Russell from T. Speis, "Generic Issue 125.II.13 - Operator Job Aids," June 12, 1986.