Commonwealth Edison
One First National Plaza, Chicago, Illinois
Address Reply to: Post Office Box 767
Chicago, Illinois 60690 - 0767

December 23, 1988

Dr. Thomas E. Murley, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: Dresden Station Units 2 and 3
4kV Undervoltage Relay Setpoint
Additional Information
NRC Docket Nos. 50-237 and 50-249

Reference: Letter from J.A. Silady to T.E. Murley dated March 28, 1988 submitting proposed amendment to 4kV undervoltage relay setting

Dear Dr. Murley:

In response to continuing discussions with NRC Staff reviewers on the referenced 4kV undervoltage relay Tech Spec change, the attached summary further describes the basis for the setpoints of the first level (loss of voltage) relays, which are the subject of the proposed amendment, as well as the second level (degraded voltage) relays. Included is a final Sargent and Lundy report dated December 6, 1988, regarding ECCS motor protection for low voltages. A draft version of this report had previously been provided to B.L. Siegel. The supplemental study by General Electric which is referenced in the summary will be underway by January 16, 1989. A schedule for completion will be provided at that time.

For reasons described in the attached summary, CECo continues to believe that raising the first level setting (or decreasing the delay for second level protection) is not in the best interest of safe and efficient operation of the Dresden units. Furthermore, CECo believes the settings of both levels, as currently applied in the field, are fully consistent with the previously approved design bases for the normal and emergency power systems.

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Please contact this office if you have any additional questions regarding this material.

Very truly yours,

J. A. Silady
Nuclear Licensing Administrator

lm

Attachment

cc: A.B. Davis - Regional Administrator, RIII
B.L. Siegel - Project Manager, NRR
S.G. DuPont - Senior Resident Inspector, Dresden
M.C. Parker - IDNS

5429K

ATTACHMENT

UNDERVOLTAGE RELAY SETPOINT BASIS

I. The first level undervoltage relay is more correctly called the "loss of voltage" relay, since its design basis is to detect complete loss of voltage on the emergency buses (indicative of a loss of offsite power). This function is clearly defined in Branch Technical Position PSB-1, which also requires that a second level of undervoltage protection should be "provided to protect the Class 1E equipment." The purpose of the proposed amendment was to change the Tech Spec to match the current field setting of the first level (loss of voltage) setting. There was no intent to change the previously accepted degree of motor protection as currently provided by the second level (degraded voltage) relay setting.

II. Attempting to base the first level undervoltage relay setting solely on motor protection concerns is both unnecessary and counterproductive to safety.

A. The first level undervoltage relays are inappropriate for motor protection since other devices provide this function. The attached study by Sargent and Lundy Engineers establishes that the motor overcurrent protection will trip the breakers to Class 1E motors within one minute at low voltage, therefore providing the necessary protection. However in response to continuing staff concerns, CECo is also in the process of contracting General Electric, who specified the 4kV ECCS motors for Dresden, to further establish that the motors will not degrade to an unacceptable level. CECo feels that the 4kV motors are the most critical since they operate continuously, rather than intermittently such as valve motors.

B. Raising the setpoint of the first level undervoltage relays is counterproductive to overall plant safety.

1. Raising the setting of the undervoltage relays would add an additional time delay to the response of ECCS pumps to an accident signal concurrent with loss of offsite power. These relays must reset before the ECCS pumps can start and sequence onto the bus. The motors will still start before reactor vessel depressurization to the injection setpoint, but the existing margin is reduced.

2. Raising the setting of the undervoltage relays increases the likelihood that a voltage dip during motor starts will cause the undervoltage relay to reactuate and clear the bus. The resultant effects on core cooling have not been analyzed. Only the degraded voltage relays are bypassed once the diesel is powering the emergency buses.

III. The five minute time delay on the second level undervoltage was provided in response to NRC concerns.

A. The Staff SER of May 19, 1982 states that:

> The five-minute time delay is of sufficient duration to prevent spurious operation of the second level loss of voltage relays during short bus voltage disturbances that may result from starting large motors or short term grid disturbances. Additionally, this time delay will allow operator action to attempt restoration of grid voltage by means available to him.

The NRC was clearly concerned that offsite power not be disconnected unless absolutely necessary. Reducing the time delay to less than one minute would greatly reduce the available margin and essentially prevent any effective operator action.

B. In a parallel effort in 1981, the NRC evaluated the adequacy of station electric system distribution voltage, and provided a favorable safety evaluation on October 7, 1981. This report concluded that:

> Voltages within the operating limits of the Class 1E equipment are supplied for all projected combinations of plant loads and offsite power grid conditions, including an accident in one unit simultaneous with the safe shutdown of the other unit.

The report also states that the undervoltage relay protection was under review, including relay setpoints, time delays, and whether spurious tripping of Class 1E equipment would occur.

CONCLUSION

The extreme unlikelihood of station distribution system voltage reaching the levels currently postulated by the NRC Staff has been previously reviewed and accepted by the NRC. In addition, the technical basis for both the first and second level undervoltage relay protection has been established in previous submittals. CECo continues to believe the existing motor protection for low system voltages is adequate, and that in particular, the undervoltage relay setpoints are justified.

SARGENT & LUNDY
ENGINEERS
FOUNDED 1891
55 EAST MONROE STREET
CHICAGO, ILLINOIS 60603
(312) 269-2000

December 6, 1988
Project No. 7927-44
S&L Letter No. D782E

Commonwealth Edison Company
Dresden Station - Units 2 & 3

4 KV Under Voltage Relays Set Point
System Code: 6700

Mr. M. Kluge
BWR Engineering Department
Commonwealth Edison Company
Post Office Box 767
Chicago, Illinois 60690

Dear Mr. Kluge:

As discussed in the meeting Sargent & Lundy (S&L) and Commonwealth Edison Company (CECo) had on December 2, 1988, S&L was assigned with the task of analyzing motor protection associated with undervoltage.

Sargent & Lundy analyzed the subject motor protection and under-voltage relay setpoint. The subject is discussed in detail in the enclosed document.

Should you have any questions regarding the analysis, please contact me at 269-6987.

Yours very truly,

Rajaindar A. Yeldandi

R. Yeldandi
Electrical Engineer

RY:jjs
In duplicate
Enclosure - Addressee only
Copies:
W. B. Fancher
M. Wallace
D. F. Wheeler
E. D. Eenigenburg
M. S. Tucker
B. M. Viehl
Z. J. Boxer
R. H. Mirochna
M. L. Reed
R. H. Jason
T. J. Ryan/A. Walser
E. Schumacher/F. W. Fischer

Motor Protection

The purpose of the following discussion is to assess the quality of protection afforded to the motors at the Dresden Nuclear power station by the features of the existing protection system in the event of severe undervoltage conditions, and to justify our opinion that the existing first level undervoltage relay setting of 70.5% of bus rated voltage, ±5% tolerance, is adequate.

As noted earlier, the primary purpose of the first level undervoltage relay is to detect a loss of offsite power. Motor protection during undervoltage conditions is provided by the following automatic features of the design:

- Degraded Voltage Protection System

  Degraded voltage relays at Dresden 2 & 3 are set at about 91% of bus rated voltage.

  The logic associated with this system will result in load shedding after 5 minutes once the degraded voltage condition is detected during non-LOCA condition. The degraded voltage condition is alarmed in the control room throughout the 5 minute timing period allowing the operator to take the appropriate corrective action which, for example, may include a transmission line switching and/or manual shedding of certain loads in the plant. During LOCA, the 5 minute timer is by-passed and automatic load shedding of busses will take place after a 7

second time delay. The 7 second time delay is necessary to override normal transient voltage dips on the auxiliary system associated, for example, with large motor starts.

- Motor Overcurrent Protection

All motors in the plant are provided with overcurrent protection. During a severe undervoltage condition, the current drawn by the running motors increases considerably. For example, based on the information contained in Reference 1, the motor full load current increases to about 165% of rated at a voltage of 67% of rated, which corresponds to the first level undervoltage relay setting including the negative tolerance.

Review of the medium voltage motor relay settings indicates that for the above conditions, the overcurrent relays would trip the motors. The attached Figure 1 illustrates, for example, that the 800 HP core spray pump motor would be tripped by its overcurrent relays in about 60 seconds for the above described condition.

The overcurrent relays would also trip the motor if started at the time the bus voltage is depressed to 67% of rated. The available motor torque would be too low to accelerate the load, and the motor would stall. The overcurrent relay would protect the motor against thermal damage.

The above analysis described the features of the existing protective relaying system which would result in tripping of motors in the event of severe undervoltage conditions. It is important to recognize, however, that the voltage levels corresponding to the first level undervoltage relay setting are extremely unlikely to be sustained. If they were to occur, it is expected that they would exist only on a transient basis during the general system collapse. The records at the Dresden Station for the last nearly 20 years substantiate this view. In an effort, however, to ensure that under no circumstances the motor qualifications were in jeopardy, Sargent & Lundy performed the analysis (Reference 2) demonstrating that the existing first level undervoltage relay set point will not adversely affect the motor thermal qualifications.

Reference 1 - IEEE Transactions on Industry Applications, Vol. IA-8, No. 4, July/August 1972, p. 383 - "Effects of Power Supply Variations on AC Motor Characteristics" by John R. Linders.

Reference 2 - "Dresden Station - Units 2 & 3, Study and Technical Documentation of Effect of Undervoltage on AC Motors".

JBW:clh
NBI/RDQZ-EA401