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March 13, 1990

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

Subject: Dresden Units 2 and 3  
Status of DCRDR Modifications  
NRC Docket Nos. 50-237 and 50-249

References: (a) Conference Call between CECO (J. Silady,  
B. Zank, R. Christensen et al.) and NRC  
(B. Siegel, J. Bongarra) on January 26, 1990  
  
(b) Letter from J.A. Silady to T.E. Murley dated  
November 17, 1989

Dr. Murley:

In the Reference (a) telephone conference call with your staff, Commonwealth Edison Company (CECO) discussed the status of Dresden modifications which have been implemented during the recent Unit 3 refueling outage (D3R11) to meet commitments made as a result of the CECO Detailed Control Room Design Review (DCRDR) for the Units 2 and 3 control room. The Enclosure to this letter provide similar information to that discussed during the Reference (a) conference call. The following discussion summarizes the status of these efforts during D3R11 (the second DCRDR outage) with the exception of the annunciator modifications which were discussed in an earlier conference call and the Reference (b) letter.

Extensive work was successfully completed on the face of the control panels (background shading, labeling and other panel enhancements) which also involved component relocations on the ECCS panel. Redundant control and indications were added for the 2/3 Diesel Generator and a large number of Feedwater Heater controls were upgraded.

Also completed prior to the Unit 3 start-up was the upgrade of approximately 100 meter and recorder scales. This involved removal, refurbishment and zone banding of the scales.

The control room ceiling was reconstructed to include resolutions to both background noise and lighting concerns as well as modifying the HVAC System. Some of the lighting Human Engineering Discrepancies (HEDs), however, will remain open pending additional enhancements as discussed on the conference call and in the Enclosure.

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Complications were also encountered in a) the modification which was made to provide override capability to the control room in use of the public address system, and b) delayed receipt of the proper color-coded diffusers for EHC panel legend lights.

Virtually all of the DCRDR work scheduled for the D3R11 outage was therefore successfully completed. As requested, projected completion dates have been provided in the enclosures for the residual work which could not be completed prior to restart of the Unit. Updates to the enclosed descriptions relative to the material provided in Reference (a) are indicated by side bars in the margin.

It is important to note that the residual HEDs that required further schedular relief all have a category/level classification of 2C. HEDs that are classified as 2C are not associated with engineered safeguard systems or engineered safety features. As such, any human error resulting from postponement of these initiatives will not lead to a degraded plant safety system. Further, the HEDs have a minimal impact on general plant performance.

Please contact this office should further information be required.

Very truly yours,



J.A. Silady

Nuclear Licensing Administrator

Enclosure

cc: B.L. Siegel - Project Manager, NRR  
A.B. Davis - Regional Administrator, RIII  
J.M. Hinds/R.M. Lerch - Projects Branch, RIII  
S.G. DuPont - Senior Resident Inspector, Dresden

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## DCRDR STATUS AFTER UNIT 3 SECOND REFUEL OUTAGE (D3R11)

### BACKGROUND SHADING, PANEL ENHANCEMENTS AND LABELING

Background shading, panel enhancements and labeling are the three largest individual areas that affect the face of the control panels. The projects entail extensive component relocations on the ECCS panel (903-3); background shading on every horseshoe panel; mimics, lines of demarcation throughout the control room; and a complete hierarchical labeling program.

All of the above listed items were completed on schedule.

### DIESEL GENERATOR AND FW HEATER CONTROL UPGRADES

Other projects that were also completed on schedule involve the addition of redundant controls and indication on Unit 3 for the "swing" diesel generator (2/3 diesel). Also, approximately 50 Feedwater Heater Vent and Drain control switches have been changed out from throttle open/close to seal-in open/close.

### METER/RECORDER SCALE REFURBISHING AND ZONE BANDING

For Unit 3 there are just under 100 meter and recorder scales that were upgraded to meet the applicable human factors criteria. A consultant was called in to manufacture the scales under the direction of and in concert with both the Human Factors group and the Instrument Mechanics. There are approximately 108 scales that were zone banded. The determination of the scales to band and the zones to enhance was a joint effort between the human factors group and operations. The Instrument Mechanics coordinated both efforts in conjunction with the scale consultant, Human Factors and the Electrical Mechanics (when necessary).

All indicators were degaussed and remagnetized. Through the cooperation of the scale manufacturer, the indicators as well as the recorder scales were installed prior to the Unit 3 start-up.

The scale enhancements were therefore completed on schedule.

### CONTROL ROOM LIGHTING AND BACKGROUND NOISE

The control room ceiling was reconstructed to include resolutions to both background noise and lighting HEDs as well as modifying the HVAC system. Trade-offs were necessary to maximize the effectiveness of each. The trade-off revolved around the allocation of ceiling space to HVAC diffusers, acoustical tiles and light fixtures.

The background noise HED resolutions were successfully implemented. The verification letter closing these HEDs was dated November 14, 1989.

LIGHTING (cont'd.)

Some of the lighting HEDs remain open, however, due to refinements still being developed. In general, the ambient light in the control room is good. The new fixtures and arrangement of light diffusers (egg crates) have created an even light condition across the entire control room. There are no significant "hot spots" that may contribute to eye fatigue. Excluding the exceptions noted below, the control room has 19 footcandles at its lowest level (only one location has 19 footcandles, all others are 20 or greater).

A list of lighting HEDs, a brief description of each and the proposed resolutions follow below:

<u>Index</u>	<u>FSR page</u>	<u>Category/ level</u>	<u>Description</u>
214	081	2C	20 footcandle minimum illumination
215	081		
094	081		
221	082	2C	10 footcandle variation in illumination
222	082		
100	082		
229	084	2C	Glare on meters
104	084		

- A. Indexes 214, 215, 094 on FSR page 081, Category/level 2C. (minimum illumination)

The 902-4 panel deviates from the criteria of twenty footcandles as the minimum illumination level in the control room. The current levels average 13.75 footcandles at the top row of meters. The 903-4 panel meets this criteria. The basis for the deviation is the position of an HVAC diffuser in the ceiling. The diffuser, related duct work, and support structure compelled the lighting consultant to install a 1 ft by 4 ft lighting fixture over the 902-4 panel. See attached figure. This fixture is one-half of the width of other fixtures used over the rest of the main control room panels. The 1 x 4 fixture will be replaced with a 2 x 4 ft fixture, if interferences can be reposition - or replaced by incandescent lighting. Either solution is expected to increase the amount of light falling on the 902-4 panel to satisfy the HED. The addition of the 2 x 4 ft fixture will make the lighting fixtures in the ceiling over Unit 2 identical to the configuration used over Unit 3.

After review by Nuclear Engineering it was decided that a new 4 bulb fixture will replace the present 2 bulb fixture. This fixture needs to be special ordered and is estimated to take 4 months for delivery. Engineering will also need to revise the structural supports of the ceiling in order to accommodate installation of the fixture. It is estimated that this work will be completed by the end of July 1990.

LIGHTING (cont'd.)

- B. Indexes 221, 222, 100 on FSR page 082, Category/level 2C.  
(variation in illumination)

This set of HEDs have to do with the uniformity of the ambient light environment. According to the CECo Checklist, the illumination levels should not vary by more than 10 footcandles at any one work station. The illumination levels for Unit 2 vary by an average of 17.19 footcandles. The illumination levels for Unit 3 vary by an average of 16.17 footcandles. The greatest single deviation is 21 footcandles, which appears twice on the 902-3 panel.

This circumstance came about by design. The placement of the lighting fixtures was designed to reduce glare in the control room. There was glare on the edgewise meters and the overhead CRTs. The addition of incandescent lights and anti-glare screens on the CRTs eliminated the glare on the CRTs. The lighting fixture placement eliminated most of the meter glare (see next page).

To complete the resolution of the glare HEDs, and to reduce the glare on the meters, the overall level of illumination that reached the top row of meters had to be dropped. To achieve this objective, light fixtures were moved further from the vertical control panel; therefore, the benchboard illumination levels are greater than the vertical panel levels.

The CECo Checklist provides for the establishment of 10 footcandles as a standard for illumination variance/uniformity at a given work station. The CECo criteria is utilized across all CECo nuclear plants. NUREG 0700 states in section 6.1.5.3b that "The level of illumination should not vary greatly over a given work station." Based on the data collected, the level of illumination uniformity found in the Dresden control room does not vary greatly over a given work station.

Van Cott and Kinkaid (1972, p. 65) state: "While uniform light distribution is difficult to achieve with known lighting techniques, fixtures located for approximate equality are helpful. Otherwise some indicators will not be legible while others will be too bright. A ratio of 7:1 between the brightest and dimmest is the maximum tolerable range." The Dresden control room has a 2:1 ratio as its worst case, on one location.

The illumination level at the meters is generally greater than 20 footcandles. This good illumination level along with the types of tasks performed on the different sections of the control boards compel us to accept the design and to close these HEDs. We feel that a reduction of the glare creates a better quality ambient lighting environment and that the illumination difference at any one work station is minimized.

LIGHTING (cont'd.)

- C. Indexes 229 and 104 on FSR page 084, Category/level 2C.  
(Glare on meters)

These two HEDs are concerned with glare in the control room. Moving the light fixtures away from the vertical control panel significantly reduced the glare in the control room. A problem still exists on two panels on each Unit, the 902(3)-6 and 7 panels. There are approximately 45 meters per Unit that are affected.

The glare on these meters falls in the upper 1/3 of the scales. In general, the upper 1/3 of these meters is not the normal operational range and in every case, the meters are perfectly readable as is. In addition, none of these instruments are vital for emergency operations.

As an addition to the scope of the modification, the station proposes to place a "hood" over the affected meters. A hood will effectively eliminate this type of glare problem. Dresden will hood each meter on these two panels. The generally good ambient light present in the control room and the elimination of the glare will allow the hooded meters to be effectively read, the HEDs closed and no new HEDs introduced.

Nuclear Engineering is presently developing the design documents that will enable the station to install the hoods. It is estimated that the hoods will be in place by the end of April, 1990.

In summary, all of the above lighting enhancements to "fine tune" the Dresden control room lighting should be complete by July, 1990.

COLOR CODE OF EHC PANEL LEGEND LIGHTS

<u>Index</u>	<u>FSR page</u>	<u>Category/ level</u>	<u>Description</u>
436	190	2C	The color of legend light indicators does not conform to the green board standard.

- References:
- (a) Letter from I.M. Johnson to T.E. Murley dated 08/25/87 transmitting Commonwealth Edison's response to the 12/19/86 SER (pages D3-1 thru D3-3)
  - (b) Letter from J.A. Silady to T.E. Murley dated 02/28/89 requesting Dresden schedule changes
  - (c) Letter from J.A. Silady to T.E. Murley dated 05/26/89 concerning a status update of schedule changes requested in Reference (b).

The particular part of the HED that was not resolved is that the legend light indicator and the legend light pushbutton diffusers on the turbine/EHC control section of the 902-7 panel (Unit 2 only) were not changed to meet the Dresden Station Control Room green board standard prior to the Unit's start-up following the dual Unit outage in December, 1989.

The procurement of the special diffusers that are required for use in these components has led to the delay in implementation of the HED resolution. After an extensive search of vendor manuals, a possible supplier was found. Upon placing an order on November 15th, 1989 we were informed of a 36 week lead time for delivery of the diffusers. The lead time in manufacturing and delivering the diffusers was shortened by station request. The diffusers were scheduled to be received the first week of February prior to the Unit 3 start-up. The Unit 2 diffusers will be installed at the first available opportunity when the Unit is off-line. It is necessary to have the Unit off-line due to the high probability of a scram if the EHC lights are manipulated.

The use of color is a valuable tool; however, it is also a redundant, secondary cue to the operator. Interviews with operators confirm that this is a very delicate panel to operate. Operators report that they rely most heavily on the components' legend and less heavily on the color.

A full shipment of the diffusers has finally arrived on site. The right combination of diffusers was gathered and installed on Unit 3. The diffusers will be installed on Unit 2 as soon as it comes off-line for any reason.

Although it is beyond the original HED commitment, the station has also decided to replace one split diffuser yellow light with a more appropriate white color. This new split diffuser must be special ordered which, due to the 36 week lead time, will delay this additional enhancement until late 1990.

PA SYSTEM OVERRIDE CAPABILITY

<u>Index</u>	<u>FSR page</u>	<u>Category/ level</u>	<u>Description</u>
117	089	2C	Control room priority over plant personnel in the use of the PA system.

The modification to introduce a system that will give the control room an override capability of the plant's public address system has been completely installed. At the modification test it was found that the design was not sufficient to fully mask an announcement made in the plant versus an announcement made by the operator in the control room. Several locations were chosen in the mod test (and subsequent tests) and the same results were found.

Quad Cities Station installed the very same system as Dresden. The Quad Cities PA modification was found to be successful in giving the control room override capability as designed. Further evaluation of the Dresden Station modification in the coming days may reveal a shortcoming in the design or installation of the Dresden PA system. Dresden has identified, with the manufacturer of the PA system, an alternative system that will be more effective in silencing a message initiated from a plant location, as the control room PA override is utilized. Evaluation time is needed to determine a realistic implementation date should an entirely new system be installed.

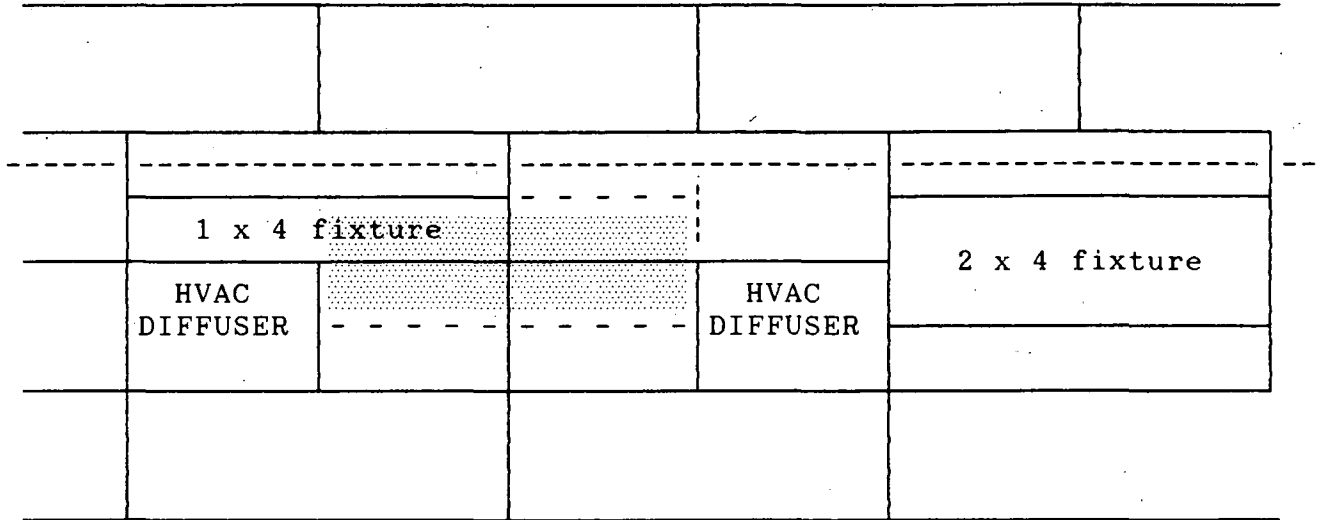
Subsequent discussions with the paging system manufacturer (Gai-Tronics) has determined that large lengths of cables, that are associated with the Dresden system, are preventing the modification from functioning properly. After review by Nuclear Engineering, the station has been requested to close out the present modification. A new modification will be initiated to install a tone generator based system that will provide the override function. The manufacturer assures CECO that this system change will accomplish the paging override with minimal wiring changes to the existing system. However, due to parts delivery (16 weeks from date ordered), modification package development time, and the requisite installation, testing and verification by Human Factors Engineering of the new modification, CECO does not expect closure of this HED until late 1990.

It should be noted that in the interim, in addition to the current PA system, the operators have a dedicated radio channel that they utilize for direct communication with local personnel.



CEILING LAYOUT OVER 902-4 PANEL

TOP VIEW



Representation of the Dresden Control Room Station Ceiling Tiles, HVAC diffusers and Lighting Fixtures.

legend

- dashed line represents the leading edge of the control board.
- - - - dashed line and shaded region represents the proposed location of the 2 x 4 lighting fixture