



KANSAS GAS AND ELECTRIC COMPANY

GLENN L KOESTER  
VICE PRESIDENT - NUCLEAR

June 29, 1982

Mr. Harold R. Denton, Director  
Office of Nuclear Reactor Regulation  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555

KMLNRC 82-214

Re: Docket No. STN 50-482

Rcf: 1) KMLNRC 82-153 dated 1/15/82 from GLKoester, KG&E,  
to HRDenton, NRC

2) KMLNRC 82-172 dated 3/10/82 from GLKoester, KG&E,  
to HRDenton, NRC

Subj: Human Factor Evaluation of Wolf Creek Site-Specific  
Control Room Panels, RL013 and RL014

Dear Mr. Denton:

Reference 1 transmitted the independent preliminary design assessment performed by the Essex Corporation of the Wolf Creek site-specific control room panels RL013 and RL014. Reference 2 transmitted KG&E's responses to Essex Corporation's findings.

Transmitted herewith are KG&E's revised responses to Essex Corporation's findings. The responses have been revised to include clarifications which were discussed with R.J. Eckenrode of the NRC Staff. The schedule for correcting those items indicated in the revised responses will be based on their priority rating. This information is hereby incorporated into the Wolf Creek Generating Station, Unit No. 1, Operating License Application.

Yours very truly,

8207020327 820629  
PDR ADOCK 05000482  
A PDR

GLK:bb  
Attach

cc: Mr. JBHopkins (2)  
Division of Nuclear Reactor Regulation  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555

Mr. Thomas Vandel  
Resident NRC Inspector  
Box 311  
Burlington, Kansas 66839

Boo!

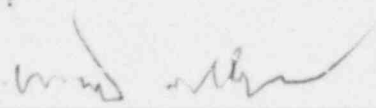
OATH OF AFFIRMATION

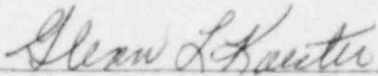
STATE OF KANSAS     )  
                              ) SS:  
COUNTY OF SEDGWICK )

I, Glenn L. Koester, of lawful age, being duly sworn upon oath, do depose, state and affirm that I am Vice President - Nuclear of Kansas Gas and Electric Company, Wichita, Kansas, that I have signed the foregoing letter of transmittal, know the contents thereof, and that all statements contained therein are true.

KANSAS GAS AND ELECTRIC COMPANY

ATTEST:

  
\_\_\_\_\_  
W.B. Walker, Secretary

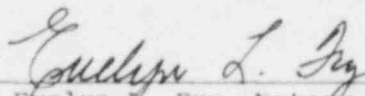
By   
\_\_\_\_\_  
Glenn L. Koester  
Vice President - Nuclear

STATE OF KANSAS     )  
                              ) SS:  
COUNTY OF SEDGWICK )

BE IT REMEMBERED that on this 29th day of June, 1982, before me, Evelyn L. Fry, a Notary, personally appeared Glenn L. Koester, Vice President - Nuclear of Kansas Gas and Electric Company, Wichita, Kansas, who is personally known to me and who executed the foregoing instrument, and he duly acknowledged the execution of the same for and on behalf of and as the act and deed of said corporation.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my seal the date and year above written.



  
\_\_\_\_\_  
Evelyn L. Fry, Notary

My Commission expires on August 15, 1984.

WOLF CREEK  
HUMAN ENGINEERING FINDINGS (HEF)

HEF <sup>(1)</sup>	Priority <sup>(2)</sup>	Subject	Disposition
1	3	Annunciators	<p>The site panel annunciators have been extensively reviewed as part of the total control room annunciator prioritization program. Four major concerns were considered in this review. They are:</p> <p><u>Prioritization -</u></p> <p>A scheme was developed whereby the relative importance of an annunciator will be apparent to the operator. Of the possible coding schemes, position was selected as the best alternative. That is, annunciators near the top of the matrix are more important to plant safety than those near the bottom. Annunciators indicating time-critical hazardous conditions are closer to the top than those that are less time critical. For example, an alarm indicating damage to a critical component would take precedence (be higher in the matrix) over one indicating a technical specification violation.</p> <p><u>Functional Grouping -</u></p> <p>Annunciators are grouped so that related ones are closely associated with each other and are located near the related MCB controls and indications. Where similar annunciators exist for redundant components or trains of components, these have been arranged in congruent blocks arranged left to right by train or component number. The prioritization by position is observed within these functional groupings. Alarms that have a sequential relationship have been placed in a vertical column, in sequence, where practicable so that the operator may identify the progression of increasingly important alarms.</p> <p><u>Engraving Size -</u></p> <p>The letter height, stroke width to height ratio, and letter height to width ratio have been modified to improve legibility of the annunciator engravings. The use of larger</p>

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1 (con't)			<p>letters established an upper limit of three lines and eight characters per annunciator tile. This necessitated a complete revision of annunciator nomenclature.</p> <p><u>Nomenclature -</u></p> <p>Nomenclature has been extensively revised to: a) improve the readability of the engraved messages, b) standardize the use of abbreviations, and c) permit use of larger letters to improve legibility.</p> <p>The site annunciator panel consists of four groups of alarms; lake makeup, plant cooling water, site electrical and miscellaneous (see Table 1, attached).</p> <p>The lake makeup alarm section is placed to the extreme left of the panel as these systems have no direct power block impact. Electrical distribution alarms related to lake systems are included in this grouping so that they are placed directly above their controls and indications. This aids complete evaluation of cause-effect abnormalities.</p> <p>Miscellaneous site alarms are placed in a low priority position except for those alarms associated with hydrogen and oxygen. High flow or low pressure in these systems is significant due to the potential hazard of these gases.</p> <p>The plant cooling water alarm section consists of alarms relating to main circulating water and service water. The alarms showing a main circulating water pump trip or a suction bay emergency condition are placed at the top of the panel. These alarms indicate a loss of the condenser heat sink and have immediate effects on plant operation. The alarms showing an abnormal differential pressure across the screens are arranged to form a sequential column with severity increasing towards the top of the board.</p>

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HUMAN ENGINEERING FINDINGS (HEF)

HEF <sup>(1)</sup>	Priority <sup>(2)</sup>	Subject	Disposition
1 (cont'd)			Site electrical alarms are placed to the right of the panel so that they are adjacent to the power block electrical alarms on panel RK016. The higher voltage switchyard alarms are placed at the top of the alarm panel and the circulating water screenhouse electrical alarms are placed adjacent to the plant cooling water alarm groups.
2	3	Annunciators:	See HEF 1 above.
3	3	Annunciators: ALL LABELS	Annunciator engravings will be changed to bring the letter height-to-width ratio within the guidelines (NUREG 0700, 9/81, 6.3.3.5.2).
4	3	Annunciators: ALL LABELS	Annunciators will be reengraved using a stroke width of approximately .058" (per Finding 3.12 of Reference) and a 6.5:1 height-to-stroke-width ratio.
6	3	Annunciators: ANNUNCIATOR TILES ANNUNCIATOR ACKNOWLEDGE	The annunciators on Panel RL014 will normally be acknowledged from the operator's console (RL001) rather than Panel RL015. All tiles are easily read from the operator's console.
7	3	Annunciator: SILENCE CONTROL	The silence function is incorporated in the acknowledge control. This is desirable because it reduces the number and complexity of controls associated with the annunciators without any function loss or ambiguity. This feature reduces the visual search time and memory requirements for the operator, enhancing overall performance. Each wing of the three main control board wings has two dedicated annunciator acknowledge controls. Each panel is readable from the acknowledge control location dedicated to that panel.
8	1	Annunciator: AUDIBLE ALARM	If the time delay relay associated with an annunciator group times out before an alarm is acknowledged (adjustable from 0 to 60 seconds, but will be administratively controlled to be no less than 10 seconds), that auditory device is silenced automatically and will not reset until the acknowledge button is pressed. This feature has no affect on the visual indications, which do have reflash capability on all windows with multiple inputs. The annunciator time-out feature is desirable in that it eliminates a distracting

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8 (cont'd)			<p>and repetitive chore during conditions of high stress, i.e., a time when several alarms are being generated in rapid sequence, as during a trip. The initial auditory signal alerts the operator of a problem. Allowing the timer to run out and silence its initial and subsequent auditory signals will reduce the need for extraneous activity (repetitively acknowledging alarms) and allow the operators to concentrate on assessing the situation and taking corrective action. Once the immediate actions have been taken, the operator resets the auditory alarm simply by pressing the acknowledge button.</p> <p>The administrative control for the time delay is through the permanent plant Calibration Procedures which will contain a statement similar to the following: "timer to be set at no less than 10 seconds."</p>
9	4	Annunciator Panel	Vertical demarcation lines will be added between columns 3 and 4 and between columns 9 and 10.
10	3	Annunciator Panel	The annunciator matrices will be indexed by means of a coordinate system utilizing letters to denote rows and numbers to denote columns. In order to facilitate rapid location of a tile, each column will have its own unique number (1 through 13). Labels for each row and for every other column will be attached to the panels. After the final position of each tile has been established, the annunciator response procedures will be revised to include tile coordinates.
11	4	Annunciator Panel	All main control board panels will be labeled in response to Finding 6.04 of the Reference. As the annunciator panels are closely associated with the main control board panel section on which they are mounted and have the same number, no further labeling is needed.

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HEF <sup>(1)</sup>	Priority <sup>(2)</sup>	Subject	Disposition
12	3	Mimic Lines: ELECTRICAL DISTRIBUTION	The direction-of-flow arrows referred to are on the mimic lines connecting the unit auxiliary transformer to the substations. When the Plant is generating power, the unit auxiliary will be supplying the substations. If the Plant trips off line, the substations could backfeed to the unit auxiliary until the reverse power relay deenergizes the feed. This backfeed mode can only occur for a maximum of 30 seconds. In light of this, the arrows will be removed as they provide no additional information to the operator.
13	3	Mimic Line: ELECTRICAL DISTRIBUTION	All mimic lines will be inspected for correctness in shape and security on board. Defective or missing lines will be replaced. Those that have come loose from the panel surface will be secured.
14	4	Mimic Lines: ELECTRICAL DISTRIBUTION	A study is presently being conducted on the use of color in the control board mimics.
15	3	Mimic Lines: ELECTRICAL DISTRIBUTION ° BENION STATION TO WEST BUS ° LA CYGNE STATION TO EAST BUS	The switchyard mimic will be modified to eliminate possible confusion that the station transmission lines intersect the switchyard buses by placing a gap between the station transmission lines and switchyard buses mimics.
16	3	Tag Out Labels	An evaluation of average control board device size determined that for commercial operation, the optimum size for tags should be 3" by 1 7/8". Use of this size tag will minimize the obscuring of labels.
17	4	Sample Label: CIRC WATER PUMP ICW01PA IHS-CW001A	Label engraving will be modified to make the letter "I" and the number "1", letters "C" and "G" and the numerals "6" and "8" discernible.



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HEF <sup>(1)</sup>	Priority <sup>(2)</sup>	Subject	Disposition
18	4	Label: GLAND WATER PUMP IWG01PA STOP-RUN	The control room convention on pump control switches is to use the word "RUN." The Gland Water Pump IWG01PA will remain unchanged and all switch labels that read "START" will be changed to "RUN".
19	4	Labels: SIMPLE INDICATORS ° AIR BREAK SWITCH 345-163 ° 345 KV WEST BUS ° 345 KV EAST BUS ° AIR BREAK SWITCH 345-45 ° AIR BREAK SWITCH 345-50 ° 4.16 KV BUS SL31 IEL-SL025A ° NO 2 XFMR 69-13.8 KV ° NO 1 XFMR 69-13.8 KV	Due to the mimic configuration, placing the 345 KV East and West Bus labels and the 4.16 KV Bus SL31 label above their indicating lights would clutter and confuse the mimic layout. These labels are closely associated with their indicating lights and will cause no operator confusion. The remaining 5 labels will be relocated above their displays or panel elements.
20	4	Labels: ° 13.8 KV VOLTS SELECTOR 1 HS-SL029 ° 4.16 KV VOLTS SELECTOR 1 HS-SL028	The existing circular label engraving will be changed to a horizontal format.
21	4	Sample Label: ° GLAND WATER PUMP IWG01PA 1 HS-WG001A	All control switch escutcheons with temporary tape labels will be revised with permanent labeling.
22	3	Simple Indicators, J-Handle Lights, Pushbutton Lights: ALL	Single filament incandescent lamps are used for position and status indication. They are preferred to neon bulbs since neon bulbs provide lower level of illumination in a well lighted control room environment. The single filament bulbs being used have an estimated 20,000 hours life span. This is a result of the fact that the voltage supplied to the bulbs has been reduced approximately 7% to increase bulb life. A burnt-out bulb can be traced by observation alone. Each switch or group of lights for a component contains at least two status lights, one for OPEN (RUN, ON)



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22 (con't)			and the other for CLOSE (STOP, OFF). At any given time, at least one of the two lamps is lighted, otherwise a bulb or circuitry problem is indicated. This can be remedied by either replacing both bulbs or repairing the circuit failure. In addition, there will be an administrative requirement to check the control boards to insure those lights that should be lit are lit. This check will be performed at each shift turnover (three times per day).
23	3	Vertical Meters: ALL	Tolerance zones will be marked on all meters for which tolerances exist. The markings will be applied so that they are in the plane of the meter face to avoid parallax error.
24	5	Vertical Meters: ° CIRC WATER PUMPS DISCHARGE PRESSURE 1P1-CW012A ° SERV WATER PUMPS DISCHARGE PRESSURE 1P1-WS009A	The plural nature of the word "pumps" indicates that these meters are giving a collective reading. The word "Header" will not be added as it would supply the operator with unnecessary information.
25	3	Vertical Meters: ° 13.8 KV BUS VOLTS IEL-SL029 ° 4.16 KV BUS VOLTS IEL-SL028	These meters will be relocated to a lower position.
26	5	Vertical Meters: ° CIRC WATER PUMPS A, B, C ° SERV WTR PUMPS A, B, C ° SERV WTR PUMPS DISCHARGE PRESSURE ° 13.8 KV BUS VOLTS	These meters have graduation marks every two units of the scale with numbered graduations every 30 units of the scale (ex: 30, 60, 90 ....). This scale configuration gives 14 graduation marks between numbers. However, the graduation marks at intermediate units of ten (@ 40, 50, 70, 80 ..... ) are larger than the other 12 graduation marks. This allows the operator to easily interpolate between the numbered graduations.
27	3	J-Handle Controls: ° 4.16 KV VOLTS SELECTOR HS-SL028 ° 13.8 KV VOLT SELECTOR HS-SL029	In lowering the meters for Finding #25, a new position, closer to the displays, will be chosen for the volt select switches.

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27 (con't)		Vertical Meters: ° 13.8 KV BUS VOLTS IEL-SL029 ° 4.16 KV BUS VOLTS IEL-SL028	
28	3	J-Handle Control: ° 13.8 KV VOLTS SELECTOR HS-SL029	The 13.8 KV volt selector will be rewired and relabeled to match the bus sequence in the mimics.
29	1	Pushbutton: BLDWN DISCH STRUCT VALVE WARNING HORN OHS-WL037A	The "Cooling Lake Blowdown Procedure - SYSWL201" requires that personnel be present at the blowdown discharge structure (BDDS) during the initiation of the blowdown system. These personnel will be in contact with the control room either by a telephone located at the BDDS or by a hand held radio.
30	5	Pushbutton: BLDWN DISCH STRUCT VALVE WARNING HORN	The button is a momentary switch, on or off. The horn's function is to sound when activated, but not continuously. Therefore, the operating function is clear.

The attached figure shows Panel RK014. Listed below are the site specific abbreviations used on this panel.

MUSH - Make Up (Water) Screen House  
MUDS - Make Up (Water) Discharge Structure  
BDDS - Blowdown Discharge Structure  
SUPV - Supervisory  
CWSH - Circulating Water Screen House  
CIRC - Circulating  
TREAT - Treatment  
SERV - Service  
HVAC - Heating, Ventilation, and Air Conditioning  
ADMIN - Administration Building

- Notes: (1) HEF 5 deleted by Essex.  
(2) Priority assigned by Essex.

Reference: NRC memorandum to J.B. Youngblood from Voss A. Moore on Control Room Design Review/Audit Report, Callaway, September 28, 1981.

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HUMAN ENGINEERING FINDINGS (HEF)

TABLE 1

	1	2	3	4	5	6	7	8	9	10	11	12	13	
A	MUSH SUPV TROUBLE	SL1 UV/ DC CTRL PWR LOSS	MUDS SUPV TROUBLE	H2 FLO HI	CWSH BAY 1 EMERG	CWSH BAY 2 EMERG	CWSH BAY 3 EMERG	CIRC WTR PMP TRIP	CWSH SUPV TROUBLE	MASTER SUPV TROUBLE	345 KV SUPV TROUBLE	345 KV TROUBLE	69 KV TROUBLE	A
B	M/U PMP TRIP	SL11 XFMR TROUBLE	MUDS WTR LEV LO	H2 PRESS LO	CWSH SCREEN TROUBLE	CWSH SCREEN BLOC	GLAND WTR PRESS LO	SERV WTR HDR PRESS LO	SERV WTR PMP TRIP	SL3 UV/ DC CTRL PWR LOSS	SL4 UV/ DC CTRL PWR LOSS	SL2 BUS 13-40 BKR TRIP	#1 SWGR BKR TRIP	B
C	MUSH SCREEN EMERG	SL11 UV/ DC CTRL PWR LOSS	SL5A CTRL PWR LOSS	O2 FLO HI	CWSH CL2 LEAK	CWSH FAST WASH	GLAND WTR PMP TRIP	SERV WTR STR 1A AP HIHI	SERV WTR STR 2A AP HIHI	SL31 XFMR TROUBLE	SL41 XFMR TROUBLE	345 KV BATT TROUBLE	SL2 UV/ DC CTRL PWR LOSS	C
D	MUSH SCREEN TROUBLE	SL1A XFMR TEMP HI	MUSH BATT TROUBLE	O2 PRESS LO	CL2 TROUBLE	ACID FEED TROUBLE				SL31 BUS TROUBLE	SL41 BUS TROUBLE	SPARE MN XFMR TROUBLE	SL2 BUS 13-42 BKR TRIP	D
E	M/U HDR NOT FULL	SL1A BUS TROUBLE	AUX RAW WTR PMP TRIP	N2 TROUBLE	CL2 BLD CL2 LEAK		WTR TREAT TROUBLE	FUEL OIL TK LEV HILO	AUX BLH FUEL OIL TROUBLE	SL3A XFMR TEMP HI	SL4A XFMR TEMP HI		SL2 A/B/C XFMR TEMP HI	E
F	M/U VLV HYD PRESS LO	MUSH HVAC TROUBLE	BDDS SUPV TROUBLE	N2 TK LEV LO	CO2 PRESS HILO	ADMIN HVAC TROUBLE	SHOP BLD HVAC TROUBLE	CWSH HVAC TROUBLE	SEWAGE TREAT TROUBLE	SL3A BUS TROUBLE	SL4A BUS TROUBLE		SL2 MCC TROUBLE	F

RK-014 SITE-RELATED