Consumers
Power
Company

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June 13, 1985

Director,
Nuclear Reactor Regulation
US Nuclear Regulatory Commission
Washington, DC 20555

DOCKET 50-155 - LICENSE DPR-6 - BIG ROCK POINT PLANT -
HUMAN FACTORS ANALYSIS OF THE STACK GAS MONITOR

Consumers Power Company letter dated March 15, 1985 included a commitment to provide the results of our evaluation of the stack gas monitor, which was made a condition of the Facility Operating License, section B(2)(e), with the approval of Amendment No. 70.

As noted in our letter of March 15, the analysis of the stack gas monitor was divided into two phases. The first phase consisted of a static human factors review of the stack gas monitor displays and controls, and was conducted as part of the Control Room Design Review. This phase included analysis of the readability of the add-on scale as required by the License condition. During the static phase of the analysis some human engineering discrepancies (HED) were identified relating to the meter, they will be discussed later.

The second phase of the human factors analysis of the stack gas monitor consisted of a dynamic evaluation of the ability to utilize the monitor during accident conditions to determine the acceptability of the placement of the meter other than on the main control panel. The monitor is located on the rear of the main panel. This evaluation was made during the recently completed Emergency Exercise on May 21, 1985. The results of this phase of the analysis will be discussed later also.

The Stack Gas Monitoring System provides continuous indication and record of stack releases of radioactive gases and iodine to the atmosphere under both normal and accident conditions. One of two plant exhuast fans must be operable for the monitoring system to provide a valid indication of release activity.

The stack gas monitor has two modes of operation; the normal range and high range. Normal range noble gas and particulate and iodine activity are indicated on individual monitors and a dual recorder. At a stack release rate of approximately 100,000 μCi/sec the noble gas monitor activates the "High Stack Gas Radiation" annunciator on the front of the main control panel. At

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this time also a grab sample is automatically taken for later analysis and the activity recorders switch to fast chart speed. The second mode of operation corresponds to when the Technical Specification limit of $0.47/\bar{E}$ Ci/sec is reached. At this point, the "High-High Stack Gas Radiation" annunciator on the front of the main control panel is activated and a switch over to the high range noble gas monitor is automatically accomplished and the high range particulate and iodine filter changer are activated. The filters are monitored in the chemistry lab. The high range noble gas indication is on an individual monitor and recorder separate from the normal range monitors and recorder.

The high range noble gas readings are used to determine atmospheric release rates. The Emergency Plan Implementing Procedures also include procedures for when the high range noble gas monitor is unavailable. For a radioactive release event inside containment where the radioactive release would not exit through the stack the release rate would be determined via offsite survey data. (The containment exhaust ventilation valves, two valves in series, which would allow release via the stack, close on all scrams, loss of air and/or power, and by a containment high radiation signal.) A radioactive release outside containment would likely involve a ground release as well as a release out the stack. For the release outside containment the plant ventilation system would direct the release, at least partially, to the stack.

The static human factors analysis of the stack gas monitor resulted in the Human Engineering Discrepancies (HED) listed below. The significance of these HED related to the readability of the monitor is considered minor. Although there will likely be some minor improvements made to the monitor, the add-on scale was judged to be easy to read during the static analysis.

HED Related to the Stack Gas Monitor

A. Neither the iodine/particulate and noble gas recorder RR-8057 nor the high range noble gas recorder RR-8058 have units indicated.

B. The high range noble gas meter RI-8328 display units, on its red scale, (original scale) are covered by the add-on scale.

C. The add-on scale for the high range noble gas meter has scale subdivisions which are in various multiples.

D. The original scales on the high range noble gas meter have no intermediate markings between the numbered markings.

E. Temporary add-on scales have been added to the normal and high range meters. The add-on scales are easy to read, however it is recommended they be redrawn and moved upwards so that increased information resolution can be obtained.

These HED will be assessed along with other HED that may result from the Control Room Design Review. Preliminary evaluations of the above HED are as follows:

The recorders noted in HED A duplicate their respective meter reading and have the same units of the meters. HED A will be resolved by adding the unit indications on the recorders.

HED B exists because the temporary add-on scales have covered the units for the original scale which are mR/hr. Although not completely unreadable, this HED will be rectified when HED C and E are resolved.

HED C is the result of adding a linear scale below the original semicircular scale on the meter. Equal divisions on the semicircular scale are unequal along the linear scale. A permanent scale to replace the add-on scale will be pursued with the vendor.

HED D is also considered to require no action. Because of the small scale size, additional indications on the scale which ranges 8 decades would not aid interpolation of the readings by an operator.

Resolution to HED E will be pursued with the vendor to provide a permanent scale to replace the add-on scale. However, as noted, the evaluator has indicated the add-on scale is easy to read.

The dynamic evaluation phase of the human factors analysis of the stack gas monitor was completed during the May 21, 1985 Emergency Exercise. A normal shift complement was used during the exercise. The purpose of this evaluation was to determine if an operator under pressure of accident conditions would or could take the time to walk behind the control panel and read the meter. Ultimately this evaluation will determine if the noble gas stack monitors are satisfactorily situated or whether they should be moved. During the Emergency Exercise operators were required to obtain data from the monitor to analyze the release rate in order to provide protective action recommendations. The release rate data was provided to the participants at the location of the monitor on the back panel in units of the monitor readout.

The Emergency Plan Implementing Procedure for Operations Personnel contains instructions to fill out the Technical Support Center (TSC) data sheet at approximately 15 minute intervals. This data sheet (attached) has 14 readings for stack gas monitors, high range gamma monitor, core damage monitor, area monitors and process monitors. All these monitors are located in the same general location on the back of the main control panel. The stack gas readings are used in the TSC to determine off-site dose release. Indication of high stack gas activity is annunciated on the front of the main control panel. The annunciator is a second method to trigger the operator to observe the stack gas activity.

The results of the dynamic evaluation are:

- Operations personnel took readings about every 15 minutes during the drill. The frequency was dependent on activities required in the drill scenario.

- The operator appeared to have ample time to collect the information. The average time for the 14 readings was about 3 minutes.

- The location of the stack gas monitor did not appear to have any negative effect on the collection of information to cope with the emergency (during the scenario).
- The shift supervisors, control operators and on-call technical advisor were all asked during post drill questioning whether the location of the stack gas monitors posed a hindrance during the drill. All personnel indicated that the monitors location did not pose a hindrance.

We have concluded that the location of the stack gas monitors is no obstacle to the operator's performance during emergency conditions and they are adequate in their present location. Based on this conclusion the Consumers Power Company position is that the Facility Operating License section B(2)(e) has been satisfied. Further evaluation will continue as part of the Control Room Design Review Program and the minor Human Engineering Discrepancies discussed earlier will be assessed and resolved.

James L. Kuemin

James L Kuemin
Staff Licensing Engineer

CC Administrator, Region III, USNRC
NRC Resident Inspector - Big Rock Point

Attachment

ATTACHMENT

Consumers Power Company
Big Rock Point Plant
Docket 50-155

TSC DATA SHEET

June 13, 1985

1 Page

IC0685-0219-NL04

TSC DATA SHEET - BIG ROCK POINT PLANT

Time _____ Log No _____ Emergency Classification _____

Reactor:

a) Reactor Pressure (psig) _____
b) Steam Drum Lvl from ℄ (inches) _____
c) Rx Water Above Core Yes ☐ No ☐
d) All Rods In Yes ☐ No ☐
e) General Reactor Condition _____

Containment:

a) Containment Pressure (psig) _____
b) Containment Water Level (ft) _____
c) MSIV Position _____
d) Ventilation Valves Position _____
e) General Containment Condition _____

Engineered Safeguards:

a) Emergency Condenser Level (%) _____
b) Emergency Condenser Temp:
Loop 1 (°F) _____
Loop 2 (°F) _____
c) Core Spray System Flow (gpm) _____
d) Backup Core Spray Sys Flow (gpm) _____
e) Containment Spray Sys Flow (gpm) _____
f) RDS Status _____
g) Liquid Poison Status _____
h) Steam Drum Relief Vlv Status _____
i) Post Incident Recycle Yes ☐ No ☐

Operations Review: _____

Radiological Conditions:

a) Stack Gas Monitor RI-8327 (cpm) _____
b) Hi Range Stack Mon RI-8328 (mR/hr) _____
c) Hi Range Gamma Mon RI-8324 (R/hr) _____
(Core Damage) RI-8325 (R/hr) _____
d) Area Monitors: (mR/hr)
Spent Fuel Storage No. 2 _____
Condensate Demin Entrance No. 8 _____
Machine Shop Area No. 9 _____
Turbine Shield Wall No. 17 _____
Radwaste Vault Entrance No. 18 _____
Emer Condenser Vent-East No. 20 _____
Emer Condenser Vent-West No. 21 _____
Other _____ _____
Other _____ _____
e) Process Monitors: (cpm)
Radwaste Discharge to Canal _____
Canal Discharge _____
Service Water Discharge to Canal _____

General Plant Conditions: _____

Observations/Maintenance Status: _____

Meterological Data:

a) Wind Direction (degrees from) _____
b) Wind Speed (mph) _____
c) Sigma Theta (degrees) _____
d) Pasquill Stability _____

Radiological Conditions:

a) TSC Dose Rates (mR/hr) _____
b) TSC Airborne (μCi/cc) _____
c) Core Damage Estimate (%) _____

General Rad Conditions/PAG Recommendations: _____

Health Physics Review: _____

Prognosis: Stable ☐ Escalating ☐ De-Escalating ☐ Terminating ☐
Potential for Release: Yes ☐ No ☐
Potential Release Duration (hours) _____
SED Recommendations/Action: _____

Send To: ____ GOCC ____ EOF ____ OSC
SED Approval: _____ Date: _____
Distribution: White-Fax Green-Communicator Canary-Tech Pink-HP Goldenrod-Control Room