



Federal Emergency Management Agency

Washington, D.C. 20472

OCT 6 1982

MEMORANDUM FOR: Brian Grimes
Director
Division of Emergency Preparedness
U.S. Nuclear Regulatory Commission

FROM: *Richard W. Grimm*
Richard W. Grimm
Assistant Associate Director
Office of Natural and Technological
Hazards

SUBJECT: Emergency Preparedness Issues, Three Mile Island
Nuclear Station Unit 1, Alert and Notification System
Technical Evaluation

The purpose of this memorandum is to respond to the Alert and Notification concerns in the Licensing Board's partial initial decision (PID) of December 4, 1981. In my memorandum of January 19, 1982, to you entitled "Emergency Preparedness Issues - Three Mile Island Nuclear Station Unit 1," it was indicated that a mini-test would be performed to identify dead spots in the alerting system. A series of tests was conducted by the firm of Parsons, Brinckerhoff, Quade, and Douglas, Inc., on behalf of GPU/Metropolitan Edison Company, during the week of March 8-12, 1982.

Attached herewith is a memorandum from the Federal Emergency Management Agency (FEMA) Region III entitled "Technical Evaluation of Final Tests and Field Verification of the Siren Alert System--Three Mile Island Nuclear Generating Station" dated June 7, 1982. It must be stressed that this test was an evaluation of only the "Siren System," not an evaluation of the total "Alert and Notification System." This was not a FEMA approval exercise.

However, according to agreements reached at the January 29, 1981, FEMA/NRC Steering Committee Meeting, FEMA Regions were tasked to evaluate the Alert and Notification Systems based on the designed system described in licensee and State and local plans. FEMA considers this recent test at TMI as an upgraded preliminary test of the siren equipment.

Therefore, FEMA finds that the Siren System for offsite alerting at TMI appears adequate from a technical standpoint. However, determination of compliance of the siren system with the criteria of Appendix 3 of NUREG 0654/FEMA REP-1 is subject to confirmation and final FEMA approval of the total Alert and Notification System, including the prompt notification evaluation, at a later date.

FEMA is in the process of having a contractor develop various testing methods and acceptance criteria to perform these tests throughout the nation which may include component tests such as those conducted at TMI and a population survey. Formal testing should commence in FY 83.

If you have any questions on this matter please call Craig Wingo of my staff at 287-0187.

Attachment
as stated




Federal Emergency Management Agency

Region III 6th & Walnut Streets Philadelphia, Pennsylvania 19106

JUN 7 1982

MEMORANDUM FOR: Vernon E. Adler, Chief, Technical Hazards Division-SL-NT

FROM:  John Wm. Brucker
Regional Director

SUBJECT: Technical Evaluation of Final Tests and Field Verification
of the Siren Alert System--Three Mile Island Nuclear
Generating Station

Final tests of the TMI Siren Alert Notification System and Field Verification of sound propagation models were conducted by the firm of Parsons Brinckerhoff Quade and Douglas, Inc., on behalf of GPU/Metropolitan Edison Company, during the week of March 8-12, 1982.

The methodology employed to evaluate the acoustical performance of the siren alert system is basically the same as presented in the final report. Minor changes were made to accommodate the use of laboratory test data on Cyclone and Allertor siren sound power output, and certain shifts in some siren locations due to right-of-way (ROW) settlements.

The field verification and acoustical performance test schedule was comprised of twelve (12) single siren soundings, seven (7) multiple (groups of three or more) soundings, and one sounding of the entire EPZ system.

Specific selection of individual and group siren sites was based upon developing an appropriate sampling and statistical base to support verification of the theoretical prediction and to obtain adequate county measurement coverage. Selection of these particular sirens was made by each local county government, based upon a variety of options proposed in the test plan. This was done to allow maximum flexibility in selection of sirens to be tested and reduce the number of soundings in high population areas, thus minimizing any potential annoyance to the public.

The ANSI S1-2-1962 (R1971) standard methods for the physical measurement of sound were adhered to, with the exception of monitoring during periods of time when wind speed exceeded 10 miles per hour. Due to the pre-arranged siren sounding schedule with each county and municipality, avoidance of siren testing during higher than desirable wind speeds was not possible. It should be noted that all instrumentation was calibrated before each day's monitoring. In addition, to ensure accuracy and reliability of measured data, batteries used by each instrument were replaced regularly.

Descriptive statistics of all measured siren levels in C weighted sound pressure levels (dBC) are presented in five tables. Review of documented data reveals

a total of 165 individual measurements ranging from 60 to 124 dBC, with two occurrences out of the 165 measurements at 60 and 61 dBC, and one occurrence of 124 dBC. The sample cumulative probabilities indicates that 99 percent of the sample population is below 123 dBC and only about 2 percent of the measured values are between 60 and 61 dBC.

Using the One-Sided Distribution-Free Upper Tolerance Limit Test, it can be expected, with a 99 percent confidence level, that at least 95 percent of the true population, or all siren sound levels, can be expected to be less than 122 dBC. Similarly, one can expect with a 99 percent confidence level that at least 95 percent of the siren levels lie above 62 dBC.

Measurement data on sound levels of single Allertor sirens indicate a maximum measured sound level of 119 dBC. Field measurements taken within 100 feet from the base of the pole clearly indicate that the upper limit of 123 dBC is of no concern in the case of Allertor sirens because of its very directive pattern as a consequence of its horn design. In the case of the Cyclone sirens, there was one measured occurrence of 124 dBC. Throughout the field measurement program, this is the sole observation exceeding the upper limit of 123 dBC. It is quite possible under certain combinations of weather and ground conditions to have sound levels fluctuating about this level; it is also recognized that a 1 dB difference is well within the field measurement accuracy.

It should be pointed out that the 123 dBC criterion is based on the Occupational and Safety Health Administration (OSHA) noise exposure standards calculation of allowable time duration per 8-hour day. These time durations are well within the 3- to 5-minute signal duration specified in NUREG-0654, Appendix 3, pages 3-12. It is, therefore, concluded that the Cyclone siren levels can be expected to be 123 dBC or less under normal circumstances, and that a slightly higher level is remotely possible under unusual situations.

At the other end of the scale, tabulated data indicates that 96 percent of the data is at or above 67 dBC and that 90 percent of the data is at or above 70 dBC. These percentages are expected to be conservatively low, since most of the low siren level data points originated from single siren tests, and at measurement locations near other siren or sirens which were not sounded during the test. Therefore, the overlap from adjacent sirens which is to be expected during total system activation is not reflected in the test data.

Summary

The system effectively ensures 100 percent coverage of the entire 10-mile EPZ to a minimum sound level of 60 dBC.

Secondly, field results demonstrated that the Allertor sirens, as installed, will not generate sound levels greater than 123 dBC anywhere, and that Cyclone sirens, as installed, will not generate sound levels greater than 123 dBC on the ground close to the mounting pole under most circumstances. The one occurrence of ground sound levels higher than 123 dBC can be attributed to the rare combinations of weather (refractive effects), topographical (nearby reflecting

surfaces) conditions, and, perhaps, the particular siren in its manufacturing process created a slight deviation in its acoustical output. The magnitude of the excess is, however, small (+ 1 db) and well within the outdoor measurement accuracy and within the equivalent safe limits of 123 to 126 dBA corresponding to 3- to 5-minute durations for siren signals based on OSHA daily exposure calculations.

With the field sampling program conducted, it is also concluded confidently that the siren alert system produced sound levels exceeding 60 dBC in areas where population density is below 2,000 persons per square mile, and exceeding 67 dBC in all areas where population density exceeds 2,000 persons per square mile.

Lastly, the results show a high degree of correlation (0.926) between the predicted siren system performance and the field measurements, with a mean error of only 3 dBC.

From the predicted results and the field verification results, it is concluded that the siren alert system, as designed and installed, achieves the intended objectives.

Recommend that the system be approved.