UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION I
631 PARK AVENUE
KING OF PRUSSIA, PENNSYLVANIA 19406

March 6, 1980

Docket No. 50-334

Duquesne Light Company
ATTN: Mr. J. N. Dunn
Vice President
Operations Division
435 Sixth Avenue
Pittsburgh, Pennsylvania 15219

Gentlemen:

The enclosed IE Circular No. 80-03, "Protection from Toxic Gas Hazards", is forwarded to you for information. No written response is required. If you desire additional information regarding this matter, please contact this office.

Sincerely,

Robert F. Carlson for
Boyce H. Grier
Director

Enclosures:
1. IE Circular No. 80-03 with Attachments
2. List of Recently Issued IE Circulars

CONTACT: R. J. Bores
(215-337-5260)

cc w/encls:
F. Bissert, Technical Assistant Nuclear
R. Washabaugh, QA Manager
J. Werling, Station Superintendent
G. Moore, General Superintendent, Power Stations Department
J. J. Carey, Director of Nuclear Operations
R. Martin, Nuclear Engineer
J. Sieber, Superintendent of Licensing and Compliance, BVPS

ENCLOSURE 1

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Accession No.:
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UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT
WASHINGTON, D.C. 20555

PROTECTION FROM TOXIC GAS HAZARDS

Chlorine gas releases have been reported at two different reactor facilities in the past two years.

- At Millstone, in March 1978, a leak of about 100 standard cubic feet of chlorine (about a gallon of liquid) occurred over a ten minute period, resulting in the hospitalization of 15 people. The ventilation system carried the chlorine into the plant buildings, where personnel distress was noted. No injuries occurred in the buildings due to the small size of the release.

- At Browns Ferry, in June 1979, a small leak from a diaphragm on a chlorine reducing valve resulted in the hospitalization of five people, including a control room operator.

Chlorine is highly toxic, producing symptoms after several hours exposure in concentrations of only one ppm. Concentrations of 50 ppm are dangerous for even short exposures and 1000 ppm is fatal for brief exposures. Chlorine, used at some power stations to control organisms in the circulating water, is normally supplied in one ton containers or in tank cars of up to 90 tons capacity.

Other potential sources of toxic gas that have been identified at nuclear power plants include:

- Nearby industrial facilities. At Waterford, in July 1979, construction forces had to be evacuated for two and a half hours due to a chlorine gas release from a nearby chemical plant.

- Chlorine transportation on adjacent highways, railways and rivers.

- Large tanks of aqueous ammonia stored near plant buildings.

- Both acid and caustic storage tanks located in a common building near the control room. At the Dresden site, in August 1977, accidental mixing of acid and caustic solutions resulted in toxic fumes that entered the control room via the ventilation system.

Criterion 19 of Appendix A to 10 CFR 50 requires a control room from which action can be taken to maintain the reactor in a safe condition under accident conditions. The control room designs in current license applications are reviewed for operator protection from toxic gases (as well as radiation), in accordance with Standard Review Plan (SRP) 6.4 (NUREG 75/087 dated 11/24/75). Related information on the identification of potential hazards and the evaluation of potential accidents can be found in SRP sections 2.2.1-2.2.2 and 2.2.3 respectively. The SRP references Regulatory Guide 1.78 (dated June 1974) on control room habitability during chemical releases. It also references Regulatory Guide 1.95 on requirements for protection against chlorine releases specifically.

The majority of the plants currently operating, however, were built and licensed prior to the development and implementation of this guidance. A review of some older plants, with respect to toxic gas hazards indicates that they do not have the degree of protection that would be required for present day plants. Evaluation of the protection of control rooms from toxic gas releases is part of the systematic evaluation program currently being carried out on certain older plants. Also, as older facilities submit requests for significant license amendments, their design features and controls for protection of control rooms are reviewed and, if appropriate, are required to be changed. However, the recent history of frequent toxic gas release incidents appears to warrant a more rapid implementation of the newer toxic gas protection policies.

For the above reasons, it is strongly recommended that:

- You evaluate your plant(s) against section 6.4 and applicable parts of sections 2.2.1-2.2.2 and 2.2.3 of the SRP with respect to toxic gas hazards.

- Where the degree of protection against toxic gas hazards is found to be significantly less than that specified in the SRP, provide the controls or propose the design changes necessary to achieve an equivalent level of protection.

No written response to this circular is required. If you desire additional information regarding this matter, contact the Director of the appropriate NRC Regional Office.

Attachments:
Sections 2.2.1-2.2.2; 2.2.3 and
6.4 of NUREG 75/087

NUREG-75/087

U.S. NUCLEAR REGULATORY COMMISSION

STANDARD REVIEW PLAN

OFFICE OF NUCLEAR REACTOR REGULATION

SECTIONS 2.2.1 - 2.2.2 IDENTIFICATION OF POTENTIAL HAZARDS IN SITE VICINITY

REVIEW RESPONSIBILITIES

Primary - Accident Analysis Branch (AAB)

Secondary - None

I. AREAS OF REVIEW

Locations and separation distances from the site of industrial, military, and transportation facilities and routes in the vicinity of the site. Such facilities and routes include air, ground, and water traffic, pipelines, and fixed manufacturing, processing, and storage facilities. Potential external hazards or hazardous materials that are present or which may reasonably be expected to be present during the projected life time of the proposed plant. The purpose of this review is to establish the information concerning the presence of potential external hazards which is to be used in further review in Sections 2.2.3, 3.5.1.5, and 3.5.1.6.

II. ACCEPTANCE CRITERIA

1. Data in the SAR adequately describes the locations and distances of industrial, military, and transportation facilities in the vicinity of the plant, and is in agreement with data obtained from other sources, when available.

2. Descriptions of the nature and extent of activities conducted at nearby facilities, including the products and materials likely to be processed, stored, used, or transported, are adequate to permit evaluations of possible hazards in Part 3 review sections dealing with specific hazards.

3. Where potentially hazardous materials may be processed, stored, used, or transported in the vicinity of the plant, sufficient statistical data on such materials are provided to establish a basis for evaluating the potential hazard to the plant.

III. REVIEW PROCEDURES

Selection and emphasis of various aspects of the areas covered by this review plan will be made by the reviewer on each case. The judgment of the areas to be given attention during the review is to be based on an inspection of the material presented, the similarity of the material to that recently reviewed on other plants, and whether items of special safety significance are involved. The following procedures are followed:

USNR

Standard review plans are prepared for the guidance of the Off operate nuclear power plants. These documents are made av general public of regulatory procedures and policies. Standa compliance with them is not required. The standard review pla for Nuclear Power Plants. Not all sections of the Standard Form

Published standard review plans will be revised periodically

Comments and suggestions for improvement will be consid Regulation, Washington, D.C. 20555.

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U.S. NUCLEAR REGULATORY COMMISSION

STANDARD REVIEW PLAN

OFFICE OF NUCLEAR REACTOR REGULATION

SECTION 2.2.3 EVALUATION OF POTENTIAL ACCIDENTS

REVIEW RESPONSIBILITIES

Primary - Accident Analysis Branch (AAB)

Secondary - Applied Statistics Branch (ASB/MPA)

I. AREAS OF REVIEW

The applicant's identification of potential accident situations in the vicinity of the plant is reviewed to determine the completeness of and the bases upon which these potential accidents were or were not accommodated in the design. (See Standard Review Plans 2.2.1 and 2.2.2.)

The applicant's probability analyses of potential accidents involving hazardous materials or activities in the vicinity of the plant, if such analyses have been performed, are also reviewed by ASB/MPA on request by AAB to determine that appropriate data and analytical models have been utilized.

The analyses of the consequences of accidents involving nearby industrial, military, and transportation facilities which have been identified as design basis events are reviewed.

II. ACCEPTANCE CRITERIA

The identification of design basis events resulting from the presence of hazardous materials or activities in the vicinity of the plant is acceptable if the design basis events include each postulated type of accident for which the expected rate of occurrence of potential exposures in excess of the 10 CFR Part 100 guidelines is estimated to exceed the NRC staff objective of approximately 10^{-7} per year. Because of the difficulty of assigning accurate numerical values to the expected rate of unprecedented potential hazards generally considered in this review plan, judgment must be used as to the acceptability of the overall risk presented.

The probability of occurrence of the initiating events leading to potential consequences in excess of 10 CFR Part 100 exposure guidelines should be estimated using assumptions that are as representative of the specific site as is practicable. In addition, because of the low probabilities of the events under consideration, data are often not available to permit accurate calculation of probabilities. Accordingly, the expected rate of occurrence of potential exposures in excess of the 10 CFR Part 100 guidelines of approximately 10^{-6} per year is acceptable if, when combined with reasonable qualitative arguments, the realistic probability can be shown to be lower.

The effects of design basis events have been adequately considered if analyses of the effects of those accidents on the safety-related features of the plant have been performed and measures (e.g., hardening, fire protection) to mitigate the consequences of such events have been taken.

III. REVIEW PROCEDURES

In some cases it may be necessary to consult with or obtain specific data from other branches, such as the Structural Engineering Branch (SEB) or Auxiliary Systems Branch (ASB), regarding possible effects of external events on plant structures or components.

The applicant's probability calculations are reviewed, and an independent probability analysis is performed by the staff if the potential hazard is considered significant enough to affect the licensability of the site or is important to the identification of design basis events.

All stochastic variables that affect the occurrence or severity of the postulated event are identified, and judged to be either independent or conditioned by other variables.

Probabilistic models should be tested, where possible, against all available information. If the model or any portion of it, by simple extension, can be used to predict an observable accident rate, this test should be performed.

The design parameters (e.g., overpressure) and physical phenomena (e.g., gas concentration) selected by the applicant for each design basis event are reviewed to ascertain that the values are comparable to the values used in previous analyses and found to be acceptable by the staff.

Each design basis event is reviewed to determine that the effects of the event on the safety features of the plant have been adequately accommodated in the design.

If accidents involving release of smoke, flammable or nonflammable gases, or chemical bearing clouds are considered to be design basis events, an evaluation of the effects of these accidents on control room habitability should be made in SAR Section 6.4 and on the operation of diesels and other safety-related equipment in SAR Chapter 9.

Special attention should be given to the review of standardized designs which propose criteria involving individual numerical probability criteria for individual classes of external man-made hazards. In such instances the reviewer should establish that the envelope also includes an overall criterion that limits the aggregate probability of exceeding design criteria associated with all of the identified external man-made hazards. Similarly, special attention should be given to the review of a site where several man-made hazards are identified, but none of which, individually, has a probability exceeding the acceptance criteria stated herein. The objective of this special review should be to assure that the aggregate probability of an outcome that may lead to unacceptable plant damage meets the acceptance criteria of Part II of this SRP Section. (A hypothetical example is a situation where the probability of shock wave overpressure greater than design

overpressure is about 10^{-7} per reactor year from accidents at a nearby industrial facility, and approximately equal probabilities of exceeding design pressure from railway accidents, highway accidents and from shipping accidents. Individually each may be judged acceptably low; the aggregate probability may be judged sufficiently great that additional features of design are warranted.)

IV. EVALUATION FINDINGS

If the reviewer verifies that sufficient information has been provided and that his evaluation is sufficiently complete and adequate to meet the acceptance criteria in Section II of this SRP, conclusions of the following type may be prepared for the staff's safety evaluation report:

"The applicant has identified potential accidents which could occur in the vicinity of the plant, and from these has selected those which should be considered as design basis events and has provided analyses of the effects of these accidents on the safety-related features of the plant. The applicant has demonstrated that the plant is adequately protected and can be operated with an acceptable degree of safety with regard to potential accidents which may occur as the result of activities at nearby industrial, military, and transportation facilities."

V. REFERENCES

Regulatory Guide 1.70, "Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants," Revision 2.

Affidavit of Jacques B. J. Read before the Atomic Safety and Licensing Board in the matter of Skagit Nuclear Power Project, Units 1 and 2, July 15, 1976. Docket Nos. STN 50-522, 523.

Atomic Safety and Licensing Board, Supplemental Initial Decision in the Matter of Hope Creek Generating Station, Units 1 and 2, March 28, 1977. Docket Nos. 50-354, 355.

Section 2, Supplement 2 to the Floating Nuclear Plant Safety Evaluation Report, Docket No. STN 50-437, September 1976.

NUREG-75/087

U.S. NUCLEAR REGULATORY COMMISSION

STANDARD REVIEW PLAN

OFFICE OF NUCLEAR REACTOR REGULATION

SECTION 6.4 HABITABILITY SYSTEMS

REVIEW RESPONSIBILITIES

Primary - Accident Analysis Branch (AAB)

Secondary - Hydrology-Meteorology Branch (HMB)
Auxiliary Systems Branch (ASB)
Effluent Treatment Systems Branch (ETSB)

I. AREAS OF REVIEW

The control room ventilation system and control building layout and structures, as described in the applicant's safety analysis report (SAR), are reviewed with the objective of assuring that plant operators are adequately protected against the effects of accidental releases of toxic or radioactive gases. A further objective is to assure that the control room can be maintained as the center from which emergency teams can safely operate in the case of a design basis radiological release. To assure that these objectives are accomplished the following items are reviewed:

1. The zone serviced by the control room emergency ventilation system is examined to ascertain that all critical areas requiring access in the event of an accident are included within the zone (control room, kitchen, sanitary facilities, etc.) and to assure that those areas not requiring access are generally excluded from the zone.

2. The capacity of the control room in terms of the number of people it can accommodate for an extended period of time is reviewed to confirm the adequacy of emergency food and medical supplies and self-contained breathing apparatus and to determine the length of time the control room can be isolated before CO_2 levels become excessive.

3. The control room ventilation system layout and functional design is reviewed to determine flow rates and filter efficiencies for input into the AAB analyses of the buildup of radioactive or toxic gases inside the control room, assuming a design basis release. Basic deficiencies that might impair the effectiveness of the system are examined. In addition, the system operation and procedures are reviewed. The ASB has primary responsibility in the system review area under Standard Review Plan (SRP) 9.4.1. The ASB is consulted when reviewing hardware and operating procedures.