

RS-002, "PROCESSING APPLICATIONS FOR EARLY SITE PERMITS"

ATTACHMENT 2

2.1.3 POPULATION DISTRIBUTION

REVIEW RESPONSIBILITIES

Primary - Probabilistic Safety Assessment Branch (SPSB)

Secondary - Equipment and Human Performance Branch (IEHB)

I. AREAS OF REVIEW

The SPSB reviews the population data in the site environs as presented in the applicant's site safety assessment, to determine whether the exclusion area, low population zone and population center distance for the site comply with the requirements of 10 CFR Part 100 to determine whether the population density is such, as given in Position C.3 of Regulatory Guide 4.7, that consideration should be given by the applicant to alternate sites with lower population density.

A secondary review is performed by IEHB and the written results are used by SPSB to complete the overall evaluation of the facility.

The IEHB reviews the low population zone (LPZ), to determine whether there is reasonable assurance that appropriate protective measures can be taken in this area, in the event of emergency. The results of the analysis are transmitted to SPSB for inclusion in the safety evaluation report.

II. ACCEPTANCE CRITERIA

SPSB acceptance criteria are based on meeting the relevant requirements of the following regulations:

1. 10 CFR 52.17 as it relates to having each applicant provide a description and safety assessment of the site, with special attention to the site evaluation factors identified in 10 CFR Part 100.
2. 10 CFR Part 100, Subpart B as it relates to determining the acceptability of a site for a power or testing reactor. The staff will take the following item, among others, into consideration:

Population density and use characteristics of the site environs, including the exclusion area, low population zone, and population center distance.

10 CFR Part 100 also provides definitions and other requirements for determining an exclusion area, low population zone, and population center distance in Section 100.3.

The requirements of 10 CFR 52.17 and 10 CFR Part 100 are deemed to have been met if the population density and use characteristics of the site meet the following:

1. Either there are no residents in the exclusion area, or if so, such residents are subject to ready removal, in case of necessity.
2. The specified low population zone is acceptable if it is determined that appropriate protective measures could be taken in behalf of the enclosed populace in the event of a serious accident.
3. The nearest boundary of the closest population center (as defined in 10 CFR Part 100) is at least one and one third times the distance from the reactor to the outer boundary of the low population zone.
4. The population center distance is acceptable if there are no likely concentrations of greater than 25,000 people over the lifetime of a nuclear power plant or plants of specified type that might be constructed on the proposed site (plus the term of the early site permit) closer than the distance designated by the applicant as the population center distance. The boundary of the population center shall be determined upon considerations of population distribution. Political boundaries are not controlling.
5. The population data supplied by the applicant in the safety assessment is acceptable if (a) it contains population data for the latest census, projected year(s) of startup of a nuclear power plant or plants of specified type that might be constructed on the proposed site (such date or dates reflecting the term of the early site permit) and projected year(s) of end of plant life, all in the geographical format given in Section 2.1.3 of Reference 3, (b) it describes the methodology and sources used to obtain the population data, including the projections, (c) it includes information on transient populations in the site vicinity, and (d) the population data in the site vicinity, including projections, is verified by other means such as U.S. Census publications, publications from State and local governments, and other independent projections, to be reasonable.
6. If the population density at the early site permit stage exceeds the guidelines given in Position C.3 of Regulatory Guide 4.7, "General Site Suitability Criteria for Nuclear Power Stations" (Ref.4), the applicant will be required to give special attention to the consideration of alternative sites with lower population densities. A site that exceeds the population density guidelines of Position C.3 of Regulatory Guide 4.7 can nevertheless be selected and approved if, on balance, it offers advantages compared with available alternative sites when all of the environmental, safety, and economic aspects of the proposed and alternative sites are considered.

III. REVIEW PROCEDURES

Selection and emphasis of various aspects of the areas covered by this section of this review standard will be made by the reviewer on each case. The judgment on 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 nuclear power plants, and whether items of special safety significance are involved. Determine that the population data contained in the safety assessment is in the detail and in the format described in Reference 3, Section 2.1.3.

Compare the population data presented in the safety assessment against whatever independent population data are available (e.g., Census Bureau CED tapes, special census

which may have been conducted, local and State agencies, Councils of Government, etc.). Note any significant differences which require clarification.

Compare the safety assessment population projections against whatever independent population projections are available (e.g., local and State agencies and Councils of Government, Census Bureau projections, Bureau of Economic Analysis, etc.). Note any significant underestimates in the safety assessment which require clarification.

At the early site permit stage, use the population and its distribution, including weighted transients, projected to the year(s) of startup of a nuclear power plant or plants of specified type that might be constructed on the proposed site (such date or dates reflecting the term of the early site permit) and projected over the lifetime of a plant or plants of specified type that might be constructed on the proposed site, to determine the population density in persons per square mile as a function of distance from the plant site out to 30 miles. Compare results to the safety assessment plot of population density vs distance (Reference 3, Section 2.1.3.6). If the population density, including weighted transient population, projected at the time of initial operation exceeds 500 persons per square mile averaged over any radial distance out to 30 miles (cumulative population at a distance divided by the area at that distance), or the projected population density over the lifetime of the facility exceeds 1,000 persons per square mile averaged over any radial distance out to 30 miles, a memorandum should be prepared advising appropriate staff personnel that an evaluation of alternative sites having lower population densities will be needed.

Determine that the safety assessment includes a map of the low population zone and a table of population distribution which includes transients (Reference 3, Section 2.1.3.4). Determine the method used by the applicant to establish the boundary of the nearest population center (Reference 3, Section 2.1.3.5). Evaluate communities which are closer to the site than the design population center to determine the likelihood that any of them can be projected to 25,000 people within the lifetime of a nuclear power plant or plants of specified type that might be constructed on the proposed site (plus the term of the early site permit). Compare the distance to the boundary of the population center to the distance to the outer boundary of the low population zone and establish that the population center distance is at least one and one third times the low population zone distance as required by 10 CFR Part 100.

Population and population density data of specific towns and cities within the low population zone can be checked against population data as contained in the Department of Commerce publication, "2000 Census of Population - Characteristics of the Population," or other Census Bureau publications.

Determine that the current and projected population data for the LPZ includes transients (e.g., workers, occupants of schools, hospitals, etc., recreational facilities).

The IEHB determines the acceptability of the LPZ with respect to the necessary finding that there is reasonable assurance that appropriate protective measures could be taken in behalf of the people within the LPZ in the event of a radiological emergency. [10 CFR 52.17(b)(3) and 10 CFR 100.3]

A memorandum stating this finding should be transmitted to SPSB for use in preparing the staff's safety evaluation report.

Determine that the nearest boundary of the closest population center is at least one and one-third times the distance to the outer boundary of the low population zone. Evaluate the characteristics of the land area between the site and the nearest population grouping which has, or is projected to have during the lifetime of a nuclear power plant or plants of specified type that might be constructed on the proposed site (plus the term of the early site permit), a population of about 25,000. Use whatever data is available on land use, land use controls such as zoning, potential for growth, or factors which are likely to limit growth between the population grouping and the plant site to determine the potential growth in population density toward the site. The population center boundary should be established at that point nearest the plant site where, in the reviewers judgment, the population density may grow to a value comparable to the density of the community itself. Population density is the controlling criteria, and in this regard, the corporate boundary of the community itself is not limiting. The detail to which this aspect of the site is reviewed will depend on the distance of the nearest probable population center relative to the distance to the outer boundary of the low population zone. (See References 5 and 6.) Where a very large city is involved, a greater distance than the one and one-third factor may be required, and appropriate additional compensating engineered safeguards may be required. These will be evaluated on a case-by-case basis, and where appropriate, a memorandum should be prepared by SPSB providing any recommendations.

IV. EVALUATION FINDINGS

The reviewer verifies that sufficient information has been provided, and that the evaluation is sufficiently complete and adequate to support conclusions of the following type, to be included in the staff SER:

As set forth above, the applicant has provided an acceptable description and safety assessment of the site which contains present and projected population densities which, at the early site permit stage, are within the guidelines of Position C.3 of Regulatory Guide 4.7, and the applicant has properly specified the low population zone and population center distance. In addition, the staff has reviewed and confirmed, by comparison with independently obtained population data, the applicant's estimates of the present and projected populations surrounding the site, including transients. Therefore, the staff concludes that the population data provided are acceptable and meet the requirements of 10 CFR 52.17 and 10 CFR Part 100.

SPSB and IEHB shall determine that:

The applicant has also calculated the radiological consequences of bounding design basis accidents at the outer boundary of the low population zone (Section 15.0 of this review standard) and has provided reasonable assurance that appropriate protective measures can be taken within the low population zone to protect the population in the event of a radiological emergency.

V. IMPLEMENTATION

The following is intended to provide guidance to applicants and licensees regarding the NRC staff's plans for using this section of this review standard.

This section will be used by the staff when performing safety evaluations of early site permit applications submitted by applicants pursuant to 10 CFR Part 52. Except in those cases in which the applicant proposes an acceptable alternative method for complying with specified portions of the Commission's regulations, the method described herein will be used by the staff in its evaluation of conformance with Commission regulations.

Implementation schedules for conformance to parts of the method discussed herein are contained in the referenced regulatory guides and NUREGs.

VI. REFERENCES

1. 10 CFR Part 52, "Early Site Permits; Standard Design Certifications; and Combined Licenses for Nuclear Power Plants."
2. 10 CFR Part 100, "Reactor Site Criteria."
3. Regulatory Guide 1.70, "Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants."
4. Regulatory Guide 4.7, "General Site Suitability for Nuclear Power Stations."
5. NUREG-0308, Safety Evaluation Report, Arkansas Nuclear One, Unit 2. November 1977 and supplements.
6. NUREG-75/054, Safety Evaluation Report, Pilgrim Nuclear Generating Station, Unit 2. June 1975 and supplements.