ATOMICS INTERNATIONAL

A Division of North American Aviation, Inc.

June 7, 1961

In reply refer –
61AT-4692

Secretary
United States Atomic Energy Commission
Washington 25, D. C.

Attention: Director, Division of
Licensing and Regulation

Subject: Notice of Proposed Rule Making,
10 CFR Part 100, Reactor Site
Criteria

Dear Sir:

Atomics International hereby submits, as Enclosure 1, its comments and recommendations in response to subject notice. In addition, included as Enclosure 2, are guides reflecting such comments and recommendations.

If you so desire, we would be pleased to discuss these comments and recommendations in further detail at your convenience.

Very truly yours,

NORTH AMERICAN AVIATION, INC.

W. L. Sequeira
Vice President
Atomics International Division

Enclosures:

1. Comments and Recommendations on Proposed Guides
2. Revised Guides reflecting Comments and Recommendations

cc: Canoga Park Area Office

A/272

Enclosure 1 to North American Aviation, Inc., Atomics International Division letter 61AT4692, dated June 7, 1961

NORTH AMERICAN AVIATION, INC., Acting through its ATOMICS INTERNATIONAL Division, hereby submits the following comments and recommendations on the Atomic Energy Commission's Notice of Proposed Guides, 10 CFR Part 100, Reactor Site Criteria.

CONTENTS

I. SUMMARY

We submit evaluation of a reactor site, selected for power needs or on other bases, is best made by establishing the maximum radioactivity release for the site so that there will not be radiation exposures in excess of those acceptable in the populated areas about the site. Such maximum radioactivity release would be one of the design criteria for any reactor to be located at the selected site. The manner in which this revised approach would be applied is outlined hereafter in these comments. Guides which exemplify this approach are contained in Enclosure 2.

These comments also contain our recommendations with respect to specific sections of the Guides proposed by the Commission. In addition, a recommendation is made that covers a multiplicity of reactors at a single site, a point not covered in the Commission's Guides.

II. GENERAL COMMENTS AND RECOMMENDATIONS

A. Need for Flexible Guides

The formulation of general criteria, methods and factors which must be considered in the evaluation of reactor sites could stimulate the growth of the nuclear power industry by encouraging the development of sites for future reactor installations. At the same time, the formulation of proper criteria will prevent unnecessary expense and activity by industry in site selection and development and will provide suitable motivation for industry to pursue the development of reactor technology.

It is obvious that the types of information required in site evaluation and the methods of evaluating such information are evolutionary items. Therefore, it is not possible at this time to list explicitly either all the factors or the specific methods for treating the factors required in site evaluation. This is recognized in the "Statement of considerations" of the Proposed Guides. Therefore, in the adoption of any set of guides or criteria, it is imperative that they be so written as to permit flexible administration. Such guides or criteria should specify that nothing therein shall obligate the Commission to approve or disapprove any reactor site because such site meets or fails to meet the criteria set forth in the guides. Additionally, applicants for a construction permit are free to demonstrate to the Commission the applicability and significance of site criteria other than those set forth in the guides.

B. Site Evaluation to Establish Design Criteria

The primary objective in the establishment and use of guides for reactor site evaluation is the prevention of serious injury to persons offsite and excessive exposure of large numbers of persons in terms of total population dose should any credible accident occur. In the Proposed Guides, a hypothetical reactor has been used, and from a consideration of the characteristics of the reactor, the site and its environs, methods are given to calculate distances which are designed to accomplish this objective. If it is possible to base site criteria on considerations of a site and its environs, and very general

reactor data, as is done in the Appendix A to the Proposed Guides, then it is also possible to determine for a given site an acceptable release of radioactivity (from a reactor or any other source) and to use this information to establish one of the design criteria for a reactor.

Since site selection for a reactor depends on many factors other than the type of reactor (e.g., a primary determining factor in selecting an electrical power station site by the utility industry is power needs), it is more logical to establish a maximum radioactivity release for a site than to select a site on the basis of an assumed release.

Approached thusly, there is no need to assume "a fission product release from the core" as provided in Section 100.11 (a) of the Proposed Guides. Rather, an exclusion area, a low population zone and population centers will be known for a given site, independent of an assumed radioactive release, by virtue of such facts as population distribution and density at the site, the area under full control of licensee, and the avenues of egress from the site and its environs. It is then possible to determine, from the meteorological characteristics of the site and its environs, for each area the radioactivity release at the site that will give the radiation exposure acceptable for that area, as defined in the guides. The worst combination of meteorological conditions at the site will be assumed in making the above determination. The radioactivity release that will give a radiation exposure acceptable in all areas will then be selected as the maximum radioactivity release for the site.

This approach assumes a definition of the radiation exposure acceptable in a population center as distinct from the Commission's proposed establishment of a distance which such a center must be from the site. We would define an acceptable radiation exposure for a population center in the same terms as acceptable exposures are defined in the Commission's Guides for the exclusion area and the low population zone.

The maximum radioactivity release determined for the selected site would be one of the design criteria for any reactor to be located at such site. Accordingly, the reactor designer would be obliged to design the reactor facility so that reasonable assurance could be given that the facility can be built and operated so that any maximum credible accidental release of radioactivity would not exceed the maximum radioactivity release established for the site. The reactor designer would be free to utilize safety factors intrinsic to particular reactor types and to apply advances in reactor technology without restrictions relating nuclear power to distance.

Under our approach, any references to or assumptions of reactor characteristics need not be included in the Guides. Accordingly, Sections 100.2 (b), 100.10 (c), 100.11 (b) (1) and (2), and Appendix A and all references thereto would be eliminated. The manner in which this revised approach would be applied is exemplified in Enclosure 2.

C. Review and Approval Procedure

Under the approach recommended above, prior to selection of a reactor type, a prospective applicant would evaluate the site selected and determine design criteria for any reactor to be located at such site. Such evaluation and determination would be subject to review by the Commission.

Thereafter, applicant would demonstrate to the Commission reasonable assurance that the reactor designed for the selected site could be built and operated to satisfy all site criteria. The characteristics of the proposed reactor and the extent to which its design incorporates well-proven engineering standards and unique or unusual factors, having a significant bearing on the probability or consequence of an accident, would all be considered. Commission approval of design at this stage would result in issuance of a construction permit.

Finally, the Commission would review the as-built facility to determine that the design criteria approved had in fact been met. Granting of an operating license would proceed in fundamentally the same manner as at present.

D. Multiple Reactors at One Site

The Proposed Guides are not clear as to the manner of evaluating a site at which more than one reactor may be located. Since site criteria are to be based on the consequences of an unlikely but credible accident, not the probability of the accident, it is recommended that as to each independent reactor there must be reasonable assurance that any maximum credible accidental release would not exceed the maximum radioactivity release established for the site. If an incident in a reactor at the site may initiate an incident in any one or more reactors at such site or if two or more reactors are otherwise mutually dependent, there must be reasonable assurance as to the interrelated complex that any maximum credible accidental release would not exceed the maximum radioactivity release established for the site.

III. SPECIFIC COMMENTS AND RECOMMENDATIONS

The following comments and recommendations refer to specific sections of the Proposed Guides as indicated.

A. Statement of Considerations

We believe that the basic objectives in establishing guides for site evaluation can be stated more succinctly and in a manner at once clearer and less alarming to the general public.

Objective (b) of the Proposed Guides is not clear because the phrases "not normally considered credible" and "the number of people killed should not be catastrophic" are subject to a considerable range of subjective interpretation. In addition, the latter could provoke public alarm without need.

The last two sentences of objective (c) of the Proposed Guides seem to imply that, regardless of the reactor type or design or of the interrelationships between population distribution and density, special safety developments, and distances, power reactors can never be located in or very near large cities. Further, it is implied that the Proposed Guides are not adequate in some cases. Since it is believed that these implications should be avoided, it is suggested that the last two sentences in objective (c) be deleted.

It is recommended, therefore, that the basic objective in the establishment and use of the Proposed Guides be stated as:

> "Serious injury to individuals offsite should be avoided and the exposure of large numbers of people in terms of total integrated population dose should be low, if an unlikely, but still credible accident should occur."

B. Scope - 100.2

With the inclusion of the words "for construction permits and operating licenses", paragraph (a) of this section indicates that the Proposed Guides would be applied to the demonstration of the adequacy of the site before and after construction of a facility in accord with an AEC-issued construction permit. Since under our recommendation site evaluation will establish design criteria, site approval is necessary prior, and only prior, to the beginning of construction. Further reviews would be concerned with the demonstration that the reactor had in fact been built to the design criteria established for the approved site. Thus the Guides should apply only to applications for construction permits.

This section of the Guides discloses that the "site" criteria therein contained must be applied more conservatively in the case of novel and unproven reactors. On the other hand, the guides we propose are directed to site evaluation, independent of any proposed reactor, and so can be applied without variance to any site being considered.

We also cannot agree with the inference apparent in this section and instinct in the Commission's concept of a population center distance that conservatism in the building of reactors and geographical isolation of reactors are analogous. We submit that the key to conservatism in this field is reactor design, not reactor location.

C. Definitions - 100.3 (c)

We recommend, rather than defining a population center in terms of its boundary, such a center is better defined in terms of an area with a population density in excess of 5,000 residents per square mile, containing more than 25,000 residents.

D. Factors to be considered when evaluating sites - 100.10

The second sentence of Section 100.10 (b) (3) stipulates that "Unless special precautions are taken, reactors should not be located at sites where radioactive liquid effluents might flow readily into nearby streams or rivers or might find ready access to underground water tables." Effluent discharge should not be based on zero as a criterion. Such a criterion would be inconsistent with 10 CFR 20, which permits the release of radioactive effluents provided that specified quantities and concentrations are not exceeded. Furthermore, this statement is inconsistent with the primary purpose of these criteria which is to set forth guides for evaluating the hazards resulting from an accident rather than ordinary operations. Since it is believed these inconsistencies were not intended, it is recommended

that this section should refer to quantities of effluents resulting from an incident which would exceed maximum radioactivity releases.

E. Determination of Exclusion Area, Low Population Zone, and Population Center Distance

The discussion under II - General Comments and Recommendations above demonstrates that it is not necessary to postulate a fission product release or to estimate an expected demonstrable leak rate from the containment to evaluate a selected site. There is no need, therefore, for the calculation presented by way of example in Appendix A. Further, even were the Commission to follow its approach, in preference to that we propose, no sample calculation should be made a part of the Guides, less the conclusions drawn therein be substituted for the Guides.

Enclosure 2 to North American Aviation, Inc., Atomics International Division letter 61AT4692, dated June 7, 1961

ATOMIC ENERGY COMMISSION

(10 CFR Part 100)

Reactor Site Criteria

General Provisions

Sec.

General Provisions

100.1 Purpose

It is the purpose of these guides to describe some of the criteria which guide the Commission in its review of proposed sites for power and testing reactors subject to Part 50 of this chapter. As it is not yet possible to establish site criteria with sufficient definiteness to eliminate the exercise of agency judgment in evaluating reactor sites, the criteria herein contained are interim guides for the convenience of prospective applicants for permits to construct power and testing reactors. The basic objective of such criteria is: serious injury to individuals off-site should be avoided and the exposure of large numbers of people in terms of total integrated population dose should be low, if an unlikely, but still credible, accident should occur.

Nothing herein contained shall obligate the Commission to approve or disapprove any reactor site because such site meets or fails to meet the criteria set forth below.

100.2 Definitions

As used in these guides:

(a) "Exclusion area" means the area surrounding the reactor site, access to which is under the full control of the prospective applicant. This area may be traversed by a highway, railroad, or waterway, provided these are not so close to a proposed facility as to interfere with normal operations, and provided appropriate and effective arrangements are made to control traffic on the highway, railroad, or waterway, in case of emergency, to protect the public health and safety. Residence within the exclusion area shall normally be prohibited. In any event, residents shall be subject to ready removal in case of necessity. Activities unrelated to operation of a proposed reactor may be permitted in an exclusion area under appropriate limitations, provided that no significant hazards to the public health and safety will result.

(b) "Low population zone" means the area immediately surrounding the exclusion area which contains residents, the total number and density of which are such that there is a reasonable probability that appropriate protective measures could be taken in the event of a serious accident. These guides do not specify a permissible population density or total population within this zone because the situation will vary from case to case. Whether a specific number of people can, for example, be evacuated from a specific area, or instructed to take shelter, on a timely basis, will depend on many factors such as location, number and size of highways, scope and extent of advance planning, and actual distribution of residents within the area.

(c) "Population center" means an area with a population density in excess of 5,000 residents per square mile containing more than 25,000 residents.

(d) "Power reactor" means a nuclear reactor of a type described in 50.21 (b) or 50.22 of this chapter designed to produce electrical or heat energy.

(e) "Testing reactor" means a "testing facility" as defined in 50.2 of this chapter.

Site Evaluation Criteria

100.10 Criteria which guide the Commission in reviewing the site for a proposed reactor

In reviewing a proposed site for a power or testing reactor subject to Part 50 of this chapter, the Commission will be guided by the following criteria,

except as a prospective applicant can demonstrate the applicability and significance of other criteria in lieu of or in addition thereto:

(a) The maximum radioactivity release at the site established, as provided in Section 100.11 of this Part, in terms of:

(1) The exclusion area, low population zone, and population centers.

(2) Meteorological conditions at the reactor site and environs, including the exclusion area, the low population zone, and population centers.

(b) Criteria determined by the environmental characteristics of the site, in addition to meteorology, including seismology, geology, hydrology, and usage. For example:

(1) No proposed facility should be located nearer than 1/4 or 1/2 mile from the surface location of a known active earthquake fault.

(2) Unless special precautions are taken, reactors should not be located at sites where an incident-induced flow of radioactive liquid effluents into the nearby streams or rivers or into underground water tables might result in excessive radiation doses.

A construction permit will not issue unless the proposed reactor is so designed that there is reasonable assurance the reactor can be built and operated so that a credible accidental release of radioactivity will not exceed the maximum radioactivity release for the site. A construction permit will also not issue unless there is reasonable assurance that the proposed reactor can satisfy the other criteria determined by environmental characteristics noted in (b) above. Notwithstanding some unfavorable environmental characteristics, an application for a permit to construct a reactor at a selected site may be approved if the design of the reactor includes appropriate and adequate compensating engineering safeguards.

100.11 Determination of the maximum radioactivity release for the site for a proposed reactor

Assuming the worst combination of meteorological conditions occurring simultaneously at a proposed reactor site and in the exclusion area, in the low population zone, between the reactor site and the population centers, and in such centers, determine the radioactivity releases at the site that would generate the following exposures:

(1) No individual located at any point on the boundary of the exclusion area for two hours immediately following the release would receive a total radiation dose in excess of 25 rem to the whole body, or a total radiation dose in excess of 300 rem to the thyroid from iodine exposure.

(2) No individual located on the outer boundary of the low population zone at the point nearest to the reactor site who is exposed to the radioactive cloud resulting from the release (during the entire period of its passage) would receive a total radiation dose in excess of 25 rem to the whole body, or a total radiation dose in excess of 300 rem to the thyroid from iodine exposure.

(3) No individual located in any population center in the vicinity of the reactor site who is exposed to the radioactive cloud resulting from the release (during the entire period of its passage) would receive a total radiation dose in excess of 2-1/2 rem to the whole body, or a total radiation dose in excess of 30 rem to the thyroid from iodine exposure.

The whole body dose of 25 rem referred to above corresponds to the once-in-a-lifetime accidental or emergency dose for radiation workers which, according to NCRP recommendations, may be disregarded in the determination of their radiation exposure status. (See Addendum dated April 15, 1958 to NBS Handbook 59.) The NCRP has not published a similar statement with respect to portions of the body, including doses to the thyroid from iodine exposure. For the purpose of determining the maximum radioactivity release at a reactor site under the conditions assumed in these guides, the whole body dose of 25 rem and the dose to the thyroid from iodine of 300 rem are conservative values.

(4) The lowest of the radioactivity releases determined as above shall be the "maximum radioactivity release" for any reactor proposed to be located at the site being considered. Such maximum radioactivity release will constitute one of the design criteria for any reactor to be constructed at such site.

(5) When more than one reactor is to be located at a site, the maximum radioactivity release established for such site in accordance with the foregoing shall be applied as follows:

(a) For reactors independent of each other, the maximum radioactivity release will be one of the design criteria of each such reactor.

(b) For reactors not independent of each other in that an incident in one may initiate an incident in one or more of the others or where two or more reactors are otherwise mutually dependent, the maximum radioactivity release will be one of the design criteria of the interrelated complex.

ALLIS-CHALMERS MANUFACTURING COMPANY

MAIN OFFICE • BOX 512 • MILWAUKEE 1, WIS.

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GENERAL MANAGER
ATOMIC ENERGY DIVISION

June 5, 1961

Secretary
U. S. Atomic Energy Commission
Washington 25, D. C.

Attention: Director, Division of
Licensing and Regulation

Dear Sir:

REACTOR SITE CRITERIA

These comments are submitted in response to the invitation contained in "Atomic Energy Commission 10 CFR Part 100, Reactor Site Criteria, Notice of Proposed Guides" published in the Federal Register on February 11, 1961.

We have carefully reviewed the proposed guides, and are also represented on the Reactor Safety Committee of the Atomic Industrial Forum. We believe the guides form an excellent basis for formulation of regulations, but feel that it is important to make some changes.

We are in complete accord with the recommendations to be made by the Atomic Industrial Forum, and are a party to those recommendations. We feel that it is particularly important to eliminate Appendix A as part of the regulation, and to [illegible] by a population center by a [illegible] rule.

In addition, we would suggest that under the introductory paragraph headed "Statement of Considerations," paragraph (c) and the last [illegible] of paragraph (f) be deleted.

Very truly yours,

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[illegible]