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Review Guide for Nuclear Reactor Siting and Reference Criteria Concerning its Application

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Nuclear Safety Commission

This committee set up the Reactor Safety Standards Panel in April, 1958, and has enacted scientific and technical standards concerning the safety of nuclear reactor facilities since then.
The Committee received a report submitted by the Panel on November 2, 1963 concerning the Reactor Siting Review Guide as a preparatory step of the siting criteria for reactors emplaced on land.
The committee reviewed the report, and set out the Reactor Siting Review Guide as shown in Attachment 1, and set out provisional reference criteria concerning the radiation dose that are required when the Guide is applied, as shown in Attachment 2.

[Attachment 1]

The Reactor Siting Review Guide

This Guide is to judge the suitability of siting conditions in relation to a possible accident when the Reactor Safety Review Panel conducts a safety review prior to the installation of the reactor that is emplaced on land.

1. Basic principle

1.1 Siting conditions in principle

It is quite natural that the reactor must be designed, constructed, operated and maintained so as not to cause an accident regardless of the location of installation.
The following siting conditions are necessary in principle to ensure public safety in preparation for a possible accident.

(1) The major premises are such that there was no event which induced a large accident in the past and such an event is unlikely to happen even in the future. In addition events that

escalate into a disaster are also rare.

(2) The reactor must be sufficiently away from the public in relation to the safety protective facility.

(3) The reactor site, including the surrounding area, should be such that appropriate measures can be taken for the public as necessary.

1.2 Basic objective

It is the policy for the Guide to ensure public safety even in the event of an accident and to promote sound development of nuclear power. The following are three basic objectives that the Guide intends to achieve.

a. To not cause radiological hazards to the public in the surrounding area even assuming the occurrence of a critical accident (hereinafter referred to as a major accident) that is likely to occur in the worst case from a technical standpoint by considering events around the site, characteristics of the reactor, and safety protective facility.

b. To not cause a significant radiological disaster to the public in the surrounding area even if the occurrence of an accident is assumed that is unlikely to occur from a technical standpoint that exceeds a major accident (hereinafter referred to as a hypothetical accident). (For instance, it is assumed that some of the safety protective facilities are not operable, the effect of which was expected in the case of a major accident, and the release of comparable radioactive material is assumed.)

c. In the case of a hypothetical accident, the influence on the collective dose must be adequately small.

2. Guide for siting review

It is necessary to examine the conformity to, at least, the following three conditions to achieve the above-mentioned basic objective upon judging the suitability of siting conditions.

2.1 The area around the reactor of a certain distance from the reactor must be an exclusion area.

The "area of a certain distance" here is the area up to a distance that could cause radiological hazards to a person if a person stays inside that distance in the event of a major accident. The exclusion area is the area where the public do not reside as a rule.

2.2 The zone outside of the exclusion area as well as of a certain distance from the reactor must be the low population zone (LPZ).

It is defined that, if some measures are not taken in the case of a hypothetical accident, the area that could give a significant radiological disaster to the public in the area is taken as the area of a certain distance. The low population zone (LPZ) is the zone in an environment in which appropriate measures can be taken so as not to give a significant radiological disaster.

2.3 The reactor site must be a certain distance apart from the highly populated area.

"A certain distance" is defined as the distance to which the total integrated population dose to the whole body becomes small to an extent sufficiently acceptable from the viewpoint of the collective dose.

3. Applicability

This Guide is applied to the siting review of a reactor with a thermal output of 10,000 KW or more. The siting review for a reactor less than 10,000 KW is to be conducted by making reference to this Guide.

[Attachment 2]

Provisional reference criteria necessary for applying the Reactor Siting Review Guide

The reference criteria are to be used by the Reactor Safety Review Panel when applying the guidance of the Attachment 1 in the course of reviewing the safety of a reactor emplaced on land.

1 Use the following dose as the reference to judge "the area of a certain distance" that is in Guide 2.1.

For the thyroid (*): 1.5Sv

*In the calculation, inhalation dose coefficient of one-year-old child are used.

For the whole body: 0.25Sv

2 Consider the following dose as a rough reference to judge "the area of a certain distance" that is in Guide 2.2.

For the thyroid (adult): 3Sv

For the whole body: 0.25Sv

3 Refer to examples of foreign countries (for instance, 20,000 person-Sv) as the reference to judge "a certain distance apart" that is in Guide 2.3.

Additional remarks

(i) The above-mentioned reference was set out by conducting a comparative study on current knowledge concerning the effect of radiation, the shape of release and kinds of radioactive materials from the reactor during the accident, and such examples in foreign countries. Since biological effects of radiation and the collective dose are still unclear, however, we will promote research in this field in our country and also reexamination will be conducted considering the tendency of the world during the course of promotion.

(ii) The above-mentioned reference was set out based on a principle different from the reference (for instance, dose for ingestion limit and evacuation actions) that related to the emergency response action taken when a reactor accident actually happened.

(iii) The purpose of the above-mentioned reference is to judge the suitability of siting conditions in relation to a possible accident when conducting a safety review prior to the installation of the reactor. The criteria in association with the prevention of radiation hazards to the public during routine operation of the reactor are specified in the Act on the Regulation of Nuclear Source Material, Nuclear Fuel Material and Reactors (the Act No.166 in 1957) and the Cabinet Office Order as well as Science and Technology Agency (STA) Notice pursuant to this Act.

(iv) 1 and 2 among the above-mentioned references address an ordinary reactor which uses uranium as fuel. It is necessary to consider separately when parts other than the thyroid and the whole body become important from the standpoint of being a hazard.