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CENTRAL DEPARTMENT FOR THE
SAFETY OF NUCLEAR INSTALLATIONS
(SCSIN)

SIN n° E 2745/82

BASIC SAFETY RULES

Rule V.1 b

PART V : General rules applicable to several systems, structures and components

CHAPTER 1 : Radiation protection

RULE IDENTIFICATION WITHIN REFERENCED CHAPTER : b

SUBJECT : Meteorological instrumentation

SCOPE : Nuclear power plant units equipped with a pressurized water reactor

0 - INTRODUCTION

RFS or "Règles Fondamentales de Sécurité" (Basic Safety Rules) applicable to certain types of nuclear facilities lay down requirements with which compliance, for the type of facilities and within the scope of application covered by the RFS, is considered to be equivalent to compliance with technical French regulatory practice.

The object of the RFS is to take advantage of standardization in the field of safety, while allowing for technical progress in that field.

These RFS should make safety analysis easier and lead to better understanding between individuals concerned with the problems of nuclear safety.

In no way do the RFS limit the overall responsibility of the operating utility and in no way do they release it from its obligation to meet regulatory provisions in force.

A RFS is applicable as a rule to any nuclear facility granted a construction permit more than one year from the publication of the RFS. Unless explicitly excluded, this time period may be extended by two additional years, in the interests of standardization, in the case of a facility regarded as identical to a facility which has already been granted a construction permit.

For those nuclear facilities to which a RFS is applicable according to the provisions laid down in the paragraph before, the operating utility which does not wish to apply this RFS must demonstrate that the safety objectives of the RFS are met by such alternative means as it shall propose, within the context of the regulatory procedures in force.

As far as other nuclear facilities are concerned, inasmuch as the RFS allow for technical updating, RFS publication does not entail, unless explicitly required, the obligation of modifying the installations or of supplying further justifications.

Moreover, the SCSIN reserves the right to modify, when considered necessary, any RFS and specify, if need be, the terms under which a modification is deemed retroactive ; for other cases, the above-mentioned rule relating to the dates of applicability are to be applied under the same conditions as an original RFS when a RFS is revised.

The RFS, applicable to nuclear power plant units equipped with a pressurized water reactor, are organized according to the table of contents appended to this RFS in Appendix 1.

1. SCOPE OF THE RULE

The purpose of this RFS is to specify the meteorological instrumentation required at the site of each nuclear power plant equipped with at least one pressurized water reactor.

Meteorological measures specified in this rule shall be used to assess the atmospheric diffusion of gaseous radioactive effluents released from nuclear power plants during normal operation and under accident conditions.

The French Advisory Committee on Reactor Safeguards (Groupe Permanent) was consulted in drawing up this rule.

2. TEXT OF THE RULE

The plant operator shall dispose of suitable instrumentation at each nuclear power plant site for measuring meteorological parameters as defined in 2.1. to the degrees of accuracy specified in 2.2.

These data shall be processed in accordance with the data reduction and compilation program described in 2.3.

2.1. Meteorological parameters required

a) The following parameters shall be measured :

- wind direction,
- wind speed,
- an indicator of atmospheric stability,
- precipitation intensity,
- relative humidity,
- atmospheric pressure,
- temperature.

- b) Wind direction and speed shall be measured at a height of 10 m by the meteorological station and at a fixed height representing the approximate effective height of release. These measurements shall also be representative of the average field not disturbed by nearby plant structures or singular topographic features. The indicator of atmospheric stability shall be representative of the field of turbulence between ground level and the effective height of release of radioactive effluent. All measurements shall be representative of the above-mentioned parameters.

2.2. System accuracy

Specifications for the measured parameters are :

- Wind direction (averaging of values over periods of approximately 10 mins) : significant measure for wind speeds greater than 0.5 m/s, within accuracy of $\pm 15^\circ$ (1).
- Wind speed (averaging of values over periods of approximately 10 mins). Significant measure for speeds over 0.5 m/s : with an accuracy of ± 0.3 m/s for wind speeds less than 3 m/s, and of $\pm 10\%$ for wind speeds greater than 3 m/s.
- Indicator of atmospheric stability :
 - . Where the temperature difference with height is used to assess atmospheric stability, it shall be determined with an accuracy of $0.3^\circ\text{C}/100$ m.
 - . Where the standard deviation of horizontal wind direction (at intervals of approximately 10 minutes) is used, it shall be determined by an anemometer with a length constant of 1,5 m and an accuracy $\pm 3^\circ$ for wind speeds greater than 0.3 m/s.
 - . An alternative indicator of atmospheric stability may be proposed, provided that it can be justified as representative.

(1) Accuracy includes sensor and sensor setting error.

- Precipitation : accuracy increments of 0.2 mm for precipitation rate of less than 1 mm/min.
- Relative humidity : accuracy of $\pm 5\%$ where relative humidity is greater than 20 %.
- Atmospheric pressure : accuracy of ± 0.5 mbar.
- Screened temperature : accuracy of ± 0.5 °C.

2.3. Data reduction and compilation

Average wind speed and direction measured at the effective height of release of gaseous radioactive material, together with data collected at ground level by the meteorological station (as defined in 2.4.1.b.) shall be processed to obtain average values over periods of approximately 10 minutes. Data shall be sampled at intervals of no longer than 20 seconds. A listing of time-averaged data shall be prepared and all data recorded on magnetic tape. Recordings shall be made in the onsite technical support centre during normal plant operation and a nearsite emergency operations facility under accident conditions. Hour-by-hour data shall be transferred after processing to the regional meteorological centre which should have access at all times to 10-minute averages of meteorological parameters.

Each recording shall include the following :

- time coordinates,
- average wind direction at approximate effective height of release of gaseous radioactive effluents,
- average wind speed at approximate effective height of release of gaseous radioactive effluents,
- average wind direction at 10-meter level,
- average wind speed at 10-meter level,
- estimators of atmospheric stability between ground level and height of release (where the standard deviation of horizontal wind direction at the 10-meter level is used, it shall be determined over recording periods of 10 minutes from no less than 180 instantaneous values of horizontal wind direction during the recording period).

- precipitation intensity,
- relative humidity,
- atmospheric pressure,
- screened temperature.

Provision shall be made for the real-time transmission of meteorological data to outside under accident conditions.

The data listing covering a minimum period of 12 hours shall be available at all times.

2.4. Meteorological instrumentation

2.4.1. Sites without tall cooling towers or significant local orographic disturbances

- a) Subject to the provisions of paragraph 2.4.3.a, a meteorological mast approximately twenty meters high shall be erected on the roof of the turbine building of one plant unit for the purpose of assessing average wind direction and speed at the approximate effective height of release of gaseous radioactive effluents.

A comparative analysis of simultaneous, equivalent measurements, taken over a period of one year without local perturbation, or a physical simulation analysis, shall be performed to verify that measurements are representative of actual conditions. Analysis shall verify that error, due to local perturbation is compatible with those specified in paragraph 2.2.

- b) A meteorological station shall exist at a site representative of atmospheric transport and diffusion conditions around the nuclear power plant, capable of measuring the following parameters :

- . average wind direction and speed at the 10-metre level,
- . instantaneous direction of the horizontal wind component at the 10-metre level,
- . precipitation intensity,

- . relative humidity,
- . atmospheric pressure,
- . screened temperature.

This station shall comply with ground-level station standards laid down by the National Meteorological Office with a view to establishing clear contact with existing networks.

2.4.2. Sites with tall cooling towers or significant local orographic disturbances

Provisions are identical to those in paragraph 2.4.1., with the exception of the indicator of atmospheric stability and average wind direction and speed at the approximate effective height of release of radioactive gaseous effluents. Subject to the provisions of paragraph 2.4.3.a., these measurements shall be taken at the top of a meteorological tower of appropriate height (generally 80 meters) situated at or in the vicinity of the site and outside the area affected by plant structures or orographic disturbances.

Moreover indicator of atmospheric stability shall be the temperature difference with height determined from temperature measurements taken at different tower levels.

2.4.3. Requirements common to all sites

- a) Acoustic radar apparatus may be used where justified to be representative, in which case the meteorological mast and tower described in paragraphs 2.4.1.a and 2.4.2 respectively would no longer be required, and the standard deviation of horizontal wind direction at the 10-meter level no longer justified. This apparatus shall be able to characterize atmospheric stability in the 25 m - 300 m layer.
- b) The meteorological station and tower-mounted instrumentation should be connected to a power system supplied from the normal grid. Sufficient backup shall be provided in the event of a main power supply failure to ensure continuous data availability. The systems shall be protected against lightning.

2.5. Maintenance and servicing schedules

Meteorological instrumentation shall be inspected and serviced at a frequency that will minimize extended periods of outage and ensure 90 percent joint data recovery for atmospheric stability, wind speed and wind direction.

Instruments shall be calibrated periodically to ensure meeting the system accuracies specified in paragraph 2.2.

2.6. Retroactivity

This RFS may be applied retroactively as specified by the Head of the SCSIN.

3. COMMENTS

Magnetic tape data may be processed statistically as part of the authorization procedure for routine release of radioactive gaseous effluents, involving the preparation of monthly statistics for average wind directions and speeds at the effective height of gaseous effluent release. Meteorological conditions shall be taken into consideration before routine releases.

A real-time assessment of the radiological consequences of an accidental release of radioactive material to the atmosphere shall be forecasted, and the affected geographical areas identified, before any decision is reached by the plant operator or the safety authorities. Meteorological data may also be used after an accidental release to reconstitute atmospheric dispersion paths and consequently locate radionuclide ground deposits.

Before instrumentation is put into service a series of analyses shall be performed to determine the conditions in which data may be used in assessing atmospheric diffusion.

For special case such as coastal or deep valley sites, when assessment of atmospheric diffusion by normal means is not satisfactory, the plant operator shall employ supplementary measurements.

The regulatory provisions laid down in this RFS aim to ensure that reliable, tested equipment is used and that suitable data are introduced into calculation models employed in the above-mentioned assessments.

Certain provisions aim to facilitate operation of equipment and facilities (i.e. ground level stations are required to be compatible with those of the National Meteorological Office), and to assure automatic processing and transmission of meteorological data (i.e. an easily recordable and transmissible indicator of atmospheric stability). This applies in particular to the 10-meter level measurements referred to in paragraph 2.1.a required for short term meteorological forecasts in the event of an accidental release of radioactive effluents.

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