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REGULATORY GUIDE

OFFICE OF NUCLEAR REGULATORY RESEARCH

REGULATORY GUIDE 3.63
(Task ES 401-4)

ONSITE METEOROLOGICAL MEASUREMENT PROGRAM FOR URANIUM RECOVERY FACILITIES—DATA ACQUISITION AND REPORTING

A. INTRODUCTION

Section 40.31, "Applications for Specific Licenses," of 10 CFR Part 40, "Domestic Licensing of Source Material," requires that applicants for a license to receive, possess, or use source material in conjunction with uranium recovery facilities provide information needed to assist in demonstrating that operations can be conducted to meet the requirements set forth in 10 CFR Part 40. Section 40.65, "Effluent Monitoring Reporting Requirements," requires that licensees routinely report radionuclide releases to unrestricted areas in liquid and gaseous effluents. The Uranium Mill Tailings Radiation Control Act (UMTRCA) requires the NRC to conform to 40 CFR Part 192, which sets standards for the control of releases from tailings related to production operations. Meteorological data are also relevant to the preparation of environmental reports pursuant to 10 CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions" (see Regulatory Guides 3.8, "Preparation of Environmental Reports for Uranium Mills," and 3.46, "Standard Format and Content of License Applications, Including Environmental Reports, for In Situ Uranium Solution Mining").

Meteorological conditions in the vicinity of the facility need to be considered in the design and operation of tailings impoundments, the assessment of the potential impact of airborne effluent releases, and the monitoring of airborne effluents. This guide provides guidance acceptable to the NRC staff regarding the meteorological parameters that should be measured, the siting of meteorological instruments, system accuracies, instrument maintenance and servicing schedules, and the recovery, reduction, and compilation of data.

Any information collection activities mentioned in this regulatory guide are contained as requirements in 10 CFR Part 40, which provides the regulatory basis for this guide. The information collection requirements in 10 CFR Part 40 have been cleared under OMB Clearance No. 3150-0020.

B. DISCUSSION

An onsite meteorological measurement program employs instrument systems physically located on or near the site that are capable of measuring meteorological information representative of the site vicinity and that are operated under the authority of the applicant or licensee. The purpose of such a program at a uranium recovery facility is to provide the meteorological information needed to make assessments to assist in demonstrating that the facility design and the conduct of operations are such that releases of radioactive materials to unrestricted areas can be kept as low as is reasonably achievable. The information is used (1) for the design and operation of tailings impoundments and (2) for estimating the maximum potential annual radiation dose to the public and the environmental impact resulting from the routine release of radioactive materials in gaseous and particulate effluents.

Tailings impoundments need to be designed and operated so that they do not overfill or breach the impoundment restraints, either of which could result in offsite releases. The guidance in the regulatory position assumes that changes in the quantity of liquid in the impoundment are related only to facility operation and to the site precipitation and evaporation characteristics.

The maximum potential airborne annual radiation dose to the public and the environmental impact resulting from routine releases is dependent on the meteorological characteristics of the site. Wind direction, wind speed, and atmospheric stability near the site are factors

that determine where the effluent will be transported and its concentration. The following guidance applies only to routine releases that occur within 30 meters (100 feet) of the ground.

C. REGULATORY POSITION

1. Meteorological Parameters

The meteorological parameters needed for the design and operation of tailings impoundments are precipitation and an indicator of evaporation. The parameters needed to estimate the atmospheric dispersion of radioactive materials are wind direction, wind speed, and an indication of atmospheric stability. For obtaining an indication of the atmospheric stability, a method such as one of the following (Refs. 1-4) may be used: insolation–cloud cover and wind speed (Pasquill-Gifford and similar methods), temperature lapse rate method, wind fluctuation method, split-sigma method, or Richardson Number.

Precipitation and evaporation data should be totaled daily and recorded as monthly and annual summaries.

The basic reduced wind direction, wind speed, and atmospheric stability data should be averaged over a period of 1 hour. At least 15 consecutive minutes of continuous data during each hour should be used to represent a 1-hour average. Wind direction data should be recorded as quarterly and annual wind rose summaries for the 16 compass directions. Quarterly and annual wind direction, wind speed, and atmospheric stability data should also be compiled in joint frequency and joint relative frequency (i.e., decimal frequency) form for heights representative of effluent releases. An example of a suitable format for data compilation and reporting purposes is shown in Table 1. Stability categories should be established to conform as closely as possible with those of Pasquill (Ref. 4).

The minimum amount of meteorological data needed for a siting evaluation is considered to be that amount of data gathered on a continuous basis for a consecutive 12-month period that is representative of long-term (e.g., 30 years) meteorological conditions in the site vicinity. To determine whether the period during which the onsite data was collected is representational, compare a concurrent period of meteorological data from a National Weather Service (NWS) station with the long-term meteorological data from that NWS station. The NWS station selected for this comparison should, if possible, be in a similar geographical and topographical location and be reasonably close (preferably within 50 miles (80 kilometers)) to the site. In some sections of the country, the spacing between NWS stations may necessitate the selection of an NWS station more than 50 miles away. The reduced data and supportive documentation should be retained and should be available for review for the period of facility operation.

2. Siting of Meteorological Instruments

The location of the meteorological instruments should represent as closely as possible the long-term meteorological characteristics of the area for which the measurements are being made. Whenever possible, the base of the instrument tower or mast should be sited at approximately the same elevation as the facility operation. Ideally, the instruments should be located in an area where localized singular natural or man-made obstructions (e.g., trees, buildings) will have little or no influence on meteorological measurements. Measurements of wind speed, wind direction, and sigma theta (if measured) should be made at least 10 obstruction heights away from the nearest obstruction (Ref. 5). To the extent practicable, these instruments should not be located in the prevailing downwind direction of an obstruction. At most facilities, the instruments could all be sited at one location. At some sites, instruments may need to be sited at more than one location if the meteorological conditions are not similar throughout the site vicinity. For example, a site could have a milling operation on a mesa where the wind blows predominantly from one direction and a tailings impoundment on the plain below in the lee of the mesa where the wind is most frequently from another direction at a lower speed and with an atmospheric stability regime different from that at the release point on the mesa.

Precipitation and evaporation are usually measured near ground level. If an evaporation pan is used to estimate evaporation, a fence or other barrier may be needed to minimize animal intrusion. Parameters such as air temperature, atmospheric moisture, and the pan water temperature should be monitored as appropriate for the type of evaporation model assessment being made.

For atmospheric dispersion assessments, wind speed and wind direction should be monitored at approximately 10 meters (33 feet) above ground level. For an open lattice tower, instruments should be located on booms oriented into the prevailing wind direction at a minimum distance of two tower widths from the tower to preclude substantial influence of the tower upon measurements (Ref. 5). Siting of the instruments used to estimate atmospheric stability is dependent on the methodology used. If instrumentation is used to measure incoming solar radiation, it should be located in an area as free as possible from terrestrial shadows. If the temperature difference with height method is used to estimate the atmospheric stability, the lower temperature-difference sensor should be located at 10 meters (33 feet) above the ground and the upper sensor should be positioned not less than 30 meters (100 feet) above the lower sensor. Aspirated temperature shields should either be pointed downward or laterally toward the north.

TABLE 1

PERIOD OF RECORD: PASQUILL STABILITY CATEGORY

Wind Direction	Wind Speed at 10-m Level 0.22-1.7 (0.5-3.9)	1.8-3.5 (4.0-7.9)	3.6-5.8 (8.0-12.9)	5.9-8.5 (13.0-18.9)	8.6-11.2 (19.0-24.9)	≥11.2 m/s ≥(25) (mph)	Total
N							
NNE							
NE							
ENE							
E							
ESE							
SE							
SSE							
S							
SSW							
SW							
WSW							
W							
WNW							
NW							
NNW							
Total							

Number of Calms*
Number of Invalid Hours
Number of Valid Hours

*A calm is any average wind speed below the starting threshold of the wind speed or direction sensor, whichever is greater. Calms should be included in the table above by assigning to each calm a wind speed that is equal to the starting threshold of the wind speed or direction sensor, whichever is greater. Wind direction during calm conditions should be assigned in proportion to the directional distribution of noncalm winds in the lowest noncalm wind speed category. The directional distribution of calms should then be included in the lowest noncalm wind speed category.

3. System Accuracy and Instrumentation Specifications

System accuracy refers to the composite accuracy reflecting the errors introduced by the entire system from the sensor to the data reduction process. This system normally consists of sensor, cable, signal conditioner, recorders, the humidity and temperature environment for signal conditioning and recording, and the data reduction process. The errors introduced by each of the separate components of the system should be determined by statistical methods (Ref. 6). The accuracies of all systems should be appropriate to the use to be made of the information over the range of environmental conditions expected to occur during the lifetime of facility operation and should be consistent with the current state of the art for the measurement.

The accuracies for time-averaged values of each parameter should be:

a. Precipitation: as measured by a recording rain gauge with a resolution of 0.25 mm (0.01 in.). The accuracy of the recorded value should be within 10 percent of the total accumulated catch for amounts in excess of 5 mm (0.2 in.).

b. Evaporation: consistent with the current state of the art. For information on installation and a description of measurement techniques using an evaporation pan, see Reference 7. An aspirated shielded device such as a lithium chloride or optical dewpoint hygrometer (Ref. 8) is suggested for measurement of humidity. Use of a hair hygrometer is not recommended. Temperature sensors should be consistent with the current state of the art for their use.

c. Wind direction: ±5° of azimuth with a starting threshold (the minimum wind speed above which the measuring instrument is performing within its minimum specification) of less than 0.5 m/s (1.0 mph).

d. Wind speed: ± 0.2 m/s (0.5 mph) for speeds less than 2 m/s (5 mph), 10% for speeds between 2 m/s (5 mph) and 22 m/s (50 mph), with a starting threshold of less than 0.5 m/s (1.0 mph).

Parameters not covered above but used to determine atmospheric stability should be measured with accuracies consistent with the current state of the art for measurement of these parameters (Refs. 1, 3).

The recording system for data acquisition may be either analog or digital. Analog recorders should be of the continuous strip chart recording type. Digital recorders should sample data at intervals no longer than 60 seconds for wind direction and speed measurements.

Accuracies for analog records of parameters that may vary rapidly with time (e.g., wind direction and wind speed) should not be more than 1.5 times those stated above. The system accuracies should include the reduction of data from the strip chart recorder to digital form.

4. System Maintenance, Servicing Schedules, and Data Recovery

The systems should be protected against severe environmental conditions such as blowing sand, lightning, and icing that may occur at the site. Meteorological systems should be inspected at least once every 15 days and serviced at a frequency that will minimize extended periods of outage and ensure an annual data recovery of at least 90% for each individual parameter measured (at least an annual 75% joint data recovery for wind speed, wind direction, and atmospheric stability). The use of redundant sensors and recorders may be an acceptable means of achieving this recovery goal. Systems should be calibrated at least semiannually to ensure that the system accuracies in this guide are met. In areas with high ambient aerosol or particulate loadings in the atmosphere (e.g., deserts), calibrations should be performed on a more frequent basis to maintain system accuracies.

Sufficient records should be retained and should be available for review for the period of uranium recovery facility operation to document any activities that may affect the quality of the meteorological data. The records should include operating logs and results of reviews, inspections, maintenance, calibrations, and audits; a description of the types of observations taken with the results and their acceptability; and actions taken in connection with any deficiencies noted.

D. IMPLEMENTATION

The purpose of this section is to provide information to applicants and licensees regarding the NRC staff's plans for using this regulatory guide.

Except in those cases in which an applicant proposes an acceptable alternative method for complying with specified portions of the Commission's regulations, the methods described in this guide will be used by the NRC staff in evaluating pertinent portions of applications submitted to the NRC for new uranium recovery facility licenses and for amendments to existing licenses involving major modification of current facilities.

REFERENCES

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7. U.S. Department of Commerce, *Substation Observations*, Weather Service Observing Handbook No. 2, Chapter 5, 1972.

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VALUE/IMPACT STATEMENT

A draft value/impact statement was published with Task ES 401-4 when the draft guide was published for public comment in September 1985. No changes were necessary, so a separate value/impact statement for the final guide has not been prepared. A copy of the draft value/impact statement is available for inspection and copying for a fee at the Commission's Public Document Room at 1717 H Street NW., Washington, DC, under Task ES 401-4.

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