

Sub-Element 4.a—Plume Phase Field Measurements and Analysis

<p>What the Policy Says</p>	<p>Intent NUREG-0654 provides that OROs should have the capability to deploy field teams with the equipment, methods, and expertise necessary to determine the location of airborne radiation and particulate deposition on the ground from an airborne plume. In addition, NUREG-0654 indicates that OROs should have the capability to use field teams within the plume emergency planning zone to measure airborne radioiodine in the presence of noble gases and to detect radioactive particulate material in the airborne plume. In the event of an accident at a nuclear power plant, the possible release of radioactive material may pose a risk to the nearby population and environment. Although accident assessment methods are available to project the extent and magnitude of a release, these methods are subject to large uncertainties. During an accident, it is important to collect field radiological data in order to help characterize any radiological release. Adequate equipment and procedures are essential to such field measurement efforts.</p> <p>Minimum Frequency Criteria 4.a.1, 4.a.2, and 4.a.3 are to be evaluated in every full-participation exercise. (Each State within the 10-mile EPZ of a commercial nuclear power site shall fully participate in an exercise jointly with the licensee and appropriate local governments at least every 2 years. Each State with multiple sites within its boundaries shall fully participate in a joint exercise at some site on a rotational basis at least every 2 years. When not fully participating in an exercise at a site, the State shall partially participate at that site to support the full participation of the local governments.)</p> <p>Criterion 4.a.1: The field teams are equipped to perform field measurements of direct radiation exposure (cloud and ground shine) and to sample airborne radioiodine and particulates. (NUREG-0654, H.10; I.7, 8, 9).</p> <p>Extent of Play Field teams should be equipped with all instrumentation and supplies necessary to accomplish their mission. This should include instruments capable of measuring gamma exposure rates and detecting the presence of beta radiation. These instruments should be capable of measuring a range of activity and exposure, including radiological protection/exposure control of team members and detection of activity on the air sample collection media, consistent with the intended use of the instrument and the ORO's plans and procedures. An appropriate radioactive check source should be used to verify proper operational response for each low range radiation measurement instrument (less than 1 R/hr) and for high range instruments when available. If a source is not available for a high range instrument, a procedure should exist to operationally test the instrument before entering an area where only a high range instrument can make useful readings.</p> <p>All activities must be based on the ORO's plans and procedures and completed as they would be in an actual emergency, unless noted above or otherwise indicated in the extent of play agreement.</p>
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Preparing to Evaluate This Criterion	Before the exercise, determine, according to the ORO's plan/procedures and the Extent of Play agreement: <ul style="list-style-type: none">• From what location is the field monitoring team to be dispatched?• What is the equipment and supply inventory for to the field monitoring teams? Consider radiation monitoring instrumentation, air sampling devices, and instrumentation to count air sample components• How are pre-deployment operational checks made on monitoring instruments?• What special methods are used for high range instruments?• Where will teams obtain spare equipment in the event of broken or out of specification instruments?• What adsorbent is used to collect a radioiodine sample and what is the required sample volume?
During the Exercise	During the exercise, in addition to evaluating activities related to the items listed above, be sure to: <ul style="list-style-type: none">• Verify inventories of field instruments and supplies.• Observe operational checks.• Verify that spare equipment or instruments are obtained for missing, broken, or out of specification items.

Sub-Element 4.a—Plume Phase Field Measurements and Analysis (Continued)

What the Policy Says	<p>Criterion 4.a.2: Field teams are managed to obtain sufficient information to help characterize the release and to control radiation exposure. (NUREG-0654, H.12; I.8, 11; J.10.a).</p> <p>Extent of Play Responsible Offsite Response Organizations (ORO) should demonstrate the capability to brief teams on predicted plume location and direction, travel speed, and exposure control procedures before deployment.</p> <p>Field measurements are needed to help characterize the release and to support the adequacy of implemented protective actions or to be a factor in modifying protective actions. Teams should be directed to take measurements in such locations, at such times to provide information sufficient to characterize the plume and impacts.</p> <p>If the responsibility to obtain peak measurements in the plume has been accepted by licensee field monitoring teams, with concurrence from OROs, there is no requirement for these measurements to be repeated by State and local monitoring teams. If the licensee teams do not obtain peak measurements in the plume, it is the ORO's decision as to whether peak measurements are necessary to sufficiently characterize the plume. The sharing and coordination of plume measurement information among all field teams (licensee, Federal, and ORO) is essential. Coordination concerning transfer of samples, including a chain-of-custody form, to a radiological laboratory should be demonstrated.</p> <p>ORO's should use Federal resources as identified in the Federal Radiological Emergency Response Plan (FRERP), and other resources (for example, compacts, utility, etc.), if available. Evaluation of this criterion will take into consideration the level of Federal and other resources participating in the exercise.</p> <p>All activities must be based on the ORO's plans and procedures and completed as they would be in an actual emergency, unless noted above or otherwise indicated in the extent of play agreement.</p>
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<p>Preparing to Evaluate This Criterion</p>	<p>Before the exercise, determine, according to the ORO's plan/procedures and the Extent of Play agreement:</p> <ul style="list-style-type: none"> • Who briefs the field monitoring team prior to deployment and what topics are to be covered? • Who controls the movement of the field teams and the determination of sample location? • What approach is used to select appropriate sampling locations, pre-designated sampling points or plume traverse (while maintaining specified exposure limits)? • Which agency's (ORO, licensee, or other) field monitoring teams are assigned the responsibility of obtaining maximum radiation readings in the downwind areas? • If the ORO teams have this responsibility, what special exposure control mechanisms are used to control exposure and/or dose? • What agency, if any, other than the ORO is to participate in this demonstration and what limitations or restrictions have been established?
<p>During the Exercise</p>	<p>During the exercise, in addition to evaluating activities related to the items listed above, be sure to:</p> <ul style="list-style-type: none"> • Observe pre-deployment briefing. • Document all instructions or assignments given to team. Include the time of assignment and the time assignment was completed. • Obtain copies of chain-of-custody forms, if appropriate.

Sub-Element 4.a—Plume Phase Field Measurements and Analysis (Continued)

<p>What the Policy Says</p>	<p>Criterion 4.a.3: Ambient radiation measurements are made and recorded at appropriate locations, and radioiodine and particulate samples are collected. Teams will move to an appropriate low background location to determine whether any significant (as specified in the plan and/or procedures) amount of radioactivity has been collected on the sampling media. (NUREG-0654, I. 9).</p> <p>Extent of Play Field teams should demonstrate the capability to report measurements and field data pertaining to the measurement of airborne radioiodine and particulates and ambient radiation to the field team coordinator, dose assessment, or other appropriate authority. If samples have radioactivity significantly above background, the appropriate authority should consider the need for expedited laboratory analyses of these samples. OROs should share data in a timely manner with all appropriate OROs. All methodology, including contamination control, instrumentation, preparation of samples, and a chain-of-custody form for transfer to a laboratory, will be in accordance with the ORO's plan and/or procedures.</p> <p>ORO's should use Federal resources as identified in the FRERP, and other resources (for example, compacts, utility, nuclear insurers, etc.), if available. Evaluation of this criterion will take into consideration the level of Federal and other resources participating in the exercise.</p> <p>All activities must be based on the ORO's plans and procedures and completed as they would be in an actual emergency, unless noted above or otherwise indicated in the extent of play agreement.</p>
<p>Preparing to Evaluate This Criterion</p>	<p>Before the exercise, determine, according to the ORO's plan/procedures and the Extent of Play agreement:</p> <ul style="list-style-type: none"> • What method is used to establish that the team is actually in the plume and not just in an area with an elevated radiation reading due to shine (cloud or ground)? • If specified, what is the minimum acceptable ambient radiation reading before a meaningful air sample is to be taken? • What method is specified to ensure that the plume has not shifted away from the sampling location or has not changed significantly in strength during the air sampling? • What is the designated background exposure rate that requires moving to a low background area to count air sample media? • If the field team does not count the air sample media in the field, what system is in place to get the sample media counted? • How are field measurement results transmitted to the specified location? • What procedures are used to ensure that samples transferred to other locations are handled in a way to maintain sample integrity? What information is required on chain-of-custody forms? • What agency, if any, other than the ORO is to participate in this demonstration and what limitations or restrictions have been established?

During the Exercise	During the exercise, in addition to evaluating activities related to the items listed above, be sure to: <ul style="list-style-type: none">• Document all field team instructions and all measurement results that are transmitted to the appropriate location.• Document all controller injects.• Obtain copies of all work sheets completed by the field teams, if appropriate.• Obtain a copy of any chain-of-custody forms that were completed.
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Preparing to Evaluate This Criterion	When researching the ORO's plan/procedures and the Extent of Play agreement, determine: <ul style="list-style-type: none">▪ TO BE ADDED
During the Exercise	Evaluate activities related to the items listed above and note: <ul style="list-style-type: none">• TO BE ADDED

Sub-Element 4.b—Post-Plume Phase Field Measurements and Sampling

<p>What the Policy Says</p>	<p>Intent NUREG-0654 provides that OROs should have the capability to assess the actual or potential magnitude and locations of radiological hazards in the IPZ and for relocation, re-entry and return measures. This sub-element focuses on the collection of environmental samples for laboratory analyses that are essential for decisions on protection of the public from contaminated food and water and direct radiation from deposited materials.</p> <p>Criterion 4.b.1: The field teams demonstrate the capability to make appropriate measurements and to collect appropriate samples (for example, food crops, milk, water, vegetation, and soil) to support adequate assessments and protective action decision-making. (NUREG-0654, I.8; J.11).</p> <p>Minimum Frequency Criterion 4.b.1 is to be evaluated once in 6 years.</p> <p>Extent of Play</p> <p>The ORO's field team should demonstrate the capability to take measurements and samples, at such times and locations as directed, to enable an adequate assessment of the ingestion pathway and to support re-entry, relocation, and return decisions. When resources are available, the use of aerial surveys and in-situ gamma measurement is appropriate. All methodology, including contamination control, instrumentation, preparation of samples, and a chain-of-custody form for transfer to a laboratory, will be in accordance with the ORO's plan and/or procedures.</p> <p>Ingestion pathway samples should be secured from agricultural products and water. Samples in support of relocation and return should be secured from soil, vegetation, and other surfaces in areas that received radioactive ground deposition.</p> <p>ORO's should use Federal resources as identified in the FRERP, and other resources (for example, compacts, utility, nuclear insurers, etc.), if available. Evaluation of this criterion will take into consideration the level of Federal and other resources participating in the exercise.</p> <p>All activities must be based on the ORO's plans and procedures and completed as they would be in an actual emergency, unless noted above or otherwise indicated in the extent of play agreement.</p>
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<p>Preparing to Evaluate This Criterion</p>	<p>Before the exercise, determine, according to the ORO's plan/procedures and the Extent of Play agreement:</p> <ul style="list-style-type: none"> • How is the area of interest (that impacted by the passing plume) going to be identified? • If aerial measurements are to be used, what method or procedure will be used to identify the area of interest that is below the detection limit of the aircraft? • What are the ORO agencies that will supply field teams? • Which ORO agencies oversee contamination control and exposure for the teams? • What instruments, equipment, and supplies are required for each type of sampling assignment? • What are the specified minimum sample sizes to be collected? • How and when will the results of direct radiation measurements be transmitted to the appropriate location? • How will the collected samples be transported to a laboratory for analysis? • What agency, if any, other than the ORO is to participate in this demonstration and what limitations or restrictions have been established?
<p>During the Exercise</p>	<p>During the exercise, in addition to evaluating activities related to the items listed above, be sure to:</p> <ul style="list-style-type: none"> • Document all instructions given to the field team. • Document all controller injects. • Document all communications to the field team coordinator. • Obtain copies of all worksheets completed by the team, including any chain-of-custody forms.

Sub-Element 4.c—Laboratory Operations

What the Policy Says	<p>Intent NUREG-0654 provides that OROs should have the capability to perform laboratory analyses of radioactivity in air, liquid, and environmental samples to support protective action decision-making.</p> <p>Criterion 4.c.1: The laboratory is capable of performing required radiological analyses to support protective action decisions. (NUREG-0654, C.3; J.11).</p> <p>Frequency Criterion 4.c.1 is to be evaluated once in 6 years.</p> <p>Extent of Play</p> <p>The laboratory staff should demonstrate the capability to follow appropriate procedures for receiving samples, including logging of information, preventing contamination of the laboratory, preventing buildup of background radiation due to stored samples, preventing cross contamination of samples, preserving samples that may spoil (for example, milk), and keeping track of sample identity. In addition, the laboratory staff should demonstrate the capability to prepare samples for conducting measurements.</p> <p>The laboratory should be appropriately equipped to provide analyses of media, as requested, on a timely basis, of sufficient quality and sensitivity to support assessments and decisions as anticipated by the ORO's plans and procedures. The laboratory (laboratories) instrument calibrations should be traceable to standards provided by the National Institute of Standards and Technology. Laboratory methods used to analyze typical radionuclides released in a reactor incident should be as described in the plans and procedures. New or revised methods may be used to analyze atypical radionuclide releases (for example, transuranics or as a result of a terrorist event) or if warranted by circumstances of the event. Analysis may require resources beyond those of the ORO.</p> <p>The laboratory staff should be qualified in radioanalytical techniques and contamination control procedures.</p> <p>OROs should use Federal resources as identified in the FRERP, and other resources (for example, compacts, utility, nuclear insurers, etc.), if available. Evaluation of this criterion will take into consideration the level of Federal and other resources participating in the exercise.</p> <p>All activities must be based on the ORO's plans and procedures and completed as they would be in an actual emergency, unless noted above or otherwise indicated in the extent of play agreement.</p>
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<p>Preparing to Evaluate This Criterion</p>	<p>Before the exercise, determine, according to the ORO's plan/procedures and the Extent of Play agreement:</p> <ul style="list-style-type: none"> • What laboratory is designated to demonstrate this criterion? • Which radionuclides, that typically might be released in a reactor accident, does the designated laboratory have the capability to analyze? Does the laboratory have the capability to analyze atypical nuclides such as transuranics or nuclides that might be used by terrorists? • What is the highest contact radiation reading allowed on any sample that is to be processed by the laboratory, if any? • If the laboratory lacks the capability to analyze certain radionuclides or receives a sample that exceeds a radiation reading limit, what arrangements are in place to obtain the analysis of these nuclides? • How and how often are the instruments used in the laboratory calibrated? Are all instrument calibrations traceable to (National Institute of Standards and Technology (NIST) standards? If not, what standard is the basis for the calibrations? • How are sample stored to reduce the potential for increased background levels in the laboratory? • How are samples prepared for counting and what contamination control procedures are used during this process? • How are sample aliquot sizes documented? • How have the sample count times been modified to account for samples with higher radioisotope levels than normal? • What sample preservation techniques are to be employed? • How are chain-of-custody forms processed and sample integrity maintained?
<p>During the Exercise</p>	<p>During the exercise, in addition to evaluating activities related to the items listed above, be sure to:</p> <ul style="list-style-type: none"> • Document all controller injects. • Document (or obtain copies of) calibration results. • Observe sample preparation with particular attention to contamination control and sample aliquot documentation. • Observe the transmission of analytical results to the appropriate location.