

**NEI White Paper  
Recommended Criteria for Evaluating Emergency Response  
Communications Capabilities During a Prolonged Station Blackout**

**I. Introduction**

This white paper provides recommended criteria to assist with the identification of enhancements that could provide means to power communications equipment necessary for licensee onsite and off-site communications during a prolonged Station Blackout (SBO) event. The communications equipment of interest is that necessary for implementation of the planning standard requirements described in 10 CFR 50, Appendix E, sections IV.D and E.9; these requirements are listed in Attachment 1. In addition, the assessment criteria applies to communication equipment that supports implementation of strategies intended to maintain or restore core cooling, containment integrity, and spent fuel pool cooling capabilities.

A discussion on the NRC staff's approach to requesting this activity is presented in SECY-11-0137, Prioritization of Recommended Actions to be Taken in Response to Fukushima Lessons Learned. The relevant section from the SECY is presented in Attachment 2. The staff provided additional information concerning expectations for this study during several public and drop-in meetings.

This paper does not discuss assessment criteria associated with the Emergency Response Data System (ERDS). These criteria will be developed at a later date in concert with the NRC staff's initiation of actions to address the associated Tier 3 recommendation presented in SECY-11-0137.

Requirements for communications related to security plan-related functions are addressed by security-related regulations, guidance, plans and procedures. Since the adequacy of security-related communications systems are evaluated by separate processes, these functions are not addressed in this white paper.

**II. Approach**

It is recognized that licensees employ many different means to meet emergency communications requirements. Consequently, there is wide variation in communications systems, configurations and capabilities. This variation precluded development of a standard evaluation template.

In lieu of a standard evaluation template, this white paper provides recommended criteria for use in evaluating existing power sources to onsite and off-site communications equipment, and the identification of enhancements necessary to ensure the availability of this equipment during a prolonged SBO event. These criteria can be readily adapted to support each licensee's assessment methodology. This approach allows a licensee the flexibility to perform an assessment that accommodates their specific needs while, at the same time, ensuring that key aspects of the evaluation are consistent with industry-developed standards and NRC staff expectations.

**III. Assessment Assumptions**

1. The occurrence of a beyond design basis natural event that results in the following:
  - Affects all on-site units simultaneously
  - Initiates a prolonged SBO (e.g., 72 hours)
  - Interrupts access to normal ultimate heat sink

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2. On-site personnel are limited to the minimum allowable on-shift complement (i.e., the minimum required number for each required position). This would typically mean the on-shift complement present during a backshift, weekend or holiday.
3. Initially, all on-site reactors are operating at full power and are successfully shut down.
4. Installed sources of AC power, including SBO power sources, are not available. These power sources are typically classified as safety-related or governed by augmented quality requirements.
5. Nonessential loads from DC battery buses are stripped in accordance with plant emergency operating procedures or other response guidelines to extend battery life.
6. Installed inverters and battery chargers remain available provided they are protected from internal and external flooding events consistent with current station design.
7. Cooling and make-up water, and diesel fuel inventories contained in structures designed to withstand the design basis seismic event are available.
8. Ultimate heat sink water inventory remains available but it cannot be accessed via installed systems.
9. Diesel fuel oil stored in seismic structures and protected from flooding and wind remains available.
10. Portable equipment, such as AC power sources and equipment staged for implementation of accident management strategies (e.g., for SAMG and EDMG), may be used provided it is stored on site; is protected from seismic, wind, and flooding events<sup>1</sup>; is maintained through programmatic controls; and has connection actions specified in existing procedures or guidelines.
11. Portable backup DC power, such as spare batteries, may be used provided the source is stored on site; is protected from seismic, wind, and flooding events; is maintained through programmatic controls; and has connection actions specified in existing procedures or guidelines.
12. Offsite infrastructure supporting communications systems is inoperable, or operating with degraded capability, in the area surrounding the site. A licensee has two options for use of this assumption.
  - Apply a default distance value, in all directions, of approximately 25 miles from the plant site, OR
  - Develop a site-specific distance assumption and document the basis.

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<sup>1</sup> *Other NEI task force teams are developing BDB survivability criteria. This paper will use those criteria.*

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13. The communications capabilities of Offsite Response Organization (ORO) and other offsite response facilities located beyond some distance from the site are not significantly impacted by the event. A licensee has two options with respect to the distance value.
  - Use a default value, in all directions, of approximately 25 miles from the plant site, OR
  - Develop a site-specific distance assumption and document the basis.
14. Communications systems equipment located in ORO and other offsite response facilities, and supplied from a backup AC power source (e.g., a diesel generator), are assumed to be available.
15. A Hostile Action directed at the affected site does not occur during the period that the site is responding to a beyond design basis event.
16. The event restricts site access as follows:
  - A. Post event time: 0 to TBD<sub>1</sub> hours – No site access. This duration reflects the time necessary to clear roadway obstructions, use alternate routes, mobilize alternate transportation capabilities, etc.
  - B. Post event time: TBD<sub>1</sub> to TBD<sub>2</sub> hours – Limited site access. The site may be accessed by walking, a helicopter, personal vehicle or small boat.
  - C. Post event time: TBD<sub>2</sub>+ hours – Unlimited access. Site access is restored to a near-normal status and/or augmented transportation resources are available to deliver heavy or large loads.

A licensee may modify the above assumptions, with the exception of Assumption #1, if supported by a documented basis.

**IV. Required Post-Event Emergency Communications Capabilities**

Consistent with the planning standard requirements described in 10 CFR 50, Appendix E, sections IV.D and E.9, communications systems and equipment associated with the following emergency response functions must be available following the event. Availability should be determined after a review of, and consistent with, each of the listed assessment assumptions.

1. Notifications to, and communications with, Offsite Response Organizations (OROs). [10 CFR 50 Appendix E.IV.D and E.9.a]

<b>Emergency Response Facility</b>	<b>Minimum Communications Links</b>
Control Room	1 for Shift Communicator

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Emergency Response Facility	Minimum Communications Links
Technical Support Center <sup>2</sup> (TSC)	1 for Key TSC Communicator
Emergency Operations Facility (EOF)	1 for Key EOF Communicator

2. Notifications to, and communications with, the Nuclear Regulatory Commission (NRC) Headquarters Incident Response Center. [*10 CFR 50 Appendix E.IV.D and E.9.d*]

Emergency Response Facility	Minimum Communications Links
Control Room	1 for ENS Communicator
Technical Support Center (TSC)	1 for ENS Communicator
Location(s) where HPN communications are performed	1 for HPN Communicator

3. Communications between licensee emergency response facilities. The minimum communications links to support this function are listed below by facility. For example, if the normally used telephone system cannot be restored to service, these links could rely upon some combination of radio, sound-powered and satellite-based communications systems. [*10 CFR 50 Appendix E.9.c. Additional links that support performance of critical response functions are also specified.*]

Emergency Response Facility	Minimum Communications Links <sup>3</sup>
Control Room	1 per Control Room
Technical Support Center (TSC)	1 each for: <ul style="list-style-type: none"> <li>• Senior Manager</li> <li>• Key Operations Support</li> <li>• Key Radiological Support</li> <li>• Key Technical Support</li> </ul> Additional response coordination links for multi-unit sites: <ul style="list-style-type: none"> <li>• 1 for each Control Room. Position at licensee’s discretion.</li> </ul>
Operational Support Center (OSC)	1 each for: <ul style="list-style-type: none"> <li>• Key OSC Manager</li> <li>• Radiological Support</li> </ul> Additional response coordination links for multi-unit sites:

<sup>2</sup> If applicable per the site Emergency Plan.

<sup>3</sup> The specified links are in addition to those specified for ORO and NRC communications.

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Emergency Response Facility	Minimum Communications Links <sup>3</sup>
	<ul style="list-style-type: none"> <li>• 1 for each Control Room. Position at licensee's discretion.</li> </ul>
Emergency Operations Facility (EOF)	1 each for: <ul style="list-style-type: none"> <li>• Senior Manager</li> <li>• Key Protective Measures</li> <li>• Operations or Technical Support (as needed to support performance of dose projections, formulation of PARs and plant status updates to ORO authorities).</li> </ul>
Joint Information Center (JIC)	1 for Senior Manager

4. Communications with field/offsite monitoring teams. [10 CFR 50 Appendix E.9.c]

Emergency Response Facility	Minimum Communications Links
Primary location where field/offsite monitoring team coordination is performed	Field/offsite monitoring team coordination
Primary location from which field/offsite monitoring teams are deployed	1 for each field/offsite monitoring team

The following communications functions and equipment should also be assessed to determine post-event availability. As above, this determination should be made after a review of, and consistent with, each of the listed assessment assumptions.

1. **Plant-Paging System** [If described in the Emergency Plan as a method to communicate initial response instructions to the plant staff.]

Since this event will result in the declaration of a Site Area Emergency declaration (at a minimum), all plant personnel would be directed to report to their assigned emergency response facilities or an assembly area, or exit the site. Once at an emergency response facility or assembly area, further communications to these individuals may be made over the inter-facility communications links via facility announcements. After the initial directions to plant personnel have been provided, the plant-paging system may be removed from service at any time as a means to extend battery life.

The following assessment actions should be performed.

- A. Determine if the plant-paging system (e.g., Gai-Tronics) is powered from a battery-backed source and will remain available to provide the initial emergency declaration and direction announcement to the plant staff. If this is the case, then no further action is required.

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- B. If portions of the plant-paging system are not powered from a battery-backed source, then reasonable provisions or alternate methods must exist to provide emergency notification to the plant staff in the areas that would not receive an announcement.
  - 1. These provisions or methods must be capable of notifying essentially 100% of the plant staff within approximately 30 minutes.
- C. If the plant-paging system is not powered from a battery-backed source, then perform some combination of the following actions.
  - 1. Provide a battery-backed power source for all or critical portions of the plant-paging system.
  - 2. Establish reasonable provisions or alternate methods to provide emergency notification to the plant staff. These provisions or methods must be capable of notifying essentially 100% of the plant staff within approximately 30 minutes.
- 2. Coordination and direction of on-site and in-plant response teams including those necessary to affect emergency repairs, firefighting, search and rescue, radiological monitoring and implementation of extended coping and severe accident mitigation strategies.

<b>Emergency Response Facility</b>	<b>Minimum Communications Links</b>
Operational Support Center (OSC) and other site-specific locations as necessary	1 each for: <ul style="list-style-type: none"> <li>• On-site radiological monitoring</li> </ul> 2 each for: <ul style="list-style-type: none"> <li>• Firefighting (1 for brigade leader and 1 for the brigade)</li> </ul> 2 each/unit for: <ul style="list-style-type: none"> <li>• In-plant radiological monitoring</li> <li>• Search and Rescue</li> <li>• Emergency repairs</li> <li>• Teams to implement extended coping and severe accident mitigation strategies</li> </ul>

**V. Communications Equipment at ORO Facilities**

Some communications capability must be available at the ORO facilities that normally receive licensee notifications of an emergency declaration or a Protective Action Recommendation (as described in the site Emergency Plan). Through discussions with ORO and other appropriate personnel, identify the communications equipment that would remain operable during an extended loss-of-grid event. This determination should be made after a review of, and consistent with, each of the listed assessment assumptions.

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**VI. Notification of the Emergency Response Organization (ERO)**

To promote timely activation of ERO facilities, licensees should verify the following:

- ERO members can be notified of the emergency using a method that would be operable under the assumed event conditions (e.g., satellite pagers), AND/OR
- ERO members are trained to automatically respond to their assigned facilities or a staging area when made aware of an area wide loss-of-grid (e.g., by direct observation, media reports, word-of-mouth, etc.).

**VII. Equipment Location Requirements**

To be assumed operable in the post-event environment, a piece of on-site communications equipment must be in a location, and maintained in a manner, that maximizes survivability following a beyond design basis event<sup>4</sup>. In particular, the location or manner shall reasonably preclude wetting from flooding or impact damage from a seismic event. The equipment itself does not need to be seismically qualified.

Equipment must be stored, or otherwise available, in locations that can be readily accessed when needed. To the degree practical, consider potential constraints to equipment access when selecting a storage location.

These requirements apply to equipment at the point of use (e.g., a radio) as well as any supporting infrastructure components. Such components may include portable power sources, and radio system repeaters and antennas.

**VIII. Performance Characteristics**

Expected reliance upon “multi-use” equipment should be minimized. This means that communications equipment used to implement emergency response functions should not be relied upon to simultaneously support other functions (e.g., Security). In cases where multiple-usage is unavoidable, the assessment should consider the capability of the equipment to effectively perform under the expected conditions and the need for specific multi-use protocols.

The assessment should verify that a radio system(s) used by ERO personnel possesses the necessary design and operating characteristics to adequately support emergency communications.

In addition, the assessment should confirm the interoperability of backup communications methods. In particular, the systems and equipment will support communications among and between:

- Licensee emergency response facilities, including Security
- Field/offsite monitoring teams and the location controlling deployment of the teams (e.g., the EOF)

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- The Shift Communicator, Key TSC and EOF Communicators, and the ORO contact points.
- ENS and HPN communicators and the NRC staff.
- On-site and in-plant teams and the location controlling deployment of the teams (e.g., the OSC)

The material in NRC Information Notice (IN) 2007-12, *Tactical Communications Interoperability Between Nuclear Power Reactor Licensees and First Responders*, should be reviewed for applicability.

**IX. Other Assessment Considerations**

A portable backup AC power source for communications systems and components may be credited as operable provided that it is consistent with the listed assumptions and requirements, including location requirements. The assessment should consider the amount of power source fuel available on-site (e.g., available fuel will support expected run time).

For battery-operated equipment, there must be a sufficient number of on-site and charged batteries to support prompt operation of required equipment. This number should be determined with consideration given to the following items.

1. At a minimum, charged batteries must be available at the start of event in sufficient number to support performance of the required emergency response functions listed in Section IV, *Required Post-Event Emergency Communications Capabilities*.
2. Use the vendor's stated minimum reliable operability period for a fully-charged battery. This information may be modified if supported by a documented assessment performed by the licensee.
3. The availability of on-site battery charging capability. The credited power source(s) and battery charging equipment must be consistent with the listed assumptions and requirements.
4. Consistent with the listed assumptions, delivery of replacement batteries may be assumed to occur any time after T + 6 hours. The assessment must consider whether the batteries are delivered in a charged or uncharged state, and if uncharged, the time required for on-site charging.

Backup communications equipment, and related power sources and infrastructure, may be purchased and installed under site standards normally applied to other EP equipment.

Manual actions that may be taken by emergency responders to facilitate the use of a particular means of communication may be credited provided that these actions are described in a response procedure or guideline. For example, radio communication relay zones may be employed if a procedure or guideline specifies or provides guidance on where personnel need to be located and their necessary equipment.

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**X. Equipment Surveillances**

Programmatic controls shall be applied to backup communications equipment to ensure availability and reliability, including the performance of periodic inventory checks and operability testing.

Supporting vendor service contracts shall be periodically verified.

**XI. National Communications System (NCS) Services**

To enhance overall post-event communications capabilities, each licensee should verify that they have arrangements in place to utilize the services offered by NCS to the degree possible. These services include access to the Government Emergency Telecommunications Service (GETS), the Telecommunications Service Priority (TSP) program and the Wireless Priority Service (WPS). Information concerning these services may be obtained from this web site - <http://www.ncs.gov/>

**XII. Personnel Training**

Response personnel shall receive periodic training on use of backup communications equipment.

**XIII. Corrective Actions**

It is expected that the results of each completed assessment will be verified and validated to ensure adequacy and accuracy. Once these actions are completed, licensees should promptly enter any unsatisfactory results into their Corrective Action Program for resolution. After submitting a condition report, it will be necessary to determine what interim correction measures may be necessary to meet the requirements of 10 CFR 50, Appendix E and related regulatory guidance.

**PARKING LOT ITEMS**

- Whether and how regional storage centers are discussed

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**Attachment 1  
Communications Requirements from 10 CFR 50, Appendix E**

Appendix E to Part 50—Emergency Planning and Preparedness for Production and Utilization Facilities

IV. Content of Emergency Plans

D. Notification Procedures

1. Administrative and physical means for notifying local, State, and Federal officials and agencies and agreements reached with these officials and agencies for the prompt notification of the public and for public evacuation or other protective measures, should they become necessary, shall be described. This description shall include identification of the appropriate officials, by title and agency, of the State and local government agencies within the EPZs.

E. Emergency Facilities and Equipment

9. At least one onsite and one offsite communications system; each system shall have a backup power source.

All communication plans shall have arrangements for emergencies, including titles and alternates for those in charge at both ends of the communication links and the primary and backup means of communication. Where consistent with the function of the governmental agency, these arrangements will include:

- a. Provision for communications with contiguous State/local governments within the plume exposure pathway EPZ. Such communications shall be tested monthly.
- b. Provision for communications with Federal emergency response organizations. Such communications systems shall be tested annually.
- c. Provision for communications among the nuclear power reactor control room, the onsite technical support center, and the near-site emergency operations facility; and among the nuclear facility, the principal State and local emergency operations centers, and the field assessment teams. Such communications systems shall be tested annually.
- d. Provisions for communications by the licensee with NRC Headquarters and the appropriate NRC Regional Office Operations Center from the nuclear power reactor control room, the onsite technical support center, and the near-site emergency operations facility. Such communications shall be tested monthly.

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**Attachment 2  
Relevant Excerpt from SECY-11-0137**

The following material is excerpted from SECY-11-0137, Prioritization of Recommended Actions to be Taken in Response to Fukushima Lessons Learned, dated October 3, 2011.

Staff Assessment and Basis for Prioritization

The staff's assessment of Recommendation 9.3 indicates that regulatory action should be initiated to determine the required staffing to fill all necessary positions for responding to a multiunit event. This would require both the NRC staff and licensees to reevaluate the current staffing assumptions and analysis for effectively responding to multiunit incidents, in addition to actions being taken to satisfy the requirements of the recently affirmed Emergency Preparedness Final Rule. The staff is focused on licensees completing the staffing analyses only so that they could be done along with the actions required by the impending rule.

*The staff also concludes that there is a need to strengthen the requirements to provide a means to power communications equipment needed to communicate onsite (e.g., radios for response teams and between facilities) and offsite (e.g., cellular telephones and satellite telephones) during a prolonged SBO. This would require additional guidance regarding what constitutes acceptable communications equipment that does not rely on the availability of facility AC power.*

The staff concludes that this recommendation would improve safety. Since sufficient resource flexibility, including availability of critical skill sets, exists, the staff prioritized this action as a Tier 1 recommendation.

Staff Recommendations

The staff recommends that the NRC, as a near-term action, undertake regulatory activities to:

1. Engage stakeholders to (1) inform development of a methodology to perform a staffing study to determine the required staff to fill all necessary positions to respond to a multiunit event, and (2) *discuss potential enhancements that could provide a means to power communications equipment necessary for licensee onsite and offsite communications during a prolonged SBO event,*
2. Develop and issue a request for information to licensees pursuant to 10 CFR 50.54(f) to (1) perform a staffing study to determine the required staff to fill all necessary positions to respond to a multiunit event, (2) *evaluate what enhancements would be needed to provide a means to power communications equipment necessary for licensee onsite and offsite communications during a prolonged SBO event, and (3) inform the NRC of the results of the staffing study and any actions taken or planned, along with their implementation schedules, to react to the staffing study results and to enhance the communications equipment, and*
3. *Evaluate licensee responses and take regulatory action to require implementation, as appropriate.*

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**Relevant Excerpt from SECY-11-0137**

Unique Implementation Challenges

The staff is currently engaged in the implementation of the recently approved revision to the EP regulations. This is the most extensive revision since the EP regulations were promulgated in 1980 in response to the TMI accident. The staff has committed to a significant outreach effort to help ensure consistent licensee implementation and in response to requests from offsite response organizations. The development of technical information in support of Recommendation 9.3 will require significant effort from the staff and licensees and must be coordinated with the ongoing EP Rule implementation.

Schedule and Milestones

- I. Issue 10 CFR 50.54(f) letter – 6 months following initiation of action
  - a. Stakeholder interaction and technical development (e.g., methods, technical basis, acceptance criteria, etc.)
  - b. Develop 10 CFR 50.54(f) letter
  - c. Issue 10 CFR 50.54(f) letter
- II. Evaluate licensee responses to 10 CFR 50.54(f) letter – Based on a timeline to be developed during the stakeholder interaction taking into account available resources.
  - a. Write safety evaluation or NUREG to document staff conclusions
- III. Issue orders to licensees (if needed) – 3 months following decision to issue orders
  - a. Develop regulatory basis and draft orders
  - b. Issue orders
- IV. Conduct inspection activities – Schedule to be determined
  - a. Develop Temporary Instruction
  - b. Conduct inspections and document results
- V. Issue letters to close out 10 CFR 50.54(f) letter and/or orders – 1 month after last inspection