ADVERSE WEATHER PROTECTION

Effective Date: January 1, 2019

PROGRAM APPLICABILITY: IMC 2515 A, IMC 2561 A

CORNERSTONES: Initiating Events
Mitigating Systems

INSPECTION BASES: See Inspection Manual Chapter (IMC) 0308, Attachment 2

SAMPLE REQUIREMENTS:

Sample Requirements		Minimum Baseline Sample Completion Requirements		Budgeted Range	
Sample Type	Section(s)	Frequency	Sample Size	Samples	Hours
Summer Readiness	03.01	Annual	1 per site	1	27 +/- 3 per site
Seasonal Extreme Weather	03.02	Prior to the onset of Seasonal Extreme Weather		1 to 2	
Impending Severe Weather	03.03	When impending severe weather is anticipated		1	
External Flooding	03.04	Annual	1 per site	1	

71111.01-01 INSPECTION OBJECTIVES

01.01 To verify that mitigating systems are not adversely impacted or challenged by adverse weather conditions.

01.02 To verify that adverse weather-related problems that could cause initiating events or impact the availability and functional capability of mitigating systems are identified and resolved.

71111.01-02 GENERAL GUIDANCE

This inspection procedure should be used to inspect weather-related risks (e.g., high winds, hurricanes, torrential rains, electrical storms, tornadoes, extreme high or low temperatures), conditions adversely affecting the ultimate heat sink (e.g., debris, ice blockages, frazil ice, sea grass, fish, etc.), offsite power systems, alternate AC power sources, and external flooding

mitigation measures. When practical, the inspection should be performed prior to the onset of adverse weather conditions at the site.

Conduct a routine review of problem identification and resolution activities using Inspection Procedure (IP) 71152, "Problem Identification and Resolution."

Sample Considerations

Inspection Objective: To verify that mitigating systems are not adversely impacted or challenged by adverse weather conditions.	
Conditions and Potential Risk Impacts	Examples
For high winds, high risk exists for outdoor components, including power supplies, fuel/air lines, and sensing lines.	Adequacy of protection of equipment outside structures from high winds (tornadoes and/or hurricanes) and high wind generated missiles.
For cold weather, high risk exists for components/sensing lines located in areas exposed to outside weather (including areas with natural air intake/ventilation) or located outside structures.	Adequacy of heat tracing and space heaters for cold weather protection of piping and equipment (e.g., refueling water storage tank (RWST)/condensate storage tank level, steam generator/main steam line pressure and flow, and feedwater flow sensing lines, fire suppression systems, minimum flow path return lines for safety injection pumps to the RWST, cooling lines for service water pumps, or ultimate heat sink cooling water supply (protection from frazil ice or intake structure blockage due to debris, including ice).
For hot weather, high risk exists for marine fouling of various heat exchangers due to clams/mussels, etc.	Adequacy of site marine biofouling treatment and monitoring program. This area may be inspected using IP 71111.07, "Heat Sink Performance."
Plant modifications, new evolutions, procedure revisions, or operator workarounds implemented to address periods of adverse weather. Refer to IMC 0326, "Operability Determinations & Functionality Assessments for Conditions Adverse to Quality or Safety" for operator workaround guidance.	Adequacy of safety evaluation for modification or change.
For extreme weather, high risk exists due to potential grid stress and disturbances.	Adequacy of communication protocols between transmission operator and the NPP to verify appropriate information is conveyed when issues arise that could impact offsite power system or alternate AC power source.
Potential for common-cause failures—barriers between flood areas.	Water-tight doors, sump pumps, and alarms.
Site specific: hurricane or river-level caused flooding.	Adequate sealing of safe-shutdown electrical equipment below the flood line.
Areas below flood plain~~e~~.	Check valves in open drain systems common to different flood areas.

71111.01-03 INSPECTION SAMPLES

03.01 Summer Readiness Sample

Verify that the licensee's nuclear power plant (NPP) procedures and associated plant features for operation of both offsite AC power systems and the onsite alternate AC power systems appropriately address measures to monitor and maintain continued availability and reliability.

Specific Guidance

a. Ensure that equipment or procedure changes which potentially affect operation or reliability of offsite and alternate AC power systems have occurred since the last summer readiness sample. *Review the NPP procedures affecting these areas and the communications protocols between the transmission system operator (TSO) and the NPP to verify that the appropriate information is exchanged when issues arise that could impact the offsite power system. Examples of appropriate information to be conveyed would include (1) coordination between the TSO and the NPP during an off-normal or emergency event affecting the NPP, (2) explanation of the event, (3) an estimate of when the offsite power system will be returned to a normal state, and (4) notification to the NPP when the offsite power system is returned to normal.* [C1]

   Verify that the reviewed procedures address the following:

   1. Actions to be taken when notified by the TSO that the post-trip voltage of the offsite power system at the NPP will not be acceptable to assure the continued operation of the safety-related loads without transferring to the onsite power supply.

   2. Compensatory actions to be taken when it is not possible to predict the post-trip voltage at the NPP for the current grid conditions.

   3. Required re-assessment of plant risk based on maintenance activities which could affect grid reliability or the ability of the transmission system to provide offsite power.

   4. Required communications between the NPP and the TSO when changes at the NPP could impact the transmission system or when the capability of the transmission system to provided adequate offsite power is challenged. Note that the TSO is completely independent of the licensee.

b. Review the material condition of the plant's offsite AC power systems and onsite alternate AC power systems, including the switchyard and transformers. Review outstanding work orders.

   1. Verify that appropriate compensatory measures have been taken, commensurate with risk, to address degraded conditions affecting these systems. Review the corrective actions for degraded conditions. Note that, depending on the grid operator, the licensee may have limited control over prioritization of outstanding work orders affecting the offsite power systems.

2. Walk down the switchyard and verify the physical condition of AC power systems. Arrange for a walkdown with appropriate plant personnel. Observe the material condition of the offsite power sources.

03.02 Seasonal Extreme Weather Sample

Verify the adequacy of the licensee seasonal readiness prior to the onset of seasonal extreme weather conditions.

Specific Guidance

a. Review seasonal extreme weather preparation procedures (e.g., extreme high temperatures, extreme low temperatures, or hurricane season preparations).

b. Verify that weather-related equipment deficiencies identified during the previous year have been corrected prior to the onset of seasonal extremes.

c. Evaluate implementation of the seasonal extreme weather preparation procedures and compensatory measures for the seasonal extremes. Consider accessibility of controls, indications, and equipment.

d. Select for inspection two to four risk-significant systems that are required to be protected from the seasonal extreme weather conditions. Review the updated final safety analysis report (UFSAR), technical specifications, and plant documents associated with these systems and then assess the following:

1. Verify that the selected systems or components will remain operable/functional when challenged by seasonal extreme weather conditions.

2. As applicable, verify that plant features and procedures for operation and continued availability of the ultimate heat sink (i.e., river, lake, and ocean) during seasonal extreme weather conditions are appropriate. Evaluate the licensee's plans to address the ramifications of potentially lasting effects of seasonal extreme weather conditions (e.g., drought, flood, extreme cold weather). As applicable, verify that ultimate heat sink maximum and minimum temperature limits, as specified in the technical specifications and/or UFSAR, are appropriately and conservatively translated into system operating procedures, alarm response procedures, operability guidance, and design basis calculations. During extended periods of high or low temperatures, ensure that vital plant areas (e.g., Emergency Core Cooling System pump rooms, containment or drywell, electrical switchgear rooms, and diesel rooms) cooled directly/indirectly by process mediums affected by external environmental conditions are adequately maintained within design basis limits. Independently verify by walkdowns where possible. This includes consideration for instrument accuracy to support conservative and timely operator action to ensure adequate margin to design basis limits.

3. As applicable, verify cold weather protection features, such as heat tracing, space heaters, and weatherized enclosures are monitored sufficiently to ensure that they support operability/functionality of the system, structure, or component (SSC) they protect. This includes instrument controller and alarm calibration

programs, as necessary, to support the cold weather protection function. As appropriate, perform a walkdown and verify the physical condition of weather protection features.

4. Verify that operator actions defined in the licensee's seasonal extreme weather procedure maintain readiness of essential systems. Verify that minimum/adequate operator staffing is specified.

5. Verify that systems and/or components required for a reactor shutdown and affected by the seasonal extreme weather conditions are available to perform their reactor shutdown functions under assumed conditions.

6. As applicable, verify that the licensee can demonstrate through testing or analysis that diesel fuel oil Cloud Point[1] specifications are acceptable for operability of diesel generator systems with above ground fuel storage tanks (e.g., emergency diesel generators, station blackout diesel generators, security diesels, fire protection diesel generators, etc.) during extreme cold weather conditions.

03.03 Impending Severe Weather Sample

Verify the adequacy of the overall preparations to protect risk-significant systems from impending severe weather.

Specific Guidance

a. Evaluate implementation of appropriate severe weather preparation procedures and compensatory measures for the severe weather that is currently impacting or is expected to imminently impact the facility, its operations, or the ability of personnel to respond to an emergency. Review the licensee's plans to address the ramifications of potentially lasting effects that may result from the severe weather conditions (e.g., drought, flood).

b. Verify that severe weather procedure operator actions maintain the readiness of essential systems. Verify that minimum/adequate operator staffing is specified. Consider accessibility of controls, indications, and equipment.

c. Verify that required surveillances are current, or are scheduled and completed, if practical, before anticipated severe weather conditions develop.

d. Examine the status of safety related equipment and to ensure inoperable equipment does not prompt a Notice of Enforcement Discretion (NOED) request. Note: The Enforcement Policy provides for the exercise of enforcement discretion under circumstances in which maintaining the stability and reliability of the electrical power supply system is consistent with protecting the public health and safety. Weather-related NOED requests usually involve a missed surveillance, an improperly scheduled surveillance, or inoperable equipment.

[1] Cloud Point defines the temperature at which a cloud or haze of wax crystals appears in the oil under prescribed test conditions, which generally relates to the temperature at which wax crystals begin to precipitate from the oil in use. [Source: ASTM D-975]

e. Plant modifications, maintenance activities (i.e., temporary hazard barrier removal), new evolutions, procedure revisions, or operator workarounds implemented to address periods of adverse weather can inadvertently affect maintenance rule systems and SSCs, and should therefore be reviewed. Determine that the licensee has assessed and managed these challenges to safe plant operation. Further followup may be appropriate using IP 71111.12, "Maintenance Effectiveness"; IP 71111.13, "Maintenance Risk Assessments and Emergent Work Control"; IP 71111.15, "Operability Determinations and Functionality Assessments"; and IP 71111.18, "Plant Modifications."

03.04 External Flooding Sample

Verify that flood protection barriers, mitigation plans, procedures, and equipment are consistent with the licensee's design requirements and risk analysis assumptions for coping with external flooding.

Specific Guidance

a. Review the UFSAR and related flood analysis documents to identify those areas that can be affected by external flooding, including water intake facilities. Review seasonal susceptibilities, such as floods caused by hurricanes, heavy rains, and flash floods. Review licensee documentation that shows the design flood levels for areas containing safety-related equipment.

b. Based on the licensee's flooding risk studies, select plant areas containing risk-significant SSCs which are below flood levels or otherwise susceptible to flooding. Use weather-related information gathered during plant status reviews or from external news sources to assist in scheduling this inspection prior to the season of highest risk.

c. Conduct a walkdown of the selected areas or rooms. By observation/review of design features, including reviews of preventive maintenance activities, consider the following, giving priority to those attributes which are risk significant for the site-specific installation:

1. Sealing of equipment below the flood line, such as electrical conduits. Verify that the service life of seals is consistent with the manufacturer's recommendations or that a documented engineering evaluation provides justification for service life beyond the manufacturer's recommendations.

2. Sealing of equipment floor plugs, holes, or penetrations in floors and walls between flood areas. Verify seals and grout, and ensure that procedures or programs to monitor for degraded conditions have been implemented.

3. Adequacy of watertight doors between flood areas. Verify alignment of "dog ears," adequacy of seals, and inspect for wear or impact damage on critical parts of the doors.

4. Common drain system and sumps, including floor drain piping and check valves, were credited for isolation of flood areas within plant buildings.

5. Adequate protection of the drain system (e.g., screens/covers) to prevent debris from disabling the drain system or components in the drain system.

6. Operable sump pumps, level alarm, and control circuits, including maintenance and calibrations of flood protection equipment.

7. Anti-siphon features, such as check values and vacuum breaks, used to prevent external flooding ingress.

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8. Condition, availability, and sufficient quantity of temporary or removable flood barriers (i.e., gaskets, sand bags, sand baskets, or other temporary barriers).

9. Protection of access to the ultimate heat sink for safe shutdown from storm surge debris impact.

10. Perimeter drain systems that minimize the egress of water to safety-related plant areas are functional.

d. For those areas where operator actions are credited, verify that the procedures such as abnormal or emergency procedures for coping with flooding can reasonably be used to achieve the desired actions, including whether the flooding event could limit or preclude the required operator actions. Observe flood mitigation drills and tabletops when possible.

   Evaluations of operator actions must consider the following:

   1. Can procedures or activities be executed as specified and within the required timeframe(s)? For example, are flood mitigation actions (e.g., closure of water-tight doors) achievable in the available timeframe between the flood warning and the onset of the flooding?

   2. Will water levels and associated effects (e.g., waves, run-up, or debris) impair support functions or the performance of necessary actions?

   3. Will other factors (e.g., equipment availability and staffing) prevent implementation of the required actions?

   4. Will proposed actions result in consequences that adversely affect other required safety or security functions (e.g., impairing required cooling functions)?

   5. Do the procedures or activities include a discussion on warning time and notification that a flood is imminent?

   6. Do the procedures include a discussion on how long the site could be flooded and appropriate considerations for the duration of the flood (e.g., availability of required consumables)?

e. Evaluate implementation of flood protection preparation procedures and compensatory measures during impending conditions of flooding or heavy rain, including the process for incorporating or assimilating information from external sources (e.g., the National Oceanic and Atmospheric Administration or Army Corp of Engineers).

71111.01-04 REFERENCES

Cross Reference of Generic Communications to IP 71111.01 and Inspection Resources:
http://drupal.nrc.gov/nrr/ope/33977 (nonpublic)

Operating Experience Gateway:
http://drupal.nrc.gov/nrr/ope (nonpublic)

IHS Codes and Standards:
http://www.internal.nrc.gov/TICS/library/standards/ihs.html (nonpublic)

NRC Technical Library:
http://www.internal.nrc.gov/TICS/library/index.html (nonpublic)

END

Attachment 1
Revision History for IP 71111.01

Commitment Tracking Number	Accession Number Issue Date Change Notice	Description of Change	Description of Training Required and Completion Date	Comment Resolution and Closed Feedback Form Accession Number (Pre-decisional, Non-public Information)
	04/03/00 CN 00-003	71111.01 has been issued to provide the minimum inspection oversight for determining the safety performance of operating nuclear power reactors.		
	ML020380469 01/17/02 CN 02-001	IP 71111.01 has been revised to provide detailed inspection requirements and guidance for evaluating a licensee's readiness for seasonal susceptibilities and impending weather conditions. In addition, the inspection resource estimate is revised to provide a band for more inspection flexibility.		
	ML041050003 04/13/04 CN 04-008	IP 71111.01 has been revised to clarify sample sizes, minimum samples for completion and improve guidance provided in the inspection requirements.		
	03/02/07	Revision history reviewed for the last four years		
C1 SRM M050426	ML070240487 03/23/07 CN 07-011	IP 71111.01 has been revised to address feedback form 71111.01-902 to include recommended inspection guidance and also to incorporate inspections for the offsite power system and the alternate AC power source.	Training performed at resident inspector counterpart meetings and completed on 12/13/06.	ML070670471
	ML072960230 01/31/08 CN 08-005	IP 71111.01 has been revised to reflect the 2007 Reactor Oversight Process (ROP) realignment (addition of external flooding review formerly in IP 71111.06) and to address feedback form 71111.01-1163.		ML073520325

Commitment Tracking Number	Accession Number Issue Date Change Notice	Description of Change	Description of Training Required and Completion Date	Comment Resolution and Closed Feedback Form Accession Number (Pre-decisional, Non-public Information)
	ML080650308 05/01/08 CN 08-013	IP 71111.01 has been revised to address feedback form 7111.01-1150 to include recommended clarification of inspection guidance regarding offsite power grid reliability verification. Revisions have also been made to include consideration for drought ramifications and to reorganize the inspection requirements.		ML081220121
	ML083170657 04/09/09 CN 09-011	IP 71111.01 has been revised to clarify the expectations for performing the grid reliability sample (FBF 71111.01-1305).		ML090700219
	ML092290690 11/09/09 CN 09-026	IP 71111.01 has been revised based on the 2009 ROP realignment (adjustment of resource estimate and clarification of sample requirements).		
	ML14337A104 12/04/14 CN 14-029	Editorial change based on FBF 71111.01-2043. Deleted Subsection 2.04.c.7, "Sources of potential internal flooding that are not analyzed or not adequately maintained, for example failure of flexible piping expansion joints, failure of fire protection system sprinklers, roof leaks, rest room backups, and failure of service water lines," which is already in IP 71111.06 and not needed in IP 71111.01.		ML14324A635 71111.01-2043 ML14324A635
	ML14343A684 09/04/15 CN 15-016	Incorporated Fukushima lessons learned (06/12/13 meeting) and Fukushima flooding inspection insights. Revised to incorporate FBF 71111.01-2130.		ML15215A044 71111.01-2130 ML15246A215
	ML17101A803 11/28/17 CN 17-027	Added additional ultimate heat sink considerations to "Summer Readiness" sample. Eliminate redundancy and improved for plain writing. Relocated optional requirements to the guidance section to better align with IMC 2515, Section 8.04, sample completion requirements.		ML17164A302 71111.01-2220 ML17200C868
	ML18278A281 12/20/18 CN 18-044	Changed seasonal extreme weather baseline sample requirement to prior to the onset of seasonal extreme weather.		ML18288A004 71111.01-2336 ML18288A013