

Procedure	Title: Power Systems - Hurricane Plan			Number: FAM-I-2006	
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Power Systems - Hurricane Plan

PURPOSE

This document establishes procedures for securing and restoration of facility Power and Protective Systems (PPS) in support of hurricane preparations.

SCOPE AND APPLICABILITY

This document supports EMP-P-0001, Hurricane Preparation and Ride-Out. This document provides direction to the Base Operations Support & Services contract (BOSS) power systems workers associated with staging temporary power for facilities as well as the proper sequence of events required to place the power systems in a support mode for an impending hurricane event.

PROCESS

1. HURRICANE PREPARATIONS

Prior to hurricane season, organizational elements are required to accomplish pre-determined tasks. The BOSS Tech Ops Manager shall delegate personnel to implement and be responsible for complying with this procedure; appoint a primary Department 3100 Hurricane Coordinator (DHC), one or more Action Coordinator (AC) where needed and assure that the DHC attend Hurricane Coordinator Training as requested by the Kennedy Space Center (KSC) Emergency Operations Center (EOC).

Department 3000	Department 4000
Primary: George Broyles 867-3263 749-5960	Primary: Jeff Peterson 867-8179 506-3220
Alternate: Rick Rolon 861-2017 607-4163	Alternate: Jeff Miller 861-0896 749-4841

The Power and Protective Systems (PPS) Department shall accomplish items specific to their organization prior to the start of hurricane season. Pre-hurricane mitigation efforts are important to overall readiness efforts. Those efforts shall be documented as described in this document.

2. HURCON IV (50-KNOT/58 MPH WINDS WITHIN 72 HOURS)

Commence hurricane preparations when HURCON IV is declared. Upon declaration of HURCON IV, Power Systems shall implement specific checklists and shall be prepared to implement 24 hour work schedules if directed. PPS Department Management shall review the hurricane plan.

Preliminary Tag-up:

The Tech Ops Manager shall hold a tag up meeting with supervisors and SE's to discuss the following:

- ✓ Ride-Out Team (ROT) membership.
- ✓ Department Hurricane Coordinator (DHC)
- ✓ Hurricane Action Coordinators

Discuss implementation of Hurricane plans for the following systems:

- ✓ Facility walk downs to secure Foreign Object Debris (FOD).
- ✓ UPS shutdown plan for specified facilities.
- ✓ Portable generator placement plans.
- ✓ Generator fueling operations, including requirements for Emergency Power Plant (EPP) fuel requirements.
- ✓ Substation switching procedures.
- ✓ Console operations.
- ✓ Configuration settings.
- ✓ In-work Outages.
- ✓ Maintenance settings and restoration.
- ✓ Radio net or cell phone call in to verify completion of preparations to C-3 console for recording in System Electronic Tie-In (SETI).

Return to work discussion

- ✓ KSC "Return To Work" Access protocol
- ✓ Hotline phone #s 861-7900 (Local) or 1-866-572-4877) (NASA Toll Free)

Actions:**Department Hurricane Coordinator – DHC actions**

- 2.1.1. Shall start a HURCON log of events and keep updated throughout the HURCON event
- 2.1.2. Request Work Control issuance of Hurricane Preparations, DART and Recovery WON to support EMP-P-0001 using JP HPPWR0XX being the customer, K1, S1
- 2.1.3. Notify Department personnel
- 2.1.4. Initiate recall of essential personnel
- 2.1.5. Develop pyramid alert roster and identify mission essential personnel
- 2.1.6. Solicit volunteers for Ride-Out Team and maintain essential personnel
- 2.1.7. Brief all Department personnel on return to work hotlines - 861-7900 (Local) or 1-866-572-4877 (NASA Toll Free).
- 2.1.8. Shop supervisors to designate Damage Assessment and Recovery Team (DART) members to be recalled for recovery and assessment efforts post HURCON conditions.
- 2.1.9. Systems Engineering Management to designate DART members to be recalled for recovery and assessment efforts post HURCON conditions.

Note: SE support will be assigned to shop hurricane recovery efforts first and then to Damage Assessment teams later as set up by BOSS DART Management Assessment Team (MAT) per EMP-P-0003. The decision as to who will support which effort will be decided by the Power and Protective Systems Management Team PPSMT. Those not required for recovery effort will be assigned to Damage Assessment and report to the Response/Recovery Coordinator (RRC) per EMP-P-0003 for assignment of areas to assess.
- 2.1.10. Ensure recovery forces have emergency supplies such as flashlights, critical tools and equipment to perform preparatory and recovery tasking.

Shop actions

- 2.1.11. Prepare vehicles for evacuation/parking/fuel all vehicles. Ensure full operating condition.
- 2.1.12. Work Crews - secure, relocate, and dispose of identified hazards.
- 2.1.13. Inventory essential supplies.
- 2.1.14. Verify all necessary hurricane supplies on hand and stored properly
- 2.1.15. Walk Down the following facilities to secure loose materials or equipment that could become projectiles in hurricane strength wind.

Orsino Substation area M6-0996

C-5 Substation area	K6-1141/ 1091
Generator shop	K6-1847
Electric shop area	K6-1446

- 2.1.16. Request sand bag placement at the following facilities to prevent water intrusion from low lying areas or driving rain.

Orsino Substation	M6-0996
C-5 Substation	K6-1141/ 1091

- 2.1.17. Back up crucial files.
- 2.1.18. Stockpile supplies to protect electronics equipment in work areas.
- 2.1.19. Secure or place to bypass UPS units specified by Systems Engineering. UPS unit configuration changes shall be coordinated with the facility manager prior to modification. Make a record in the HURCON log of UPS unit configuration to facilitate post hurricane recovery.
- 2.1.20. Install requested backups and record installation on PPS-F-2131, "Hurricane Leave in Place Generators".
- 2.1.21. Verify substation 101 is in AUTO configuration.
- 2.1.22. Verify Space Station Processing Facility (SSPF) Substations 117 and 118 are in AUTO configuration.
- 2.1.23. Coordinate any new power requirements with the Booster Fabrication Facility (BFF) Facility Manager.
- 2.1.24. Contact power console to initiate hurricane preparations checklist.
- 2.1.25. Complete PPS-F-2131, "Leave in Place Generators for HURCON" to document all temporary generators placed in the field prior to hurricane preparations.
- 2.1.26. Provide and connect portable generators as required for hurricane preparations. Utilize PPS-F-2130, "Generator Request Form", for real time requests.
- 2.1.27. Request Roads and Grounds secure all temporary generators identified on PPS-F-2131.
- 2.1.28. Request fueling operations' top-off fielded generators identified on Form PPS-F-2131 and backup fuel tanks identified on PPS-F-2132, "Facility Gen Fuel Requirements for HURCON" to 90% of full capacity.
- 2.1.29. Request Water and Waste verify sump pumps operational at the Launch Control Center (LCC) battery tunnel (2), at the Launcher road cross over tunnel (2) and the VABR tunnel.
- 2.1.30. Verify\Provide power to portable chillers at the following locations: LCC, OPF-1&2, VABR
- 2.1.31. If directed, at C3PF connect portable chiller to the generator.

- 2.1.32. If directed, at the PCC verify\provide to connect the portable chiller to a power source.
- 2.1.33. Notify Department Hurricane Coordinator (DHC) via the Action Coordinator after all HURCON IV actions are completed.

3. HURCON III (50-KNOT/58 MPH WINDS WITHIN 48 HOURS)

HURCON III is the phase when most preparation activities shall be completed and evacuation of non-essential personnel may be directed. KSC shall initiate hurricane securing (i.e., safeguarding) of facilities, property, and equipment when HURCON III is announced. The Power System Manager or Action Coordinator shall provide updated lists of their ROT to the DHC including name, functional area, work phone, and home phone number of each member. ROT members will assemble and be briefed at the KSC Auditorium. Any equipment, vehicle, or manpower shortages will be reported immediately to the DHC.

Actions:

- 3.1.1. Continue work on any HURCON IV work not yet completed.
- 3.1.2. The Action Coordinator provides status reports as required to the DHC
- 3.1.3. Send Ride-Out Team roster to the DHC.
- 3.1.4. At Utility Annex, verify the louvers next to SS-830 are completely covered to prevent water intrusion into the switchgear.
- 3.1.5. At substation 837, 119, 817, and 227, power down the thermostats to prevent the exhaust fans from running (turn off fan breaker in SWGR panel) and place protective measures over the louver openings to prevent wind blown water intrusion into the gear.
- 3.1.6. Relocate pre-designated vehicles as directed.
- 3.1.7. Issue hurricane supplies (plastic bags, sheeting, tape, etc.) to employees.
- 3.1.8. Store loose equipment.
- 3.1.9. Back up computer hard drives as necessary.
- 3.1.10. Power down computers and electronic equipment.
- 3.1.11. Cover electronic equipment with plastic.
- 3.1.12. Remove loose articles from desktops, turn bookcases against inside walls, move desks and files away from windows and doors and lower blinds, if installed.
- 3.1.13. Where practical, raise equipment at least sixteen (16) inches off the ground.
- 3.1.14. Disconnect all unnecessary electrical equipment and turn off unnecessary lighting.

- 3.1.15. Park government vehicles in designated parking locations. Leave parking brake set, doors unlocked and keys in the Ignition
- 3.1.16. Issue hurricane supplies (plastic bags, sheeting, tape, etc.) to department employees.
- 3.1.17. Secure facility windows and doors prior to HURCON II with sandbags and tape as needed.
- 3.1.18. Prior to HURCON II, secure or place to bypass any remaining UPS units specified in section 2.1.18 of this instruction. Changing UPS unit configuration must be coordinated with the facility manager prior to switching.
- 3.1.19. Notify DHC via the Action Coordinator after all HURCON III and IV actions are completed

4. HURCON II (50-KNOT/58 MPH WINDS WITHIN 24 HOURS)

HURCON II is the phase when all securing actions shall be completed or terminated. The remainder of KSC and contractor personnel shall be released effective at HURCON II when directed by the CD through the NASA Emergency Management Officer (NEMO).

Actions:

- 4.1.1. Ensure all HURCON IV/III actions are complete.
- 4.1.2. Secure vehicles not in use at designated parking locations. Park vehicles facing away from the facility leave parking brake set, doors unlocked, and keys in ignition.
- 4.1.3. Meet with DHC and advise O&M personnel of Storm Category and subsequent changes.
- 4.1.4. If required by Heating, Ventilation, and Air Conditioning (HVAC), under FAM-I-0001, Hurricane Operations for KSC HVAC Plants, secure substation 119 at the Industrial Area Chiller Plant (IACP).
- 4.1.5. If required by HVAC department, support power securing operations at the Utility Annex (UA).
- 4.1.6. Personnel shall secure all IT equipment (PC and associated hardware) and wrap in plastic bag prior to exiting KSC as directed in the next step.
- 4.1.7. Personnel not required for execution of hurricane preparations and/or Ride-Out Team shall be released from duty when directed by the BOSS O&M Division Manager.
- 4.1.8. Ride-Out Team members shall report to assigned stations when notified (take vehicles, heavy equipment and tools)
- 4.1.9. Action Coordinators (AC) shall pick up supplies, cots, and blankets from logistic centers.

- 4.1.10. Notify the DHC via the Action Coordinator when all shop personnel have evacuated.
- 4.1.11. Notify DHC via the Action Coordinator when all HURCON actions are completed.

5. HURCON I (50-KNOT/58 MPH WINDS WITHIN 12 HOURS)

HURCON I is the phase when KSC shall remain secured and the Ride out Team (ROT) shall be sheltered or evacuated. ROT personnel shall be directed to shelter prior to the arrival of 50 knot/58 MPH winds

Actions:

- 5.1.1. Release all personnel not required for Ride-Out Team.
- 5.1.2. Communications – shall ensure ROT has mobile phones and radios.
- 5.1.3. Ensure all substations and generators have been configured per direction from Facility Managers.
- 5.1.4. ROT shall be required to remain on site at the Electrical Maintenance Facility (EMF) and/or the Launch Control Center (LCC).

6. POST HURRICANE OPERATIONS – RETURN TO NORMAL OPERATIONS

6.1. Restore power to facilities

- 6.1.1. Post hurricane damage assessment and recovery shall be per EMP-P-0003, Damage Assessment and Recovery. Personnel shall start restoring systems to pre-hurricane configuration and normal operation as directed by PPSMT.
- 6.1.2. The PPSMT shall establish a base of communications at the EMF (K6-1446K), or an alternate designated location if the EMF is unavailable for coordinating all DART activities.
- 6.1.3. PPSMT to form up the DART for recovery effort first to address power, fire and security restoration activities and then to assess damage to areas prior to general occupancy.
- 6.1.4. Protective Systems will form up DART for recovery effort first to address fire and security safeing and restoration activities and then to assess damage to areas prior to general occupancy.
- 6.1.5. Distribute forms, FAM-F-001A, "Hurricane Damage Documentation Form" or FAM-F-001B, "BOSS Hurricane Damage Assessment Form" to each DART to record all damage found and safeing activities performed for use by the MAT and RRC later.
- 6.1.6. Communications from the field shall be to the PPSMT for all activities except emergency securing operations that should be directed to the LCC Power console or the PSCC and then PPSMT.

- 6.1.7. The PPSMT will keep a the HURCON log up to date with all activities and record/receive all Damage Assessment reported on the Hurricane Damage Assessment Form FAM-F-001A or FAM-F-001B (Or an equivalent form). These forms will be forwarded to the MAT or RRC as time permits to complete the damage assessment as required by EMP-P-0003.
- 6.1.8. Using list of UPSs developed in 2.1.18, inspect all UPS systems. If stable utility power is available, switch all UPS units from BYPASS to NORMAL per posted instructions. Document and report to C-3 console any failures for later review and restoration.
- 6.1.9. Secure generators that may have started during hurricane ride out event. Document and report to the C-3 console any damaged equipment found.
- 6.1.10. At Utility Annex, if needed, open the louvers next to SS-830 that were covered to prevent driven water intrusion into the switchgear.
- 6.1.11. At substation 837, 119, 817, and 227, remove hurricane protection measures and power up the thermostats to allow exhaust fans to run normally (turn on fan breaker in SWGR panel).
- 6.1.12. If substation 119 at the Industrial area chiller plant was secured, then with HVAC plant operator concurrence, restore power to the substation. Inspect IACP power distribution equipment. Document and report to C-3 console and EMF management recovery team, any failures for later review and restoration.
- 6.1.13. If the Utility Annex power was secured, then with HVAC plant operator concurrence, restore power. Inspect Utility Annex power distribution equipment. Document and report to C-3 console and EMF management recovery team any failures for later review and restoration.
- 6.1.14. Verify Facility power to locations where HURCON temporary power generators were installed per form PPS-F-2131 and shut down temporary generator(s) and place equipment back on facility power.

6.2. Return Equipment to original locations

- 6.2.1. Coordinate all damage needing immediate safeing with the LCC Power Coordinator and report to the PPSMT as soon as possible.
- 6.2.2. Inspect other area as designated by the PPSMT and document damage on form FAM-I-0001A, "Hurricane Damage Documentation Form".
- 6.2.3. If required to assess the damage value, complete Form FAM-I-0001B, "BOSS Hurricane Damage Assessment Form"
- 6.2.4. Return all forms to the PPSMT. Coordinate all damage needing immediate safeing with the LCC Power Coordinator and report to the PPSMT.
- 6.2.5. Return all temporary generators removed during Hurricane Preps to their assigned locations per form PPS-F-2131. Reconnect and verify correct operation of the generators.

- 6.2.6. Remove all hurricane support generators from locations identified in PPS-F-2131 back to the generator shop.
- 6.2.7. Relocate Sandbags to pallets for Roads and Grounds pickup.
- 6.2.8. Notify Roads and Grounds to pick up pallets of sandbags.
- 6.2.9. Notify Roads and Grounds to remove generator securing anchors to avoid trip hazards.
- 6.2.10. Remove any other hurricane securing measures to outsides of facilities.

RECORDS

The following records are retained by the organizations listed below:

Record	Responsible Organization
PPS-F-2130, Generator Request Form	Power and Protective Systems
PPS-F-2131, Hurricane Leave In Place Generators	Power and Protective Systems
PPS-F-2132, Facility Stationary Generator Checklist	Power and Protective Systems
System Electronic Tie-In (SETI)	Mission Support Office

AFFECTED DIVISIONS/OFFICES

Engineering Services
FSEU and OM&E

ROLES AND RESPONSIBILITIES**FSEU Technical Operations Manager:**

- Ensures compliance within the Department to the requirements stated in this procedure.
- Ensure employees are briefed on the requirements of this procedure

FSEU Supervisor:

- Ensures compliance within the department to the requirements stated in this procedure.

Systems Engineering:

- Responsible for the update of this procedure and compliance within the department to the requirements stated in this procedure

Employees

- Be familiar with the contents of this procedure and comply with stated requirements.

REFERENCE DOCUMENTS

The following documents are referenced in this procedure:

Document Number	Title
EMP-P-0001	Hurricane Preparation and Ride-Out
FAM-I-0001	Hurricane Operations for KSC HVAC Plants
FAM-F-001A	BOSS Hurricane Damage Documentation Form
FAM-F-001B	BOSS Hurricane Damage Assessment Form
PPS-F-2130	Generator Request Form
PPS-F-2131	Leave In Place Generators for HURCON
PPS-F-2132	Facility Gen Fuel Requirements for HURCON

ACRONYMS

AC	Action Coordinator (supervisor or lead taking action)
ARF	Assembly and Refurbishment Facility
DART	Damage Assessment and Recovery Team
DHC	Department Hurricane Coordinator
EMF	Electrical Maintenance Facility
EOC	Emergency Operations Center
EPP	Emergency Power Plant
FOD	Foreign Object Debris
HMT	Hurricane Management Team
HURCON	Hurricane Condition
HVAC	Heating, Ventilation and Air Conditioning
IACP	Industrial Area Chiller Plant
LCC	Launch Control Center
MAT	BOSS Management Assessment Team
NEMO	NASA Emergency Management Officer
PPS	Power and Protective Systems
PPSMT	Power and Protective Systems Management Team
ROT	Ride Out Team
RRC	BOSS Response/Recovery Coordinator
SETI	Systems Electronic Tie-In
SHT	Safety Health and Training

SSPF Space Station Processing Facility
UA Utility Annex

DEFINITIONS

None

REVISION RECORD

The following revisions have been applied to this document:

Revision Number	Change Description	Date
0	Initial Release to document the hurricane plan for Payload Facilities – ELECTRICAL SYSTEMS.	8/24/2012
1	Updated for the potential of powering down the Utility Annex.	11/30/2017
2	Updated for BOSS	09/05/19
3	Updated to conform to EMP-P-0001 for 2020	08/05/2020

DOCUMENT APPROVALS

X

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X

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