Cold Weather Preparation Guidelines

For

Cane Run Station and Remote CTs

Business Use

Purpose

This document was established as a guideline to aid in maintaining unit reliability during cold weather events at the Cane Run Natural Gas Combined-Cycle (NGCC) Generating Station and its associated Remote CTs.

Safety

Safety remains the top priority during cold weather events. Job safety briefings will be conducted during preparation for and in response to these events.

Management Roles and Expectations

Management plays an important role in maintaining an effective cold weather readiness program. The management roles and expectations below provide a high-level overview of the core responsibilities related to cold weather preparation. The management team at Cane Run Station serves the following roles concerning the Winterization process:

A) Set expectations for safety, reliability, and operational performance.
B) Develop a cold weather preparation procedure for the station and ensure that it is updated with best practices and lessons learned.
C) Ensure that the cold weather preparation procedure for the station includes processes, staffing plans, and timelines that direct all key activities before, during and after extreme cold weather events.
D) Ensure proper execution of the cold weather preparation procedure.
E) Conduct a plant readiness review prior to an anticipated extreme cold weather event.
F) Encourage plant staff to look for areas at risk due to cold weather conditions and identify opportunities to improve readiness and response.
G) Following each winter, evaluate the effectiveness of the cold weather preparation procedure and incorporate lessons learned.

Processes and Procedures

A cold weather preparation procedure including checklists has been developed and is maintained for seasonal winter preparedness. Components of the cold weather preparation procedure are included later in this document.

After an extreme cold weather event, the procedure will be reviewed to evaluate improvement opportunities and identify lessons learned. Changes to procedures including lessons learned will be communicated to the appropriate personnel at the station.

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Evaluation of Potential Problem Areas

A critical part of a cold weather readiness program is identifying and prioritizing components, systems and other areas of vulnerability which may experience freezing problems or other operational issues. Some of the major items considered were:

A) Equipment or processes that could create safety related hazards.
B) Equipment that could initiate an automatic unit trip.
C) Equipment that could impact unit startup.
D) Anything that could potentially cause damage to the unit.
E) Equipment that could adversely affect environmental controls that could lead to derates or outages.
F) Equipment that could affect the delivery of fuel or water to the units.
G) Impaired field devices that could cause operational problems.

Testing

In addition to the typical problem areas, emphasis has been placed on additional testing of low frequency tasks such as startup of emergency generators and backup systems where applicable.

Training

Cane Run Station coordinates annual training in plant specific awareness for cold weather operation. This includes response to freeze related alarms, troubleshooting and repair of freeze protection circuitry, review of special inspections or rounds implemented during severe cold weather events, fuel handling procedures, knowledge of the ambient temperature for which the freeze protection is designed, and lessons learned from previous experiences or the NERC Lessons Learned program.

A. A cold weather readiness meeting is held on an annual basis to highlight preparations and expectations for severe cold weather.
B. Operations personnel review cold weather scenarios affecting instrumentation readings, alarms, and other indications on plant control systems.
C. Cane Run ensures appropriate NERC Generation Availability Data Systems (GADS) coding for unit derates or trips because of a severe cold weather event to promote lessons learned, knowledge retention, and consistency.

Communications

Clear and timely communication is essential to an effective Cold Weather Preparation program. Key points include the following:

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A. Before a severe cold weather event, Plant Management communicates with the Vice President of Power Production that the site-specific cold weather preparation procedure is in place.
B. Before and during a severe cold weather event, communicate with all station personnel about changing conditions and potential areas of concern to heighten awareness around safe and reliable operations.
C. Before and during a severe cold weather event, keep the Balancing Authority (Generation Dispatch) up to date on changes to unit availability, capacity, or other operating limitations.
D. After a generating unit trip, derate, or failure to start due to severe cold weather, Plant Management will conduct an analysis of the event and incorporate lessons learned into their Cold Weather Preparation Procedures.

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Cane Run and Remote CTs Cold Weather – Winterization Plan

This plan has been developed and implemented to prevent the generating units at Cane Run Station and its satellite stations from inadvertently becoming unavailable in the event of extreme cold weather. It specifically addresses the recommendations of the NERC Reliability Corporation regarding preparation for cold weather events. These requirements are:

1. Review freeze protection equipment material condition and supplemental freeze protection methods used at generating stations.
2. Make repairs and improvements to freeze protection equipment material condition and supplemental freeze protection methods where necessary to restore intended function where degraded.
3. Establish contingency plans to keep power generating and supporting equipment from freezing in the event of sustained periods of freezing temperatures with high winds.

The following is an overview of the program at Cane Run intended to meet these requirements.

A. <u>Work Management System</u>

The goals of using the Maximo Work Management System as a part of the Winterization Plan are as follows:

1) Ensure that all cold weather preparation preventive work orders (PM's) are completed prior to the onset of the winter season.
2) Perform cold weather readiness system walkdowns to identify any deficiencies and issues that will need repair.
3) Review the work management system for open corrective maintenance work orders that could affect plant operation and reliability in cold weather. Ensure that the work orders are prioritized correctly so that the work is completed prior to the winter season.
4) Ensure that all modifications and construction activities are performed such that the changes maintain cold weather readiness for the station.

These measures are generally PMs in Maximo which are programmed to generate work orders at the beginning of October, **to be completed by November 30th**. A list and description of these PMs can be found below. Completing these PMs in October and early November will ensure the plant is ready for winter by November 30th.

In addition, SERCO will ensure the plant's fleet of vehicles will have been properly winterized and in good working order.

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A list of the actual PMs can be found in the following table:

PM Gen #	Description	Responsibility	Date of Generation
00056468	PM-ANNUAL Winterization CT1 Evaporative Cooler - Un-Winterize and Prepare For Service	Support Watch Crew	May-22
00056469	PM-ANNUAL Winterization CT1 Evaporative Cooler - Winterize System and Piping	Operations Crew	October-22
00056472	PM-ANNUAL Winterization CT2 Evaporative Cooler - Unwinterize and Prepare For Service	Support Watch Crew	May-22
00056473	PM-ANNUAL Winterization CT2 Evaporative Cooler - Winterize System and Piping	Operations Crew	October-22
00056900	PM-ANNUAL Winterization - Inspect All Bldg Wall Mounted Heaters For Proper Operation	Operations Crew	October-21
00056901	PM-ANNUAL Winterization - Wholesale Inspection of All Heat Trace Circuits	Support Watch Crew / Ready Electric	October-22
00057618	PM-ANNUAL Winterization - Inspection and Service of Plant Snow Removal Equipment(fm)	Support Watch Crew	October-22
00057619	PM-ANNUAL Winterization - Inspection and Service of Plant Portable Space Heaters	Warehouse	October-22
00057620	PM-ANNUAL Winterization - Inspection and Service of Plant Vehicles For Proper Winterization	Contractor Service - SERCO	October-22
00057621	PM-ANNUAL Winterization - Inspection or Repair of All Plant Exterior Doors and Windows(fm)	Support Watch Crew	October-22
00060305	PM-SEMI-ANNUAL HRSG1 LP ECONOMIZER RELIEF VALVE/PILOT VLV - Removable Insulation Cap - Winter/Summer	Support Watch Crew	November-21
00060310	PM-SEMI-ANNUAL HRSG2 LP ECONOMIZER RELIEF VALVE/PILOT VLV - Removable Insulation Cap - Winter/Summer	Support Watch Crew	November-21
00060311	PM-SEMI-ANNUAL HRSG1 IP ECONOMIZER RELIEF VALVE/PILOT VLV - Removable Insulation Cap - Winter/Summer	Support Watch Crew	November-21
00060312	PM-SEMI-ANNUAL HRSG2 IP ECONOMIZER RELIEF VALVE/PILOT VLV - Removable Insulation Cap - Winter/Summer	Support Watch Crew	November-21
00044087	PM- Yearly - PR-13 Gas Turbine Winterize PR13.	PR O&M Crew	October-22
00063984	Winterize / De-winterize Demin Tank N2 Blanketing Valves / Regulator	Operations Crew	November-21

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00063986	PM-ANNUAL Winterization - CT1 FM-200 Cabinet Heaters - Seasonal Operation	Operations Crew	November-21
00063987	PM-ANNUAL Winterization – CT2 FM-200 Cabinet Heaters - Seasonal Operation	Operations Crew	November-21

B. Preparation of Critical Instrumentation and Equipment

The following tasks will be completed according to the PMs listed in part (A) to ensure that critical equipment and instrumentation are adequately prepared for cold weather.

1. All critical site-specific problem areas have adequate protection to ensure operability during a severe cold weather event.
2. All electrical and instrumentation equipment susceptible to cold weather will have been winterized. Critical instrumentation has been identified for additional operator rounds during severe weather events.
3. Temperature Indicators are placed in areas containing equipment sensitive to extreme cold conditions and in freeze protection enclosures to ensure that the temperature is being maintained above freezing.

C. Insulation, Heat Trace and Other Freeze Protection

To ensure the reliability of building/pipe insulation and heat trace circuitry, and to provide back-up for these systems, the following will occur:

1. Verification of the integrity of the insulation on all critical equipment identified in the Cold Weather Preparation Procedure.
2. All heat trace elements on exterior piping will have been inspected and be in good working order to prevent these pipelines from freezing.
    a. An annunciator panel has been installed to monitor the state of heat trace circuits and alert the control board operators when a heat trace circuit becomes deenergized. The indication is also visible at the heat trace panel in the field.
    b. Heat Trace Circuitry and Power Supplies will be evaluated for continued accuracy and reliability
    c. Any heat trace or insulation removed during regular maintenance will have been replaced and integrity restored
    d. Testing will occur again during severe cold weather events to ensure continued functioning
    e. Back-up methods of heating instrumentation will be on hand – heat blankets, additional lines of heat trace wire w/ 120VAC plugs for quick application, etc.
3. Heaters, Heat Lamps, and Space Heaters
    a. All permanently mounted wall heaters will be tested.
    b. All portable space heaters will be tested, repaired and/or replaced as necessary.
    c. All portable space heaters and heat lamps will be secured in place to prevent unauthorized removal.

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   d. Plant electrical circuits will be evaluated for adequate load capacity. Ground Fault Interrupters (GFI's) will be used properly.
   e. An adequate fuel supply for the heaters will be onsite.
4. Wind Breaks
   a. Wind barriers will be installed as deemed appropriate to protect critical instruments, sensing lines, controllers, and piping.
5. Covers, Enclosures, and Buildings
   a. Enclosures with heat lamps will be installed for identified transmitters.
   b. Portable space heaters will be placed in enclosures with temperature-sensitive equipment and maintained at regular intervals.
   c. Missing covers will be installed on valve actuators, damper drives, and electrical boxes to prevent from accumulating ice.
   d. Critical instruments have been placed inside plastic enclosures to protect against ice and wind.
   e. All the exterior windows and doors will have been inspected, repaired if necessary, and be in good working order.
   f. Tarps/plastic enclosures will be installed over hotwell openings and stairwells as necessary to prevent warm air from leaving the operating areas.
   g. All large overhead doors at the station will be inspected and repaired as needed and kept closed when not in use.

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D. Supplemental Equipment

The following items will be in stock in sufficient quantity before the beginning of the cold weather season. Care should be taken to make sure quantities of these items remain in stock throughout the cold weather season (December through April).

PERSONAL PROTECTION /EXPOSURE PREVENTION EQUIPMENT

____ Rubber Boot Slip-Ons (All Sizes) – Min Qty: L – 12pr / XL – 12pr

____ Walk by Yaktrax (Attachable grips for work boots) – Min Qty: S – 5pr / M – 8pr / L – 8pr / XL 8pr

____ Jersey Gloves – Min Qty: 75pr

____ Leather Gloves (All Sizes) – Min Qty: S – 25pr / M – 25pr / L – 75pr / XL 50pr

____ Head Socks – Min Qty: 25ea

FUEL AND ACCESSORIES

____ Diesel Fuel (All tanks full) – Min Qty: 250 gal

____ Diesel Fuel Tanks (Anti-gel additives) – Min Qty: 6 cans

____ 400 Gallon Tank of Kerosene - Filled (For portable heaters) – Min Qty: 300 gal

____ Starting Fluid (Aerosol Cans) – Min Qty: 12 cans

____ Fuel Cans (All sizes/types) – Min Qty: 2 Gal – 2 ea. / 5 Gal – 2 ea.

SNOW REMOVAL/TRACTION MATERIALS

____ Sand – Min Qty: 20 bags

____ Ice-Melt – Min Qty: Concrete Safe – 40 bags / Regular – 120 bags

MISCELLANEOUS ITEMS

____ De-Icer (for windshields) – Min Qty: 10 cans

____ Plastic (used to contain heat) – Min Qty: Clear – 5 rolls / Reinforced – 5 rolls

____ Extra Rolls of Heat Trace – Min Qty: 2 rolls

____ Heat Blankets – Min Qty: 6 ea.

____ Heat Tape – Min Qty: 7 ea

____ Duct Tape – Min Qty: 24 ea.

____ Tie-Wire – Min Qty: 5 rolls

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____ Heat Lamps/Bulbs – Min Qty: 18 lamps / 35 bulbs

____ Plywood – Min Qty: 12 sheets (4'x8')

____ 2X4 Lumber – Min Qty: 12 ea.

____ Galvanized 2 ½" Wood Screws – Min Qty: 1 box

____ Spray Foam Sealant – Min Qty: 12 cans

____ Snow Shovels – Min Qty: 12 ea.

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Warehouse Supervisor Signature Certifying Completion Date

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E. Operational Supplies

Prior to a severe cold event, operational supplies will be inventoried to ensure that enough stores are kept maintaining unit reliability and integrity. The Commercial Group at the station will coordinate to schedule deliveries of supplies based on the severity of any upcoming severe cold weather events and the lead times of the supplies. These supplies will include:

1) Chemical compounds as required for water treatment purposes
2) Ethylene Glycol
3) Ammonia
4) Lubricating Oils for Rotating Machinery
5) Diesel Fuel
6) Gasoline
7) CEMS Calibration Gases
8) Welding Supplies
9) Enough supply of kerosene for supplying space heaters
10) Hydrogen Gas for Generator Cooling [PR12 and PR13]

F. Staffing

The following are the measures that will be taken to prepare the plant in the days immediately preceding a forecasted extreme cold-weather event.

Having made all the preparations listed above, most of this plan revolves around having enough personnel onsite to properly implement the plan and keep the plant running during the weather event and in the days following.

1. All departments will decide to have increased staffing levels onsite during the cold weather event. This is especially true during periods of normally low staffing (nights and weekends).
2. In the event personnel must stay overnight and cannot leave the property, food rations and cots are available. Cots are stored in the CR7 Warehouse. Frozen food rations are stored in the freezer in the CR7 Warehouse.
3. If local roadways are in such bad shape that staff cannot make it to the site in their own vehicles, four-wheel drive vehicles from the plant's fleet will be used to pick them up and bring them to the plant.
4. Facilities maintenance personnel will focus on clearing snow and ice from the plant's main thoroughfares. Plant maintenance and extra operations personnel will make rounds to ensure the generating equipment remains in working order. They will deploy the heating and anti-freezing equipment listed above and make corrections to operating conditions as necessary.
5. Work crews will be rotated as staffing allows to limit exposure to severe cold weather.
6. The "buddy system" will be employed during severe cold weather events to promote personnel safety.

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G. Communications

To promote effective communication during cold weather events, the following will occur:

1. Appropriate communication protocols will be followed during severe cold weather events.
2. The satellite phone will be tested for operation according to weekly PMs.
3. Communication will be discussed during daily pre-job briefings.

H. Special Operating Instructions

1) Additional Operator rounds will be initiated, utilizing cold weather checklists to verify critical equipment is protected. Room temperatures will be monitored.
2) Adequate supplies of kerosene for portable heaters will be maintained onsite.
3) Units will be placed online at minimum load prior to severe cold weather as Operations and Generation Dispatch mandate.
4) According to monthly PMs, the Emergency Diesel Generator onsite will be tested for operability.
5) Critical auxiliary equipment will be placed in service on Cooling Tower and Raw Water systems in the Screen House where freezing weather could adversely impact their operation.
6) Road sections surrounding the Cooling Tower will be closed when icy conditions are present.
7) Cooling Tower risers A & B will be drained periodically to remove condensation buildup preventing nozzle and piping freeze damage.
8) Sand will be used on Screenhouse floors if slick conditions exist.
9) Heat Trace Panels allow operators to respond to alarms urgently when heat trace alarms are annunciated on the DCS screen. Individual failed circuits are displayed using light indications on the heat trace power panels in the field. This allows for greater response effectiveness and reduced circuit downtime.

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COLD WEATHER PREPARATION TASKS TO HAVE BEEN COMPLETED BY NOVEMBER 30TH

The following tasks regarding winterization and cold weather equipment preparation will have been completed by the beginning of the cold weather season.

CR FACILITIES MAINTENANCE

____ All exterior doors and windows have been inspected and repaired if necessary

____ All portable space heaters have been inspected and repaired if necessary

____ Maintenance Work Order Backlog has been reviewed for Winterization related corrective work orders, and work has been scheduled for completion

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Maintenance Coordinator Signature Certifying Completion Date

CR INSTRUMENTATION AND ELECTRICAL MAINTENANCE

____ All unit heaters mounted in out buildings have been inspected and repaired if necessary

____ All heat trace elements have been inspected and are in good working order

(Evaluating daily as problems occur)

____ All temperature sensitive electrical and instrument devices have been properly winterized (outdoor transmitters, CEMS equipment, Water Treatment outdoor enclosures, etc.)

____ Enough people have been trained in the operation of snow removal equipment

____ Plant vehicles have been winterized by SERCO

____ All snow removal equipment (plows, spreaders, bobcat, and trucks) have been inspected and are in good working order and parked in the Equipment Storage Building as designated

____ All other designated mobile equipment has been parked in the Equipment Storage Building

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Maintenance Supervisor Signature Certifying Completion Date

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