Revised 8/2/2016

PPL companies

Cold Weather Preparation Guidelines

For

Cane Run Station and Remote CTs

Revised 8/2/2016

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 as a result 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 in an effort 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. Work Management System

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.

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

PM Gen #	Description	Responsibility	Date of Generation
00056469	PM-ANNUAL CT1 Evaporative Cooler - Winterize	Support Watch Crew	October 1
00056473	PM-ANNUAL CT2 Evaporative Cooler - Winterize	Support Watch Crew	October 1

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00056900	PM-ANNUAL Winterization – Inspect all Building Wall-Mounted Heaters for Proper Operation	Support Watch Crew	October 1
00056901	PM-ANNUAL Winterization – Wholesale Inspection of All Heat Trace Circuits	Support Watch Crew	October 1
00057618	PM-ANNUAL Winterization – Inspection and Service of Plant Snow Removal Equipment	Contracted Service	October 1
00057619	PM-ANNUAL Winterization – Inspection and Service of Plant Portable Space Heaters	Support Watch Crew	October 1
00057620	PM-ANNUAL Winterization – Inspection and Service of Plant Vehicles For Proper Winterization	Contracted Service - SERCO	October 1
00057621	PM-ANNUAL Winterization – Inspection or Repair of All Plant Exterior Doors and Windows	Support Watch Crew	October 1
00044087	PM- Yearly - PR-13 Gas Turbine Winterize PR13.	PR O&M Crew	September 21
02528-01	PM- Annual – PR11 Check all Heaters and Heat Trace	PR O&M Crew	November 1
03145-01	PM – Annual – PR12 Check all Heaters and Heat Trace	PR O&M Crew	November 1

A copy of the written PM procedures can be found in Appendix A.

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

In order 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.

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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.
    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.
        i. For example, the Direct Air Injection System (DAIS) compressors have been protected from harsh wind during severe cold weather events using temporary shelters built from wood and tarps.
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 of 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)

____ Walk by Yaktrax (Attachable grips for work boots)

____ Jersey Gloves

____ Leather Gloves (All Sizes)

____ Head Socks

FUEL AND ACCESSORIES

____ Diesel Fuel (All tanks full)

____ Diesel Fuel Tanks (Anti-gel additives)

____ 400 Gallon Tank of Kerosene - Filled (For portable heaters)

____ Starting Fluid (Aerosol Cans)

____ Fuel Cans (All sizes)

SNOW REMOVAL/TRACTION MATERIALS

____ Sand

____ Ice-Melt (At least 4 pallets)

MISCELLANEOUS ITEMS

____ De-Icer (for windshields)

____ Plastic (Several rolls, used to contain heat)

____ Extra Rolls of Heat Trace

____ Duct Tape

____ Tie-Wire

____ Heat Lamps/Bulbs

____ Plywood

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____ 2X4 Lumber

____ Galvanized 2 ½" Wood Screws

____ Spray Foam Sealant

____ Snow Shovels

_____ _____

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 sufficient stores are kept to maintain 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) A sufficient 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, the majority 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 make arrangements 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 Towers and Raw Water systems in the Screen House where freezing weather could adversely impact their operation.
6) 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.
7) Direct Air Injection System (DAIS) compressors will receive additional cover to protect against wind and ice.

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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

____ All snow removal equipment (plows, spreaders, bobcat, backhoe, and trucks) have been inspected and are in good working order

____ A sufficient number of people have been trained in the operation of snow removal equipment

____ Plant vehicles have been winterized by SERCO

_____ _____

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)

_____ _____

Maintenance Supervisor Signature Certifying Completion Date

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Appendix A: PM Documentation

PM Description: PM-ANNUAL Winterization CT1 Evaporative Cooler - Winterize System and Piping

Safety, PPE, Warnings and Precautions

- Be cognizant of nearby operating equipment and other hazardous conditions around the jobsite (20 foot sphere).

Perform a pre-job briefing before beginning work. The pre-job briefing should include a discussion of the procedures outlined in this document as well as live conditions at the jobsite.

LOTO Carding Standards

The gas turbine can be in service for this PM.

This PM involves the application of LOTO to the Evaporative Cooler Pumps and certain valves.

Required Consumables

No consumables are required for this PM.

Required Special Tools

No special tools are required for this PM.

Detailed procedures can be found on the following page(s).

If you would like to suggest any improvements to or have concerns about the procedure(s) outlined in this document, please submit them to the planning department. Any effort to improve or better document our operations and maintenance practices is greatly appreciated!

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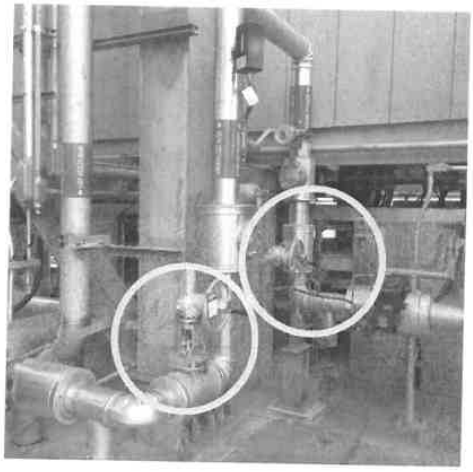
CT1 Evaporative Cooler Winterization Procedure

Complete these items in the order shown in these instructions. Complete the accompanying checklist and return the planning department as a record of completion.

1. De-energize (and LOTO) both Evaporative Cooler Pump motors (11MBL31AP001 and 11MBL31AP002) at the MCC in CT1's Electrical Package.

2. Isolate water supplies (and LOTO) to the evaporative cooler by closing the following valves located at ground level on the west side of CT1's Electrical Package:
   a. Demineralized Water: 1TGJ-BV--1005
   b. Service Water: 1TGJ-BV—1010



Evaporative Cooler makeup supply isolation valves

3. Open the valve at the drain connection (11MBL31AA107) to allow the sump to drain (lower platform).

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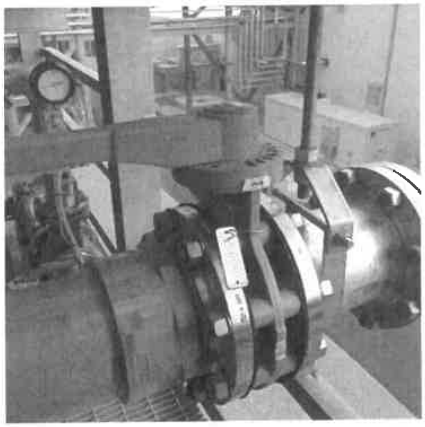
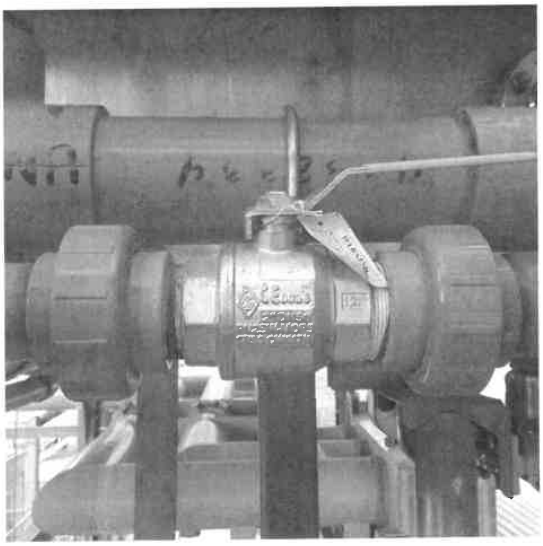


Main Drain Valve (11MBL31AA107)

4. Open the ball valve on the seasonal drain line, located near the drain connection. This allows for the sump to drain.



Seasonal Drain Valve

5. Allow sump to completely drain before proceeding.

6. Drain the cooler distribution lines on the module sidewall.
   a. The tuning valves should be completely open for this procedure.
   b. If the system is equipped with a sampling port on the blow-down line, this may also be used to drain the blow-down/distribution lines.

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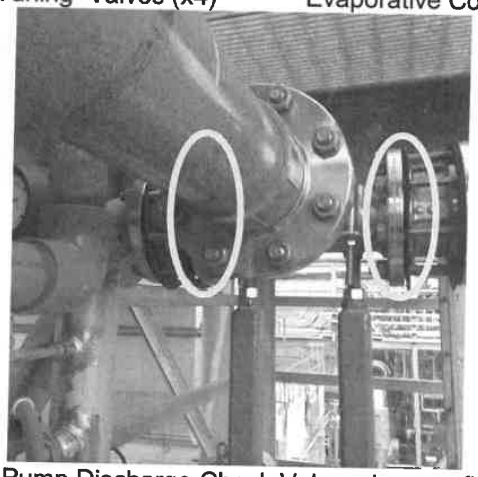
c. In order to completely drain the distribution lines, the check valve(s) flanged connections should be loosened. CAUTION: When removing either the Y-strainer or the check valve(s) be mindful of the rush of water through the opening left by the equipment. Once system is completely drained, reinstall any removed components to prevent dirt and debris entry into the system.

Evaporative Cooler Tuning Valves (x4)

Evaporative Cooler Sample Valve



Evaporative Cooler Pump Discharge Check Valves. Loosen flange bolts to drain.

7. Once the sump tank has been drained, the supply line up to the supply connection should be drained by opening the following valves located at ground level on the west side of CT1's Electrical Package:
   a. Demineralized Water: 1TGJ-BV--1022, 1TGJ-BV--1023
   b. Service Water: 1TGJ-BV--1024, 1TGJ-BV—1025

Cold Weather Preparation Guidelines

For

EW Brown Generating Station

Effective Date: 10/1/15

Note: The following procedures were developed based on information gathered from ***NERC's Reliability Guideline: Generating Unit Winter Weather Readiness – Current Industry Practices*** and ***EPRI's Seasonal Readiness Guideline.***

Purpose:

This document was established as a guideline to aid in maintaining unit reliability during cold weather events at the EW Brown Generating Station. It should be used as a framework in developing a cold weather readiness program for each station. The list of suggestions and typical problem areas contained in this document is not meant to be all inclusive. Each station's cold weather readiness program should be plant specific based on factors such as geographical location, technology and equipment configuration.

Safety

Safety remains the top priority during cold weather events. Job safety briefings should 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 each station should tailor these roles and expectations to fit within their own organization.

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 should be developed and maintained at each station for seasonal winter preparedness. Components of an effective cold weather preparation procedure are included later in this document.

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

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 to consider are;

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 should be placed on additional testing of low frequency tasks such as startup of emergency generators and backup systems where applicable.

Training

Coordinate annual training in plant specific awareness for cold weather operation. This may include 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. Consider holding a cold weather readiness meeting on an annual basis to highlight preparations and expectations for severe cold weather.
B. Operations personnel should review cold weather scenarios affecting instrumentation readings, alarms, and other indications on plant control systems.
C. Ensure appropriate NERC Generation Availability Data Systems (GADS) coding for unit derates or trips as a result of a severe cold weather event to promote lessons learned, knowledge retention, and consistency. Examples include NERC GADS code 9036 “Storms (ice, snow, etc.)” or code 9040 “Other Catastrophe.”

Communications

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

A. Before a severe cold weather event, Plant Management should communicate 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, the affected stations will 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 should conduct an analysis of the event and incorporate lessons learned into their Cold Weather Preparation Procedures.

Elements of a Cold Weather Preparation Procedure

Listed below are key elements of a cold weather preparation procedure that should be addressed at each station. This is not an all-inclusive list. Each station should review their plant design and configuration, identify areas with potential exposure to the elements and ambient temperature, and tailor their plans to address them accordingly.

A. Work Management System (Maximo)
    1) Review the work management system to ensure adequate annual preventive work orders (PM's) exist for cold weather preparation.
    2) Ensure that all cold weather preparation preventive work orders (PM's) are completed prior to the onset of the winter season.
    3) Perform cold weather readiness system walkdowns to identify any deficiencies and issues that will need repair.
    4) 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.
    5) Ensure that all modifications and construction activities are performed such that the changes maintain cold weather readiness for the station.

B. Preparation of Critical Instrumentation and Equipment
    1) Check that all critical site specific problem areas have adequate protection to ensure operability during a severe cold weather event. Emphasize the points in the plant where equipment freezing could cause a Unit trip, derate or failure to start.
    2) Develop a list of critical instruments and transmitters that require increased rounds by the operating staff during severe cold weather events.

3) Thermometers should be 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
   1) Verify the integrity of the insulation on all critical equipment identified in the Cold Weather Preparation Procedure.
   2) Heat trace reliability and electrical continuity
      a. Perform a complete evaluation of all heat trace circuits, including power supplies to ensure they maintain their accuracy.
      b. The evaluation of heat trace and insulation on critical lines should be performed on new installations, during regular maintenance activities or if damaged.
      c. Ensure that any heat trace and insulation removed or disturbed during regular maintenance is replaced and integrity restored.
      d. Check heat tracing on all critical lines and piping during severe cold weather events to ensure that the circuits remain functional. Temperature guns can be used to check piping temperatures.
   3) Heaters, Heat Lamps and Space Heaters
      a. Test operation of all permanently mounted wall heaters.
      b. All portable space heaters should be tested, repaired and/or replaced as necessary.
      c. Ensure that all portable space heaters and heat lamps are secured in place to prevent unauthorized removal.
      d. Evaluate plant electrical circuits for adequate load capacity and ensure that Ground Fault Interrupters (GFI's) are used properly.
   4) Wind Breaks
      a. Install wind barriers as deemed appropriate to protect critical instruments, sensing lines, controllers and piping.
   5) Covers, Enclosures, and Buildings
      a. Install enclosures with heat lamps for identified transmitters.
      b. Missing covers should be installed on valve actuators, damper drives and electrical boxes to prevent from accumulating ice.
      c. Inspect all buildings to ensure windows, doors, fan louvers and any other penetrations are operating correctly and closed to prevent cold air from entering.
      d. Install tarps/plastic enclosures over hotwell openings and stairwells as necessary to prevent warm air from leaving the operating areas.
      e. Inspect and repair as needed all large overhead doors at the station.

D. Supplemental Equipment – Ensure adequate inventories of equipment and other supplies needed to prepare and respond to a severe cold weather event. These items need to be readily available to the staff at the station. Examples of supplemental equipment might include:
   1) Tarps
   2) Portable Space Heaters and Heat Lamps and bulbs
   3) Extension Cords and GFI's

4) Kerosene
5) Propane and Rosebuds
6) Plastic Rolls
7) Lumber for building wind breaks and enclosures
8) Wire Ties
9) Portable Lighting
10) Portable Generators
11) Handheld welding torches
12) Instrumentation Tubing
13) Ice removal chemicals and equipment
14) Blankets
15) Cots
16) Shovels for Snow Removal
17) Cold Weather Personal Protective Equipment (PPE) – Boots, gloves, head socks

E. Operational Supplies – Prior to a severe cold weather event, conduct an inventory of critical supplies needed to keep the plant operational. Coordinate with the Commercial Group at the station to schedule deliveries based on the severity of the event and lead times of the individual items. Examples of Operational supplies might include:
   1) Coal
   2) Oil for Lighters
   3) Hydrogen
   4) CO2
   5) Anhydrous Ammonia
   6) Lime
   7) PAC or other Mercury Control Products
   8) Limestone
   9) Caustic Soda
   10) Sulfuric Acid
   11) Diesel Fuel
   12) Gasoline
   13) Hydrazine
   14) Calibration Gases
   15) Lubricating Oils
   16) Welding Supplies

F. Staffing
   1) Consider enhanced staffing (24x7) during severe cold weather events.
   2) Arrange for on-site lodging and meals as needed.
   3) Arrange for transportation as needed.
   4) Arrange for support and appropriate staffing from substation operations to ensure minimal equipment and lines outages.
   5) Rotate work crews exposed to severe cold weather conditions.
   6) Consider employing the “buddy system” during severe cold weather events to promote personnel safety.

G. Communications
   1) Ensure that appropriate communication protocols are followed during severe cold weather events.
   2) Identify a back-up communication option in case the primary system is not working (i.e. satellite phone).
   3) Ensure that communication is discussed as part of the daily job safety briefing during severe cold weather events.

H. Special Operating Instructions (prior to or during severe cold weather events)
   1) Initiate additional Operator rounds utilizing cold weather checklists to verify critical equipment is protected. Monitor room temperatures.
   2) Test dual fuel capability and ensure adequate fuel supply (where applicable).
   3) Consider pre-warming, early start-up or placing units in service at minimum load prior to forecasted severe cold weather events.
   4) Test run emergency generators prior to severe cold weather events to ensure availability. Review fuel availability.
   5) Place critical auxiliary equipment in service on Cooling Towers, Coal and Limestone conveyor systems and Service Water systems in the Screen House where freezing weather could adversely impact their operation.

References:

1) Reliability Guideline: Generating Unit Winter Weather Readiness – Current Industry Practices, dated August 2013, North American Electric Reliability Corporation (NERC).
2) Seasonal Readiness Guideline, dated December 2014, Electric Power Research Institute (EPRI).

Cold Weather Preparation Guidelines for Generating Stations
Procedure Title
10/01/2015
Effective Date

Required Approval Signature

Jeffrey Fraley, General Manager, Tyrone/E. W. Brown
Print Name & Title
Jeffrey S. Fraley, 10/1/2015
Signature & Date

OPERATIONS COLD WEATHER PROCEDURES

UNIT #1

1. KEEP CHECK ON ECONOMIZER TEMPERATURES. IF TEMPERATURE SHOULD DROP TO 34 DEGREES F, LIGHT BOILER FOR 1/2 HOUR. IF MAINT. IS BEING PERFORMED, DRAIN THE BOILER.
2. AFTER UNIT HAS BEEN OFF FOR 12 HOURS, TAKE BOILER INTERLOCK OUT AND CLOSE THE F.D. FAN DAMPERS.
3. SET UP CIRCULATING WATER SYSTEM WARMING LINE.
4. SET UP SERVICE WATER STRAINERS FOR WINTER OPERATION.
5. CHECK HEATERS OPERATING ON OUTSIDE EQUIPMENT, I.Ds, ETC.
6. ENSURE THE AGITATION WATER VALVE TO THE BOTTOM ASH HOPPER OVERFLOW TANK REMAINS OPEN IF BOTH UNIT 1 &2 ARE BOTH OFF.

UNIT #2

7. KEEP CHECK ON ECONOMIZER TEMPERATURES. IF TEMPERATURE SHOULD DROP TO 34 DEGREES F, LIGHT BOILER FOR 1/2 HOUR. IF MAINT. IS BEING PERFORMED, DRAIN THE BOILER.
8. AFTER UNIT HAS BEEN OFF FOR 12 HOURS, PLACE FD CONTROLS IN MANUAL AND SET AT 0, WHICH SHOULD CLOSE THE OUTLET DAMPER.
9. SET UP HEATING SYSTEM CROSS CONNECTION.
10. SET UP CIRCULATING WATER SYSTEM WARMING LINE.
11. OPEN CONDENSATE OVER-FLOW'S WARMING LINE (UNIT ON).
12. STOP VENT FANS AND CLOSE DAMPERS.
13. SET UP SERVICE WATER STRAINERS FOR WINTER OPERATION. THE OUT OF SERVICE BASKET DRAINS SHOULD BE OPEN.
14. ENSURE THE HEATER IS ON AT CONDENSATE MAKE-UP PUMPS.
15. CHECK HEATERS OPERATING ON OUTSIDE EQUIP. (I.D.s ETC.)
16. CONFIRM 7895 TANK HEATER BREAKER IS CLOSED.
17. CHECK 7895 HEAT TRACE BREAKERS ARE CLOSED
18. CHECK 7895 PUMP BUILING HEATER IS WORKING.
19. CHECK HEATER IN BAP BUILDING IS WORKING.
20. ENSURE THAT EITHER U-1 OR U-2 BOTTOM ASH WATER SUPPLY VALVE REMAINS OPEN WHENEVER BOTTOM ASH IS NOT BEING PULLED.
21. ENSURE THE AGITATION WATER VALVE TO THE BOTTOM ASH HOPPER OVERFLOW TANK

REMAINS OPEN IF BOTH UNIT 1 & 2 ARE OFFLINE.

UNIT #3

22. MONITOR ECONOMIZER TEMPERATURES (KA3173 & KA3174). NOTE: OUTSIDE SUCTION DAMPERS SHOULD BE CLOSED MANUALLY. TURN THE SWITCH OFF AND CRANK DAMPERS CLOSED. OPEN THE INSIDE DAMPERS COMPLETELY.
23. IF ECONOMIZER TEMPERATURE SHOULD DROP TO 34 DEGS F, LIGHT BOILER OFF FOR 1/2 HOUR. IF MAINTENANCE IS BEING PERFORMED, "ECONOMIZER ONLY" COULD BE DRAINED BY CLOSING THE ECONOMIZER RECIRCULATING VALVES AND OPENING THE ECONOMIZER DRAINS.
24. MONITOR EHC FLUID TEMPERATURE - MINIMUM OF 80 DEGREES F.
25. SET-UP CIRCULATING WATER SYSTEM WARMING LINE.
26. SET-UP HEATING SYSTEM CROSS CONNECTION FOR HOUSE HEATING STEAM AND GLYCOL SYSTEM.
27. SET-UP SERVICE WATER STRAINERS FOR WINTER OPERATION.
28. CHECK HEATER AT CONDENSATE MAKE-UP PUMPS.
29. CHECK HEATERS OPERATING ON OUTSIDE EQUIPMENT (I.D.s, ETC.).
30. DO NOT DRAIN COOLING TOWERS UNLESS NECESSARY.
31. IF CIRCULATING WATER SYSTEM IS DRAINED OPEN DRAINS ON CIRCULATING WATER LINES TO BFPs.
32. IF TOWERS ARE DRAINED, OPERATE SUCTION AND DISCHARGE VALVES MANUALLY TO CHECK FOR FREEZING BEFORE OPERATING AUTOMATICALLY.
33. ENSURE THE SBAC COOLING WATER PUMPS HEAT TRACES ARE WORKING.
34. CRACK DRAINS ON BFP DRAINS IF COOLING TOWER REMAINS FULL WITH UNIT OFF LINE.
35. CHECK LOW PRESSURE SERVICE WATER REGULATOR HEAT TRACE AND CHECK THE HEAT IN THE ROOM. WINTERIZE THIS ROOM, PARTICULARLY THE DOOR LEADING OUTSIDE AND THE TRENCH IN WHICH THE BOTTOM ASH LINE RUNS.
36. GET PORTABLE GAS HEATER IN EXTREMELY COLD WEATHER.

***** ALL UNITS *****

37. WALK DOWN UNITS & CLOSE ALL WINDOWS.
38. CLOSE OFF WATER SUPPLY TO ALL PRECIP. HOPPER ROOMS.
39. OPEN VENTS & DRAINS.
40. CAUTION CARD SUPPLY VALVES CLOSED DURING COLD WEATHER.

PJFF

41. CHECK FOR PROPER OPERATION OF ALL HOPPER ROOM SPACE HEATERS
42. CHECK HEAT TRACE FOR SERVICE WATER LINE TO PAC AND PJFF HOPPER ROOM.

FGD

43. CHECK FOR OPERATION OF SW FLOW CONTROL VALVES HEAT TRACE.
44. CHECK SW CROSS TIE DRAIN VALVE HEAT TRACE.
45. CHECK SW PLATFORMS HEAT TRACE.
46. CHECK OPERATION OF MANUAL BLEED TO AUX POND FLUSH OR DRAIN THE LINE.
47. CHECK HEAT TRACE FOR 8034 FEED LINE IN BERM.
48. HOLD CARD THE SERVICE WATER SUPPLY TO THE LIMESTONE HANDLING BELTS AND OPEN THE DRAINS OR HOSE CONNECTIONS ALONG THIS LINE TO THE BULK UNLOADERS.

CCRT

49. ENSURE BOTH CCRT HEAT TRACE PANELS ARE IN AUTO AND TEST CIRCUITS.
50. ENSURE CCRT BUILDING AND SILO UNLOADER R00M HEATERS ARE WORKING.

WINTERIZE INSTRUMENTATION

1) CK. STRIP HTRS. U1, U2, & U3 C.T. LEVEL TRANSMITTERS.
2) CK. STRIP HTRS. ON U3 LPSW TRANS & REGULATOR.
3) CK. STRIP HTRS. ON U3 CIRC. WATER FLOW TRANSMITTER.
4) REPLACE FILTER ELEMENT IN AIR TO NEW DEMINERALIZER FILTER KU# 3004980.
5) CHECK HEAT TRACE AT NOX FLOW TRANS & LINE TO CT SITE.
6) CHECK HEAT TRACE AT U2 BOOSTER PUMP TO CT SITE.
7) CHECK ALL HEAT TRACE AT THE FGD.
8) CHECK ALL HEAT TRACES AT THE PJFF AND PAC SILOS.
9) CHECK ALL HEAT TRACES AT THE CCRT.
10) CHECK ALL HEAT TRACE AT LS PREP.
11) CHECK HEATING AT DIESEL FIRE PUMP HOUSE & MAKE SURE VENTS ARE CLOSED.
12) CHECK HEAT TRACE AT U2 ID FANS.
13) CHECK HEAT TRACE LPSW AT LS UNLOADING.
14) CHECK HEAT TRACE LPSW AT LS STORAGE CONVEYOR.
15) CHECK HEAT TRACE LPSW AT LS RECLAIM CONVEYORS.
16) CHECK HEAT TRACE AT U3 HPSW AT CLA-VAL.
17) CHECK HEAT TRACE LPSW AT U3 HPSW RELIEF VALVES.
18) CHECK HEAT TRACE AT U1 & U3 ID FAN LUBE OIL SKIDS.
19) CHECK PLANT SPACE HEATER MOTORS.
20) CHECK HTG STEAM REGULATOR FOR PROPER OPERATION.
21) CHECK HEAT TRACE FOR DUNCAN'S OFFICE WATER SUPPLY.
22) CHECK HEAT TRACE FOR WATER TO CY DUST COLLECTOR.
23) THIS IS BY WALKOUT DOOR BY LAB (OLD U1 DEMIN AREA).
24) CHECK HEAT TRACE UP ON U3 SCR.
25) CHECK HEAT TRACE ON DOMESTIC WATER LINE COMING INTO PLANT. THIS IS BEHIND TW FILTERS IN TW ROOM - BKR #11 UPSTAIRS.
26) IF REPAIRS ARE NEEDED, WRITE A WORK ORDER.

Cold Weather Preparation Guidelines

For The

Ghent Generating Station

a PPL company

Ghent Station Cold Weather Preparation Guideline
1/04/2016

Purpose:

This document was established as a guideline to aid in maintaining unit reliability during cold weather events at the Ghent Generating Station. It should be used as a framework in developing a cold weather readiness program for the station. The typical problem areas contained in this document are not meant to be all inclusive. This procedure falls under the corporate "Cold Weather Preparation Guidelines For Generating Stations".

Safety

Safety remains the top priority during cold weather events. Job safety briefings should 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.

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 at morning staff meetings prior to any 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 will be developed and maintained at the Ghent Station for seasonal winter preparedness. A master document with appendices and written procedures will be kept in the Records Rooms, Third Floor, of the Ghent Station Administration Building.

The Cold Weather Preparation Procedures should be evaluated annually. After an extreme cold weather event, the procedure should be reviewed in the daily Staff Meeting to evaluate improvement opportunities and identify lessons learned.

a PPL company

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 to consider are;

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.

Communications

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

A. Before a severe cold weather event, Plant Management should communicate 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, the Ghent Station will 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 should conduct an analysis of the event and incorporate lessons learned into their Cold Weather Preparation Procedures.

Elements of a Cold Weather Preparation Procedure

Listed below are key elements of the Ghent Station Cold Weather Preparation Procedure:

A. Work Management System (Maximo)
    1) Review the work management system to ensure adequate annual preventive work orders (PM's) exist for cold weather preparation.
    2) Ensure that all cold weather preparation preventive work orders (PM's) are completed prior to December 1st of each year.
    3) Perform cold weather readiness system walkdowns to identify any deficiencies and issues that will need repair.
    4) 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.

B. Preparation of Critical Instrumentation and Equipment
   1) Check that all critical site specific problem areas have adequate protection to ensure operability during a severe cold weather event. Emphasize the points in the plant where equipment freezing could cause a Unit trip, derate or failure to start. (Refer to Appendix A attached to this document)
   2) Use thermal sensor guns, when situations warrant during extreme cold conditions, to verify areas containing equipment that are in freeze protection enclosures and are critical to plant operations, are being maintained above freezing.

C. Insulation, Heat Trace and Other Freeze Protection
   1) Verify the integrity of the insulation on all critical equipment identified in the Cold Weather Preparation Procedure.
   2) Heat trace reliability and electrical continuity
      a. Perform an evaluation of all heat trace circuits, including power supplies to ensure they maintain their accuracy. (Refer to Appendix C attached to this document).
      b. The evaluation of heat trace and insulation on critical lines should be performed on new installations, during regular maintenance activities or if damaged.
      c. Ensure that any heat trace and insulation removed or disturbed during regular maintenance is replaced and integrity restored.
      d. Check heat tracing on all critical lines and piping during severe cold weather events to ensure that the circuits remain functional. Temperature guns can be used to check piping temperatures.
   3) Heaters, Heat Lamps and Space Heaters
      a. Test operation of all permanently mounted wall heaters. (Refer to Appendix B attached this Document)
      b. All portable space heaters should be tested, repaired and/or replaced as necessary. All portable space heaters are stored in the Ghent Warehouse and at the end of each cold weather season are to be cleaned and returned to the Ghent Warehouse.
      c. Ensure that all portable space heaters and heat lamps are secured in place to prevent unauthorized removal.
   4) Wind Breaks
      a. Install wind barriers as deemed appropriate to protect critical instruments, sensing lines, controllers and piping.
   5) Covers, Enclosures, and Buildings
      a. Install enclosures with heat lamps for identified transmitters.
      b. Missing covers should be installed on valve actuators, damper drives and electrical boxes to prevent from accumulating ice.
      c. Inspect all buildings to ensure windows, doors, fan louvers and any other penetrations are operating correctly and closed to prevent cold air from entering.
      d. Inspect and repair as needed all large overhead doors at the station.

D. Supplemental Equipment – Ensure that the Commercial Group, in October of each year, has an adequate inventory of equipment and other supplies needed to prepare and respond to a severe cold weather event. These items need to be readily available to the staff at the station. Examples of supplemental equipment might include:
   1) Portable Space Heaters and Heat Lamps and bulbs
   2) Extension Cords and GFI's
   3) Kerosene
   4) Propane and Rosebuds
   5) Plastic Rolls
   6) Lumber for building wind breaks and enclosures
   7) Wire Ties
   8) Portable Lighting
   9) Portable Generators
   10) Instrumentation Tubing
   11) Ice removal chemicals and equipment
   12) Blankets
   13) Cots
   14) Shovels for Snow Removal
   15) Cold Weather Personal Protective Equipment (PPE) – Boots, gloves, head socks
   16) MRE's
   17) Additional Heat Trace

E. Operational Supplies – Prior to a severe cold weather event, ensure that a full inventory of critical supplies needed to keep the plant operational are on site. Coordinate with the Commercial Group at the station to schedule deliveries based on the severity of the event and lead times of the individual items. Operational supplies that are critical to the plant cold weather include:
   1) Coal
   2) Oil for Igniters/Oil Guns
   3) Hydrogen
   4) CO2
   5) Anhydrous Ammonia
   6) Lime
   7) PAC or other Mercury Control Products
   8) Limestone – Clean Stone
   9) Caustic Soda
   10) Sulfuric Acid
   11) Diesel Fuel
   12) Gasoline

F. Staffing
   1) Consider enhanced staffing (24x7) during severe cold weather events.
   2) Arrange for on-site lodging and meals as needed.
   3) Arrange for transportation as needed.
   4) Rotate work crews exposed to severe cold weather conditions.
   5) Consider employing the "buddy system" during severe cold weather events to promote personnel safety.

G. Communications
   1) Review emergency communication protocols prior to annual cold weather season.

H. Special Operating Instructions (prior to or during severe cold weather events)
   1) Initiate additional Operations coverage during cold weather events to verify critical equipment is protected.
   2) Test run emergency generators prior per normal protocol.
   3) Place critical auxiliary equipment in service on Cooling Towers, Coal and Limestone conveyor systems and Service Water systems in the Screen House where freezing weather could adversely impact their operation.

References:

1) Reliability Guideline: Generating Unit Winter Weather Readiness – Current Industry Practices, dated August 2013, North American Electric Reliability Corporation (NERC).
2) Seasonal Readiness Guideline, dated December 2014, Electric Power Research Institute (EPRI).

Yearly Follow-up Recommendations

Listed below are items that should be considered prior to the cold weather season or after a cold weather event to ensure the Ghent Station's cold weather preparedness:

1) Consider holding a cold weather readiness meeting on an annual basis to highlight preparations and expectations for severe cold weather.
2) Operations personnel should review cold weather scenarios affecting instrumentation readings, alarms, and other indications on plant control systems.
3) Ensure appropriate NERC Generation Availability Data Systems (GADS) coding for unit derates or trips as a result of a severe cold weather event to promote lessons learned, knowledge retention, and consistency. Examples include NERC GADS code 9036 "Storms (ice, snow, etc.)" or code 9040 "Other Catastrophe."

COLD WEATHER PROBLEM AREAS FOR THE GHENT GENERATION STATION

Listed below are the areas around the Ghent Station that are considered areas of concern during a severe cold weather incident:

- Unit-1 FGD:
  - Unit-1 FGD Oxidation Air Blower Radiators – Construct tent and set salamander heaters in place to help control the 1-1/1-2 Oxidation Air Blower oil temperatures.
- Unit-1/2 Low Pressure Water Pier:
  - 1-1, 1-2, and 1-3 Traveling Water Screens Backwash Water to each screen
  - Traveling Water Screens Backwash Strainer and backwash piping
  - 1-1, 1-2, and 2-1 LPSW Pumps Vent Valves
  - 1-1, 1-2, and 2-1 LPSW Pumps Pre-Lube and Quenching Water Lines.
- Unit-1 Cooling Tower
  - 1-1 and 1-2 Circulating Water Pump Lube Water Lines
  - The space heaters inside U-1 Circulating Water Pump Lube Water Building
  - Diesel Fire Pump is winterized and Battery Charger operational
  - Unit-1 Cooling Tower Level Transmitters
- Unit-1 Diesel Generator
  - The Unit-1 Diesel Generator is winterized
  - Unit-1 Diesel Generator Battery Charger operational
  - Space Heaters in Unit-1 Diesel Generator Room functioning
- Unit-2 Cooling Tower
  - 2-1 and 2-2 Circulating Water Pumps Lube Water Lines
  - Unit-2 Cooling Tower Level Transmitters
- Unit-2 Diesel Generator
  - The Unit-2 Diesel Generator is winterized
  - Unit-2 Diesel Generator Battery Charger is operational
  - Space Heaters in the Unit-2 Diesel Generator Room functioning
- Unit-3/4 Low Pressure Water Pier
  - 3-1, 3-2, and 4-1 Traveling Water Screens Backwash Water to each screen
  - Traveling Water Screens Backwash Strainer and backwash piping
  - 3-1, 3-2, and 4-1 LPSW Pumps Vent Valves
  - 3-1, 3-2, and 4-1 LPSW Pumps Pre-Lube and Quenching Water Lines
  - Space Heaters in the Unit-3/4 LPSW Pump Lube Water Building
- Unit-3 Cooling Tower

  - 3-1 and 3-2 Circulating Water Pump Lube Water Lines
  - The space heaters inside U-3 Circulating Water Pump Lube Water Building
  - Unit-3 Cooling Tower Level Transmitters

- Unit-3 Diesel Generator
  - The Unit-3 Diesel Generator is winterized
  - Unit-3 Diesel Generator Battery Charger operational
  - Space Heaters in Unit-3 Diesel Generator Room functioning
- Unit-4 Cooling Tower
  - 4-1 and 4-2 Circulating Water Pump Lube Water Lines
  - The space heaters inside U-4 Circulating Water Pump Lube Water Building
  - Unit-4 Cooling Tower Level Transmitters
- Unit-4 Diesel Generator
  - The Unit-4 Diesel Generator is winterized
  - Unit-4 Diesel Generator Battery Charger operational
  - Space Heaters in Unit-4 Diesel Generator Room functioning
- Unit-1, Unit-2, Unit-3, and Unit-4 FGDs
  - Limestone Slurry Supply Piping to each of the above Unit FGDs
- Gypsum Tank Farm
  - Enclosure around the Gypsum Transfer Pumps
- CCR
  - Gypsum Supply Pipe Line Sump area
- Coal Handling
  - Conveyor Belt Sprays are full and operational
- Main Buildings
  - All Rolling Door Operators are functioning correctly
  - All Window Operators where applicable are operational
  - Check all space heaters are operating correctly

Cold Weather Preparation Guidelines

For The

Mill Creek Generating Station

Mill Creek Station Cold Weather Preparation Guideline
12/04/2016

Purpose:

This document was established as a guideline to aid in maintaining unit reliability during cold weather events at the Mill Creek Generating Station. It should be used as a framework in developing a cold weather readiness program for the station. The typical problem areas contained in this document are not meant to be all inclusive. This procedure falls under the corporate "Cold Weather Preparation Guidelines For Generating Stations".

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

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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 at morning staff meetings prior to any 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 will be developed and maintained at the Mill Creek Station for seasonal winter preparedness. A master document with appendices and written procedures will be kept in the Records Rooms, Third Floor, of the Mill Creek Station Administration Building.

The Cold Weather Preparation Procedures should be evaluated annually. After an extreme cold weather event, the procedure should be reviewed in the daily Staff Meeting to evaluate improvement opportunities and identify lessons learned.

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 to consider are;

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.

Communications

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

A. Before a severe cold weather event, Plant Management should communicate 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, the Mill Creek Station will 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 should conduct an analysis of the event and incorporate lessons learned into their Cold Weather Preparation Procedures.

Elements of a Cold Weather Preparation Procedure

Listed below are key elements of the Mill Creek Station Cold Weather Preparation Procedure:

A. Work Management System (Maximo)
    1) Review the work management system to ensure adequate annual preventive work orders (PM's) exist for cold weather preparation. These PM's for the Mill Creek Station are detailed in Appendix A.
    2) Ensure that all cold weather preparation preventive work orders (PM's) are completed prior to December 1st of each year.
    3) Perform cold weather readiness system walkdowns to identify any deficiencies and issues that will need repair.

4) 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.

B. Preparation of Critical Instrumentation and Equipment
   1) Check that all critical site specific problem areas have adequate protection to ensure operability during a severe cold weather event. Emphasize the points in the plant where equipment freezing could cause a Unit trip, derate or failure to start. (Refer to Appendix B attached to this document)
   2) Use thermal sensor guns, when situations warrant during extreme cold conditions, to verify areas containing equipment that are in freeze protection enclosures and are critical to plant operations, are being maintained above freezing.

C. Insulation, Heat Trace and Other Freeze Protection
   1) Verify the integrity of the insulation on all critical equipment identified in the Cold Weather Preparation Procedure.
   2) Heat trace reliability and electrical continuity
      a. Perform an evaluation of all heat trace circuits, including power supplies to ensure they maintain their accuracy. (Refer to Appendix C attached to this document).
      b. The evaluation of heat trace and insulation on critical lines should be performed on new installations, during regular maintenance activities or if damaged.
      c. Ensure that any heat trace and insulation removed or disturbed during regular maintenance is replaced and integrity restored.
      d. Check heat tracing on all critical lines and piping during severe cold weather events to ensure that the circuits remain functional. Temperature guns can be used to check piping temperatures.
   3) Heaters, Heat Lamps and Space Heaters
      a. Test operation of all permanently mounted Yard wall heaters and HVAC Units. (Refer to Appendix D attached this Document)
      b. All portable space heaters should be tested, repaired and/or replaced as necessary. All plant and FGD portable space heaters are stored in the Mill Creek Unit 2 Basement NE corner. Limestone heaters are stored in the Limestone building. At the end of each cold weather season all space heaters are to be cleaned and returned to their respective areas.
      c. Ensure that all portable space heaters and heat lamps are secured in place to prevent unauthorized removal.
   4) Wind Breaks
      a. Install wind barriers as deemed appropriate to protect critical instruments, sensing lines, controllers and piping.
   5) Covers, Enclosures, and Buildings
      a. Install enclosures with heat lamps for identified transmitters.
      b. Missing covers should be installed on valve actuators, damper drives and electrical boxes to prevent from accumulating ice.
      c. Inspect all buildings to ensure windows, doors, fan louvers and any other penetrations are operating correctly and closed to prevent cold air from entering. (Refer to Appendix E attached to this Document).

d. Inspect and repair as needed all large overhead doors at the station.

D. Supplemental Equipment – Ensure that the Commercial Group, in October of each year, has an adequate inventory of equipment and other supplies needed to prepare and respond to a severe cold weather event. These items need to be readily available to the staff at the station. Examples of supplemental equipment might include:
   1) Portable Space Heaters and Heat Lamps and bulbs
   2) Extension Cords and GFI's
   3) Kerosene
   4) Propane and Rosebuds
   5) Plastic Rolls
   6) Lumber for building wind breaks and enclosures
   7) Wire Ties
   8) Portable Lighting
   9) Portable Generators
   10) Instrumentation Tubing
   11) Ice removal chemicals and equipment
   12) Blankets
   13) Cots
   14) Shovels for Snow Removal
   15) Cold Weather Personal Protective Equipment (PPE) – Boots, gloves, head socks
   16) MRE's
   17) Additional Heat Trace

E. Operational Supplies – Prior to a severe cold weather event, ensure that a full inventory of critical supplies needed to keep the plant operational are on site. Coordinate with the Commercial Group at the station to schedule deliveries based on the severity of the event and lead times of the individual items. Operational supplies that are critical to the plant cold weather include:
   1) Coal
   2) Hydrogen
   3) CO2
   4) Anhydrous Ammonia
   5) Lime
   6) PAC or other Mercury Control Products
   7) Limestone – Clean Stone
   8) Caustic Soda
   9) Sulfuric Acid
   10) Diesel Fuel
   11) Gasoline

F. Staffing
   1) Consider enhanced staffing (24x7) during severe cold weather events.
   2) Arrange for on-site lodging and meals as needed.
   3) Arrange for transportation as needed.
   4) Rotate work crews exposed to severe cold weather conditions.

5) Consider employing the "buddy system" during severe cold weather events to promote personnel safety.

G. Communications
   1) Review emergency communication protocols prior to annual cold weather season.

H. Special Operating Instructions (prior to or during severe cold weather events)
   1) Initiate additional Operations coverage during cold weather events to verify critical equipment is protected.
   2) Test run emergency generators prior per normal protocol.
   3) Place critical auxiliary equipment in service on Cooling Towers, Coal and Limestone conveyor systems and Service Water systems in the Screen House where freezing weather could adversely impact their operation.

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2) Seasonal Readiness Guideline, dated December 2014, Electric Power Research Institute (EPRI).

Yearly Follow-up Recommendations

Listed below are items that should be considered prior to the cold weather season or after a cold weather event to ensure the Mill Creek Station's cold weather preparedness:

1) Consider holding a cold weather readiness meeting on an annual basis to highlight preparations and expectations for severe cold weather.
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Mill Creek - Cold Weather Winterization – PM Work Orders:

PM-Annual - Cold Weather Winterization Efforts for Operations: See Long Description

- **Perform Winterization Procedures below as necessary:**
- 1. Ensure all exterior doors to the plant are operational
- 2. Place covers over all hotwell openings on the main floor
- 3. Place covers over all stairwell openings on the main floor
- 4. Open the boiler heat release doors to circulate heated air
- 5. Open the boiler lower vestibule doors on each unit to introduce heated air to the mezz and basement areas
- 6. Crack open low point drains on piping air systems.
- 7. Any equipment that has the potential to freeze will be placed in the recirculation mode or left in service
- 8. Any equipment that has the potential to freeze and that cannot be left in service or recirculated will be removed from service and drained
- 9. Operations will use torpedo type space heaters to prevent equipment from freezing when the temperature inside the plant drops below freezing. Will maintain fuel oil for space heaters.
- 10. Operations to monitor outside air temperature.
- 11. Operations to maintain shovels and food.
- 12. 1&2 Absorber Level Backup Service Water Line - 12" Service Water Supply out of Unit 1 needs to be isolated and drained when not in use during cold weather. Isolation is located behind Unit 1&2 Plant Flyash Filter Separator and at the new WFGD where it intersects with the Clearwell Supply on the new pipe rack.
- 13. 3 ID Fans Oil Cooler cold weather operations - crack bypass

PM-Annual - Cold Weather Winterization Efforts for Coal Handling: See Long Description

- **Perform Winterization Procedures Below as necessary:**
- 1. Supplies: Salt and sand for roadways.
- 2. Supplies: De-icing fluid.
- 3. Procedures: Coal Handling mobile equipment.
- 4. Procedures: Cold weather operation procedures.

PM-Annual - Cold Weather Winterization Efforts for 1-4 WFGD: See Long Description

Perform Winterization Procedures Below as necessary:

- Building Preparation: Installation of temporary structures (wind breaks) w/ heat lamps, ext. cords & GFI's.
- 1. 3A & 3B Reactant Feed Valves
- 2. 1&2 FDG Sample Sink area.
- 3. 4 FGD Sample Sink area.
- 4. Equipment: Rosebuds and propane tanks.

Cold Weather Winterization – Work Orders:

PM-Annual - Cold Weather Winterization, Control Instrumentation 1-4 Plant and all 1/2 WFGD:

Perform Winterization Procedures below as necessary:

- 1. Verify all heat trace on all control instrumentation Unit 1-4.
- 2. Check operation of heat trace in 1/2 WFGD/AQS structures.
- 3. Check heaters in WFGD/AQS structures.
- 4. RO Building (5) Wall Mounted Heaters - Check water lines (chemical freezes at 59 degrees).

PM-Annual - Cold Weather Winterization Efforts for I/E 1-4 Plant and 3&4 WFGD:

Perform Winterization Procedures Below as necessary

Unit 3 &4 WFGD:

- 1. Building Preparation: Testing and repairing of building heaters
- 2. Piping: Heat trace repaired / replaced and tested.

Unit 1-4 Plant:

- 1. 1-4 Plant Flyash Blower Cooling Water Line - Check heat trace and make sure lines are insulated.
- 2. Unit 2 and 3&4 Cooling Tower Service Building Safety Showers - Check heat trace and make sure lines are insulated.
- 3. Unit 2 and 3&4 Cooling Tower Service Building Heaters - Check water lines (freezes at 32 degrees).
- 4. Screen Well Brominator Room Wall Mount Heater - Check water lines (freezes at 32 degrees).
- 5. Unit 3 Sodium Format Tank - Check heat trace and make sure lines are insulated (chemical freezes at 59 degrees)
- Note: Write work orders as necessary for any insulation repairs**.**

PM-Annual - Cold Weather Winterization Efforts for I/E Limestone, CH & GPP. Perform Winterization Procedures Below as necessary: Note: Any insulation repairs - write work orders.

Limestone:

- 1. Reactant Feed Reference Line pressure flow - Heat lamps w/ GFI's.
- 2. Limestone Pit Heaters - Make sure they are working.

Coal Handling:

- 1. CH Supply Pump Reference Line Transmitters - Check heat trace and install as necessary.

GPP:

- . Print out Linked Document and inspect all items on list for Heaters and Heat Trace.

Pipe Chase:

- 1. City Water Line in Old Pipe Chase - Check indicator light and heat trace - working.

PM-Annual - Cold Weather Winterization Efforts for Insulation:

Perform Winterization Procedures Below as necessary:

- 1. Piping: Insulation repair and replacement

Appendix B

COLD WEATHER PROBLEM AREAS FOR THE MILL CREEK GENERATION STATION

Listed below are the areas around the Mill Creek Station that are considered areas of concern during a severe cold weather incident and where space heaters are typically used:

- Screen House
  - Screen Wash Booster Pump
  - Station Air Supply Trap @ Main Floor
- Fire System
  - #1 Fire Pump/Booster Pump/Jockey Pump
  - #2 Fire Pump
  - #3 Fire Pump
  - City water header @ 2A ID fan NE Corner
  - Reserve Transformers Deluge Valves
- Instrument Air System
  - #1 & 2 Pall Air Dryers
  - #3 & 4 Pall Air Dryers
- Make up Pumps
  - Unit 1 Makeup Pumps
  - Unit 2 Makeup Pumps
  - Unit 3 Makeup Pumps
  - Unit 4 Makeup Pumps

Cold Weather Preparation Guidelines

For

Trimble County Generating Station

3/23/16

Purpose:

This document was established as a guideline to aid in maintaining unit reliability during cold weather events at the Trimble County Generating Station. This document was used as a framework in developing a cold weather readiness program for the station. The list of suggestions and typical problem areas contained in this document is not meant to be all inclusive. A detailed cold weather Operating procedure can be found in the operations library.

Safety

Safety remains the top priority during cold weather events. Job safety briefings should 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.

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 and at morning staff meetings.
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. Follow up with the following Trimble County Managers:

    a. **General Manager –** Jeff Joyce (502-627-6409)
    b. **Manager Production –** Mike Buckner (502-627-6206)
    c. **Manager Maintenance – Power Generation –** Larry Byrd (502-627-6202)
    d. **Manager Engineering and Technical Services –** Laura Mohn (502-627-6070)

Processes and Procedures

A cold weather preparation procedure including checklists has been developed and is maintained at Trimble County station for seasonal winter preparedness. A master document with written procedures is maintained in the Operations Library and Training department 5th floor.

After an extreme cold weather event, the procedure should be reviewed to evaluate improvement opportunities and identify lessons learned. Needed changes to procedures including lessons learned should be communicated to the Training Department personnel at the station so proper revisions can be made.

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 to consider are;

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.

Communications

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

A. Before a severe cold weather event, Plant Management should communicate 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, Trimble County Operations staff will 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 the Cold Weather Operating Procedures.

Elements of a Cold Weather Preparation Procedure

Listed below are key elements of a cold weather preparation procedure that should be addressed at the Trimble County station. This is not an all-inclusive list. Each station should review their plant design and configuration, identify areas with potential exposure to the elements and ambient temperature, and tailor their plans to address them accordingly.

A. Work Management System (Maximo)
   1) Review the work management system to ensure adequate annual preventive work orders (PM's) exist for cold weather preparation.
   2) Ensure that all cold weather preparation preventive work orders (PM's) are completed prior to the onset of the winter season.
   3) Perform cold weather readiness system walkdowns to identify any deficiencies and issues that will need repair.
   4) 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.
   5) Ensure that all modifications and construction activities are performed such that the changes maintain cold weather readiness for the station.

B. Preparation of Critical Instrumentation and Equipment
   1) Check that all critical site specific problem areas have adequate protection to ensure operability during a severe cold weather event. Emphasize the points in the plant where equipment freezing could cause a Unit trip, derate or failure to start.
   2) Thermometers will be 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
   1) Verify the integrity of the insulation on all critical equipment identified in the Cold Weather Preparation Procedure.
   2) Heat trace reliability and electrical continuity
      a. Perform a complete evaluation of all heat trace circuits, including power supplies to ensure they maintain their accuracy. (Refer to TC Cold Weather Operating Procedures)
      b. The evaluation of heat trace and insulation on critical lines should be performed on new installations, during regular maintenance activities or if damaged.
      c. Ensure that any heat trace and insulation removed or disturbed during regular maintenance is replaced and integrity restored.
      d. Check heat tracing on all critical lines and piping during severe cold weather events to ensure that the circuits remain functional. Temperature guns can be used to check piping temperatures.
   3) Heaters, Heat Lamps and Space Heaters
      a. Test operation of all permanently mounted wall heaters.
      b. All portable space heaters should be tested, repaired and/or replaced as necessary.
      c. Ensure that all portable space heaters and heat lamps are secured in place to prevent unauthorized removal.
      d. Evaluate plant electrical circuits for adequate load capacity and ensure that Ground Fault Interrupters (GFI's) are used properly.

4) Wind Breaks
    a. Install wind barriers as deemed appropriate to protect critical instruments, sensing lines, controllers and piping.
5) Covers, Enclosures, and Buildings
    a. Install enclosures with heat lamps for identified transmitters.
    b. Missing covers should be installed on valve actuators, damper drives and electrical boxes to prevent from accumulating ice.
    c. Inspect all buildings to ensure windows, doors, fan louvers and any other penetrations are operating correctly and closed to prevent cold air from entering.
    d. Install tarps/plastic enclosures over hotwell openings and stairwells as necessary to prevent warm air from leaving the operating areas.
    e. Inspect and repair as needed all large overhead doors at the station.

D. Supplemental Equipment – Ensure adequate inventories of equipment and other supplies needed to prepare and respond to a severe cold weather event. These items need to be readily available to the staff at the station. Examples of supplemental equipment might include:
    1) Tarps
    2) Portable Space Heaters and Heat Lamps and bulbs
    3) Extension Cords and GFI's
    4) Kerosene
    5) Propane and Rosebuds
    6) Plastic Rolls
    7) Lumber for building wind breaks and enclosures
    8) Wire Ties
    9) Portable Lighting
    10) Portable Generators
    11) Handheld welding torches
    12) Instrumentation Tubing
    13) Ice removal chemicals and equipment
    14) Blankets
    15) Cots
    16) Shovels for Snow Removal
    17) Cold Weather Personal Protective Equipment (PPE) – Boots, gloves, head socks

E. Operational Supplies – Prior to a severe cold weather event, conduct an inventory of critical supplies needed to keep the plant operational. Coordinate with the Commercial Group at the station to schedule deliveries based on the severity of the event and lead times of the individual items. Examples of Operational supplies might include:
    1) Coal
    2) Oil for Lighters
    3) Hydrogen
    4) CO2
    5) Anhydrous Ammonia
    6) Lime
    7) PAC or other Mercury Control Products

8) Limestone
9) Caustic Soda
10) Sulfuric Acid
11) Diesel Fuel
12) Gasoline
13) Calibration Gases
14) Lubricating Oils
15) Welding Supplies

F. Staffing
1) Consider enhanced staffing (24x7) during severe cold weather events.
2) Arrange for on-site lodging and meals as needed.
3) Arrange for transportation as needed.
4) Rotate work crews exposed to severe cold weather conditions.
5) Consider employing the "buddy system" during severe cold weather events to promote personnel safety.

G. Communications
1) Ensure that appropriate communication protocols are followed during severe cold weather events.
2) Identify a back-up communication option in case the primary system is not working (i.e. satellite phone).
3) Ensure that communication is discussed as part of the daily job safety briefing during severe cold weather events.

H. Special Operating Instructions (prior to or during severe cold weather events)
1) Initiate additional Operator rounds utilizing cold weather checklists to verify critical equipment is protected. Monitor room temperatures.
2) Consider pre-warming, early start-up or placing units in service at minimum load prior to forecasted severe cold weather events.
3) Test run emergency generators prior to severe cold weather events to ensure availability. Review fuel availability.
4) Place critical auxiliary equipment in service on Cooling Towers, Coal and Limestone conveyor systems and Service Water systems in the Screen House where freezing weather could adversely impact their operation.

References:

1) Reliability Guideline: Generating Unit Winter Weather Readiness – Current Industry Practices, dated August 2013, North American Electric Reliability Corporation (NERC).
2) Seasonal Readiness Guideline, dated December 2014, Electric Power Research Institute (EPRI).

Yearly Follow-up Recommendations

Listed below are items that should be considered prior to the cold weather season or after a cold weather event to ensure the Trimble Station's cold weather preparedness:

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