Latest Revision Approval:

Written By: NAES Corp Date: December 19, 2014

Approved By: Andy Duncan Date: March 31, 2022

REVISION HISTORY LOG				
Rev.	**Date**	**Description**	**By Initials**	**Approval Initials**
-	12/19/14	Initial Release		
1	03/09/15	Quail Run Addition		
2	03/31/22	Review vs updated TAC 25.53 requirements	ECN	AD

1. INTRODUCTION

This Plant Emergency Plan shall be followed by NAES Plant personnel to respond to an Emergency Water Shortage.

Quail Run Energy Center utilizes city water for makeup water to the Cooling Towers and Raw Water Tank supply.

Quail Run also has a fresh water pond, Pond C, that can be used to make up to the cooling towers. Pond C receives well water from the a system of wells located on the site property. Pond water would not normally be used to supply the Raw Water Tanks due to the potentially to rapidly foul the RO membranes.

2. PURPOSE

This plan is designed to provide an action plan for a potential or actual loss of the plant's source of water. The focus of the plan is to ensure generation capability to support grid reliability. Economic factors will also be considerations, but are not covered in this plan.

3. OBJECTIVE

Water is a necessity for the operation of any power plant. Water is used for cooling and for steam generation. The cooling tower is the equipment that typically uses the most water in any power plant. The inability to cool process steam or lube oil will require a plant to shut down or reduce load. This plan will address ways to deal with a shortage of water for both cooling and steam production.

4. REFERENCE POLICIES

Substantive Rules Applicable to Electric Service Providers PUCT §25.53

PEP-004 Hot Weather Plan

PEP-007 Severe Weather Plan

5. PLANT PREPARATORY ACTIONS

One of the most valuable resources to a facility that is facing a shortage of water is an alternate source of water. Most facilities are not designed with redundant water sources. If a facility does have an alternate source of water, the first response, when faced with a water shortage, would be to shift to the alternate source of water.

The following preparatory actions should be taken when the site is aware that there will or may be a shortage or water supply to the facility:

A. **REFERENCE** procedures PEP-004 Hot Weather Plan, and PEP-007 Severe Weather Plan for general guidelines on drought conditions.

B. **REFERENCE** Attachment-A Drought Condition Operation Memorandum. The actions in this memo give parameters to decrease cooling tower blowdown, turn off foggers, and decrease HRSG blowdown to increase run time.

C. Discuss with Chemtreat the options to operate outside of normal chemistry parameters if the facility generation is needed. Discuss options listed in Attachment-A Drought Condition Operation Memorandum

D. **CONTACT** the City of Odessa water division at 432-335-4634 to ensure emergency contingency plans for the site run season.

E. If notified there will be a city water outage or reduction in city water supply, the site will need to determine if it can run using a combination of Pond C water and city water supply.

   1. Consider the following:

      a. Filling C pond as much as possible prior to the reduction / outage.

      b. Maintain Raw Water tank level as full as possible prior to the reduction / outage.

      c. Maintain Demin Tank level as full as possible prior to the reduction / outage

      d. Discuss / consider running only one block to reduce water consumption rate based on the duration of reduction / outage.

      e. If a full city water outage is expected, the plant typically would not run. Supplying Pond C water to Raw Water Tank would cause rapid fouling of the RO membranes. Discussions based on generation need would need to be made if there is a desire to run with C pond supplying the Raw Water system. Spare RO membranes would need to be considered. Coordinate with Chemtreat to obtain chemistry samples and any additional methods to assist.

F. **INFORM** management, dispatch, and asset management of any risk to generation

6. PLANT RESPONSE ACTIONS

In the event the facility is faced with an imminent shortage of water, the following actions should be taken as applicable:

A. Line up cooling tower makeup from Pond C. If Pond C is the primary source of water, communicate with dispatch the option to run a single block to extend run time.

B. Implement the recommendations listed in Attachment-A Drought Condition Operation Memorandum as applicable after consulting with Chemtreat to reduce cooling tower and plant blowdown to maintain in chemistry limits

C. Monitor pond C volume.

D. Increase grab samples on tower chemistry 4 times per shift while units are running if operating outside of normal chemistry parameters.

E. Coordinate daily with Chemtreat to ensure site needs are supported

F. INFORM management, dispatch, and asset management of any risk to generation

G. If there is a loss of city water supply, discuss with plant management and chemtreat the option to supply Pond C water as makeup to the Raw Water system. Note that this could rapidly foul the RO membranes and run time could be limited.

7. RECOVERY ACTIONS

A. Once the water shortage is over, restore plant water reserves to normal.

B. If the plant was shut down due to the water shortage, restore the plant to operation as directed by dispatch and plant management.

ATTACHMENT A

Memorandum

TECHNICAL & SUPPORT SERVICES DEPARTMENT

Lab Services Section

TO: **Phillip Neal [Quail Run Energy Center]**
FROM: **Michael Daycock**
SUBJECT: **Drought Condition Operation**
DATE: **April 30, 2012**

INTRODUCTION

T&SS Process Chemistry Group was requested to provide information regarding operation of a plant during a drought condition. The following report details options for reducing water usage, along with risks and potential risk mitigation associated with each option. The exact numbers are considered to be estimates in order to contrast the benefit of increased run time with the risks of each option.

The primary user of water, cooling tower evaporation, is NOT controllable. Therefore, options for decreasing water usage have a marginal impact on total run time.

SUMMARY/DISCUSSION

DECREASE COOLING TOWER BLOWDOWN

Decreasing cooling tower blowdown to approximately 275 GPM (combined flow from two towers) can add approximately 9 hours of run time to the current mode of operation. The limit on cycles of concentration of 11.8 is required to stay within the Title V Air permit requirements of 12,000 PPM TDS (Approximately 16,000 µS/cm conductivity). The following chart, **Table 1**, is based on the following:

- 10 million gallon volume in C-Pond
- No water available from Texland or City water
- Evaporation rate taken from “QREC Base Water Balance v13”
- C-Pond conductivity of 1,350 µS/cm.
- All 4 units running

ATTACHMENT A (cont'd)

Table 1. Normal and drought operation flow rates around cooling tower (approximate)

Normal Operations		Drought Operations	
Current Makeup Rate GPM	3841	New Makeup Rate GPM	3156
Evaporation from Towers GPM	2881	Evaporation from Towers GPM	2881
Cycles fo Concentration	**4.0**	**Cycles of Concentration**	**11.5**
Blowdown GPM	960	Blowdown GPM	275
Run Time on C-Pond Hrs	43.4	Run Time on C-Pond Hrs	52.8
Adititional Run Hours	**9.4**		

Note: Max cycles of concentration is 11.8 based on Air Permit

RISK MITIGATION OPTIONS

1. Increase feed rate of polymer dispersant/corrosion inhibitor and silica inhibitor (triple current setpoints)

TURN OFF FOGGERS

Foggers at the inlet of the combustion turbine use demineralized water. Turning off foggers can reduce water usage by approximately 100 GPM. Reducing water usage by 100 GPM will increase operating time by 1-2 hours. There are no risks to equipment associated with this option.

DECREASE HRSG BLOWDOWN

Decreasing HRSG blowdown generally will not increase operating time. All blowdown water from HRSG's is routed to the cooling tower, which decreases water requirements for the cooling tower. It is expected that the operating time gain from decreasing HRSG blowdown is negligible, and it is not recommended.

NAES	PLANT EMERGENCY PLANS	
Number: **PEP-007**	Subject: **Severe Weather Response including Hot and Cold Weather Emergencies**	
Approved for use by:	Current Issue: **Rev 3**	Issue Date: **November 23, 2022**
Prepared by NAES Corporation		

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APPENDICES

NA

Latest Revision Approval:
Written By: NAES Corp Date: December 19, 2014

Approved By: Andy Duncan Date: March 31, 2022

REVISION HISTORY LOG

Rev.	Date	Description	By Initials	Approval Initials
-	12/19/14	Initial Release		
1	03/09/15	Quail Run Addition		
2	03/31/22	Review vs updated TAC 25.53 requirements	ECN	AD
3	11/23/22	Updates to Incorporate Hot and Cold Weather Response	ECN	AD

1. INTRODUCTION

The instructions in this Plant Emergency Plan for Severe Weather (PEP-007) shall be followed by NAES personnel to implement the actions required to prepare for and respond to severe weather events. Only the most recently approved revision of this document shall be used.

Advanced planning and verification of site readiness prior the arrival of a Severe Weather Event can greatly reduce the impact of such an event on both personnel and facility equipment.

2. PURPOSE

The Severe Weather Plan is a plan to guide activities required to prepare for severe weather conditions such as Thunderstorms, Tornadoes, and Hurricanes, and other weather events. The focus of this plan is on maintaining personnel safety and facility reliability and during severe weather events.

3. OBJECTIVE

It is the responsibility of NAES personnel to develop and implement a robust Severe Weather Plan to maintain the readiness and reliability of this facility during periods of severe weather. This plan should be reviewed periodically to incorporate industry best practices and lessons learned for continuous improvement.

4. TERMS AND DEFINITIONS

Heat Stress Stay Time Limit - The Recommended Work Time Limit/ Maximum Work Time Limit employees may work in a heat stress environment. Refer to QR-SMP-023 Heat Stress procedure.

High Winds – Any consistent winds in excess of 40 mph.

OCN – ERCOT describes an OCN as "the first of four levels of communication issued in anticipation of a possible Emergency Condition," or "an operating condition in which the safety or reliability of the ERCOT System is compromised or threatened."

Thunderstorm - Storm that can produce hail 0.75 inch in diameter or larger and / or wind gusts to 58 mph. Excessive rainfall may cause localized flooding.

Tornado Watch – Conditions are right for tornados to form AND tornados are possible. Watch the sky AND monitor weather websites (http://www.nhc.noaa.gov/ AND / OR www.weather.com are good choices) for more information.

Tornado Warning – A tornado has been sighted OR indicated by weather radar.

Winter Storm Watch – A Winter Storm is possible in the specified area.

Winter Storm Warning – A Winter Storm is imminent in the specified area.

Drought Condition – defined by the delicate balance between water supply and demand. Whenever human demands for water exceed the natural availability of water, the result is drought.

5. REFERENCE POLICIES

Texas Administrative Code §25.53 Electric Service Emergency Operating Plans

Texas Administrative Code §25.55 Weather Emergency Preparedness

ERCOT Nodal Protocols Section 3: Management of Activities for the ERCOT System 3.21

6. POTENTIALLY SEVERE WEATHER EVENT IDENTIFICATION

In the event of impending severe weather, the Control Room Operator will monitor the local emergency weather broadcast. The Plant Manager or designee shall be notified. If the Plant Manager cannot be contacted, the most senior onsite Supervisor/Manager shall determine the appropriate action.

The safety of on-site personnel will be the primary concern, and the protection of facility equipment will be considered as well.

Plant management shall try to be on-site to determine appropriate action. When the possibility of severe weather exists, all on-site personnel and contractors should be informed. This makes it easier to muster personnel if the need arises.

For hot and cold weather emergencies, this procedure should be used in conjunction with PEP-003 Cold Weather Plan and PEP-004 Hot Weather Plan as applicable.

7. HIGH WINDS

A. Monitor approaching storm on available weather sources (radio, internet, mobile device, etc) Keep all plant personnel informed of status.

B. Perform a site walk down securing or removing loose metal, wood, or other material in outdoor areas which could be picked up by strong winds.

C. Perform a site walk down to ensure that gas bottles are properly secured.

D. Inspect integrity of any trailers and enclosure tie-downs on site.

E. Secure any empty drums or move to storage area.

F. Evaluate scheduled work for potential postponement.

G. Secure all plant doors leading to the outside of the plant. Ensure no doors are in the open position.

H. Verify communications equipment is adequate and functioning.

I. Secure or remove loose materials in all outside areas (high line yards, roofs etc.) that have the potential to become windblown or airborne.

J. Check all transformer and switchyard breakers control panels doors are closed and mechanically sealed (i.e. latched closed).

K. Consider halting all outdoor crane and/or rigging activities if scheduled or in progress.

8. THUNDERSTORMS

A. Perform Section 7 of this procedure for High Winds.

B. Walk down and close any plant building rolling doors, any open outside doors, turbine building, compartment doors, and electrical and cabinet doors

C. Ensure the EDG building doors are closed.

D. Inspect plant drains, waste water tank levels, and oily water separator for proper operation

E. Pump out plant containment areas & sumps as needed.

F. Write work orders for any equipment problems encountered during the heavy precipitation event to identify & correct leaking buildings walls or openings, wiring or control boxes, for repair to prevent recurrence and improve plant reliability.

G. Lower level of "C" pond prior to predicted heavy rains if possible by placing in service.

H. Move all opened clean and used oil storage drums inside.

9. TORNADOES

In the event that a Tornado is posing a threat to the facility, appropriate action should be taken to keep personnel out of harm's way. Plant personnel safety is the prime concern. The following actions should be taken to minimize the risk to personnel in the event of a tornado:

A. Perform all activities in section 7 – High Winds and Section 8 – Thunderstorms as applicable.

B. TORNADO WATCH:

- Upon initial notification that the facility is in a tornado watch, keep the plant site clear of potential "missile hazards" by either putting things away, tying equipment down or clearing them from the site.
- Ensure any contractors / vendors onsite are notified of the potential hazard by communicating to their work sponsor. Secure work as appropriate. Unnecessary personnel should leave the facility if safe to do so.
- Designate shelter locations to accommodate the personnel that are onsite.

C. TORNADO WARNING:

- The Supervisor/Manager/CRO will make an announcement and instruct all personnel to immediately seek safe shelter.
- Quail Run maintains a two Tornado shelters between the Admin Building and Water Treatment Plant building. Each shelter can accommodate 20 people standing for a total of 40 people.
- If personnel cannot make it to the Tornado shelter, personnel should immediately seek one of the following areas onsite:
    - Small interior rooms on the lowest floor without windows – such as the bathrooms and cleaning supplies closet in the Admin building
    - Rooms and enclosures that are constructed of reinforced concrete, brick or block with no windows and a heavy concrete floor and or / reinforced roof system: CT enclosures, CT Auxiliaries Compartments, Water Wash skid enclosures are some examples.

  - Get as close to the floor as possible and against sturdy machinery that will prevent portions of the roof, etc. from striking directly should they fall.

- Do not evacuate buildings until dangerous wind levels have subsided.
- An automobile is not a safe place to be in these circumstances.
- If outside, seek safety in a low-lying depression such as a ditch or ravine.
- An announcement shall be made indicating when the tornado or severe storm has passed.

If the plant is in danger of a direct strike by a tornado, the evacuation of the Control Room may be necessary. If the evacuation of the Control Room becomes necessary, the plant shall be left in an automatic control mode of operation. The CRO and any personnel in the plant shall take shelter in the tornado shelter or other suitable location as described above. Once the emergency condition has passed, plant management shall declare an "all clear" or "return to normal" condition, or take other appropriate actions as warranted by damages.

Following the "all clear", an investigative team shall be assigned to inspect all outside plant areas looking for damage and other potentially dangerous conditions.

10. HURRICANES

Quail Run Energy Center is not located within a hurricane evacuation zone and will follow the guidelines for Thunderstorms and/or Tornadoes, as outlined in this Plan, as appropriate, when facing the effects of hurricane induced severe weather.

11. EARTHQUAKES

In general, a facility will have no warning in the event of an impending earthquake. In the event that an earthquake threatens the facility, appropriate action should be taken to keep personnel out of harm's way. Plant personnel safety is the prime concern. The following actions should be taken to minimize the risk to personnel in the event of an earthquake:

- If inside
  - Take cover under a desk or strong table or in a doorway, or sit or stand against an inside wall.
  - Stay away from windows, glass, bookcases, and outside doors.
  - Do not attempt to leave the building during a severe earthquake because of the hazards of downed power lines, falling debris from the building, etc.
- If outside

    - move away from buildings and utility wires.
    - Watch for falling glass, electrical wires, poles or other debris.
- Following the earthquake
    - Check for injuries and provide first aid as necessary.
    - Check for broken fuel lines and electrical faults. Isolate ruptures and faults as necessary.
    - Check for ruptures in systems containing hazardous chemicals. Isolate and contain spills.
    - Place the plant in a safe condition by shutting down any damaged equipment as necessary.
    - walkdown the plant and document all damage. If there is any structural damage, an appropriate engineering evaluation is required prior to making any repairs. Report results to plant management.

12. SEVERE WEATHER STAFFING

During periods of severe weather, attempts should be made to minimize personnel risk. Additionally, we want to ensure the appropriate personnel are on hand to help the facility survive the severe weather event.

- Additional off-shift operations personnel will be utilized as necessary to prepare and response to severe weather events.
- Maintenance department assigns 1 mechanical-maintenance technician and 1 instrumentation-control-electrical (IC&E) technician on call at all times on a weekly rotational basis. A secondary person is assigned as backup in the event the primary person for that week cannot be reached.

13. EMERGENCY SUPPLIES AND INVENTORY

See PEP-003 Cold Weather Plan and PEP-004 Hot Weather Plan for emergency supplies that are maintained onsite for weather events.

The facility contains a kitchen and pantry with perishable and canned food items and also maintains a water supply. A locker room with showers is located in the bathrooms.

If an event is known to be approaching, the Plant Manager and the Operations Manager will determine the need to bring additional supplies onsite.

14. HOT WEATHER EMERGENCY RESPONSE

Summer Readiness is intended to prepare the plant to operate throughout the summer without issues. However, in the event of severe hot weather beyond normal expected operations, Quail Run will perform the below actions to minimize the impact of hot weather event. ERP-01 Emergency Response - Section 7 - Earthquakes, Tornados, and Severe Weather Emergencies – directs emergency response to this procedure.

ACTIONS

1. In the event that ERCOT issues a OCN (Operating Condition Notice) for Quail Run Energy Center due to Extreme Hot Weather, QREC will perform the following:

   a. A log entry should be made that the OCN was issued and that the Hot Weather Emergency Response procedure was entered.

   b. Contact the Operations Manager that the OCN was issued.

   c. The Plant Manager, Operations Manager, Maintenance Manager, and EH&S Manager should be notified – qrec-mgt@naes.com (done to ensure any additional regulatory requirements are met)

   d. Minimize equipment swapping to minimize the risk to plant generation.

   e. Perform PEP-004 App-F Extreme Heat Operations Checklist every 4 hours until the OCN is clear. Report any abnormal conditions to the CRO. Document completion in eLogger.

   f. In the event the Hot Weather supply checklist verification has not been performed per PEP-004-APP-E (for example the Hot Weather Emergency event occurs prior to Summer Readiness Declaration), verify the following supplies available, annotate location, and utilize as needed to respond to the event.

Hot Weather Emergency Supplies				
Item	**Min Quantity**	**Quantity Available**	**Quantity on Order**	**Notes/Location:**
Spare Wall AC Units	2			
Spare floor portable AC Units*	1			
Large Portable Fans (36 in)**	2			
Spare Extension Cords (50+ ft)	5			FP-BOX-1
Spare RO membranes	1 set or on order			
Spare demin bottles	2 or on order			

g. In the event the Hot Weather Emergency occurs prior to Summer Readiness, review PEP-004 App-A Summer Readiness Checklist and PEP-004 App-B Summer Readiness Checklist for actions that can assist in responding to the Hot Weather Emergency. These include

(1) CT tuning
(2) Scheduling HVAC PMs with contractor
(3) Removing wall panels around air compressors if needed
(4) Review and reschedule high risk maintenance tasks outside the OCN window.

h. When the OCN is clear, log that OCN is clear and restore plant equipment and staged material as needed.

15. COLD WEATHER EMERGENCY RESPONSE

Winter Readiness is intended to prepare the plant to operate throughout the winter months without issues. However, in the event of severe cold weather occurs beyond normal expected operations, Quail Run will perform the below actions to minimize the impact of cold weather event.

ACTIONS

1. In the event that ERCOT issues a OCN (Operating Condition Notice) for Quail Run Energy Center due to Extreme Cold Weather, QREC will perform the following:

a. A log entry should be made that the OCN was issued and that the Cold Weather Emergency Response procedure was entered.

b. Contact the Operations Manager that the OCN was issued.

c. The Plant Manager, Operations Manager, Maintenance Manager, and EH&S Manager should be notified – qrec-mgt@naes.com (done to ensure any additional regulatory requirements and notifications are met)

d. Minimize equipment swapping to minimize the risk to plant generation.

e. In the event that Winter Declaration has not been performed (for example the Cold Weather Emergency event occurs prior to Winter Readiness Declaration), perform the following (NOTE: The Operations manager can prioritize the following actions and sections of PEP-003 checklists to best prepare for the cold weather event):

- Schedule CT tuning if needed
- Perform Heat Trace Initial Operational and Space Heater Checklist in PEP-003
- Perform Critical Transmitter Checklist in PEP-003
- Inspect Insulation on all components (use PEP-003 as guidance)
- Review and reschedule high risk maintenance tasks outside the OCN window.

f. Once temperature is below 40F, perform Plant Freeze protection Checklist in PEP-003.

g. In the event the Cold Weather supply checklist verification has not been performed (for example the Cold Weather Emergency event occurs prior to Winter Readiness Declaration), verify the following supplies available and utilize as needed to respond to the event – stage portable heaters as needed, cover equipment in tarps, etc.

Cold Weather Emergency Supplies				
Item	**Min Quantity**	**Quantity Available**	**Quantity on Order**	**Notes/Location:**
Tarps (light and HD canvas)	10			AX-PR1-A2B
Propane Portable heaters – torpedoes	5			Connex
Propane torch	5			FP-BOX-1
Insulation blankets	2			FP-BOX-2
Spare Extension Cords	5			FP-BOX-1
Propane bottles – 20 lb	10			Compressed Cylinder Pad
Propane bottles - small	10			Compressed Cylinder Pad
Heat Trace Tape (temporary)	10			FP-BOX-1
Electrical Portable heater	1			FP-BOX-8
Bungee Cords	20			FP-BOX-1
Ty-wraps	200			12-B000-005

h. When the OCN is clear, log that OCN is clear and restore plant equipment and staged material as needed.

NAES	PLANT EMERGENCY PLANS	
Number: **PEP-009**	Subject: **Priorities For Recovery of Generation Capacity**	
Approved for use by:	Current Issue: **Rev 2**	Issue Date: **March 31, 2022**
Prepared by NAES Corporation		

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APPENDICES

None

Latest Revision Approval:

Written By: NAES Corp Date: December 19, 2014

Approved By: Andy Duncan Date: March 31, 2022

REVISION HISTORY LOG				
Rev.	**Date**	**Description**	**By Initials**	**Approval Initials**
-	12/19/14	Initial Release		
1	03/09/15	Quail Run Addition		
2	03/31/22	Review vs updated TAC 25.53 requirements	ECN	AD

1. INTRODUCTION

Recognizing that proper preparation and planning are essential to ensure reliability during recovery of electric generation capability following a system-wide outage, NAES has established the following Priorities for Recovery of Generation Capacity Plan.

The Texas Administrative Code (TAC), Substantive Rules Chapter 25, Subchapter C, Article 25.53 (e)(2)(C) requires electric utilities and power generation companies to prepare and file an emergency operations plan which contains a restoration of service annex that identifies plans intended to restore to service a generation resource that failed to start or that tripped offline due to a hazard or threat.

This Plant Emergency Plan shall be followed by NAES Plant personnel to respond to a plant outage, in conjunction with a system-wide outage. Only the most recently approved revision of this document shall be used and previous versions shall be destroyed to prevent confusion.

2. PURPOSE

The Priorities for Recovery of Generation Capacity Plan is a plan to guide activities required to prepare for emergency conditions for generation recovery and also satisfies the requirements of several outside agencies. The focus is on maintaining facility reliability and preventing prolonged outages.

3. OBJECTIVE

It is the responsibility of NAES personnel to develop and implement a robust Recovery of Generation Plan to maintain the readiness and reliability of this facility. This plan should be reviewed periodically to incorporate industry best practices and lessons learned for continuous improvement.

4. REFERENCE PROCEDURES

OP-106 Plant Startup

OP-107 Shutdown Procedure

OP-201 Combustion Turbine Operations

OP-301 Steam Turbine Generator Operations

OP-401 Steam Cycle Operations

EOP-3- Combustion Turbine Generator Trip

5. PRIORITIES FOR RECOVERY

The Quail Run Energy facility will follow the recovery plan of the local Independent System Operator (ISO) or Regional Entity (RE). The primary focus will be to return the plant to service to support recovery of the grid, according to the needs of the ISO or RE. The information in this procedure, and the appropriate Quail Run Operating Procedures, will be used to guide the facility recover actions.

6. PLANT PREPARATORY ACTIONS AND TIMELINE

- The Quail Run Energy facility does not have black start capability. Auxiliary power must be available to the Quail Switch Substation from the electrical grid in order to recover from a total plant electrical outage.
  - Recovery of Generation Capacity due to a complete loss of the electrical grid would be dependent upon the recovery of 345KV circuits with the Quail Switch substation.
  - Priority for recovery would be to deliver any and all net capacity to the electrical grid based on dispatching instructions from ERCOT.

In the event of an emergency requiring power plant shutdown, the facility will report immediately to Direct Energy's Qualified Scheduling Entity ("QSE") 24-hour desk (EDF Trading), who will in turn notify all appropriate internal and external parties. After declaring an all-clear condition at the location, the facility will follow a comprehensive startup procedure that is unique to the capabilities of each specific power plant.

- During plant restoration following Loss of All AC power, operators must monitor grid voltage and frequency due to the potential instability of the grid. If any operating parameter is unstable during restoration, communicate all issues with EDF.

7. RESOURCES

- The Quail Run Energy Operations control room is currently staffed with one on-duty Control Room Operator. If conditions warrant, additional System Operators may be called in. If there is a potential issue with communications or with control system equipment, the associated support staff may be put on alert or called to service as deemed necessary by the on duty Control Room Operator. The Quail Run Energy's System Operators shall take steps to ensure that only required support and management personnel are present in the System Operations Control Center during a capacity or energy emergency.

- Quail Run Energy maintains additional procedures in other sections of this EOP to address operating emergencies. Additional operating procedures for System Operators are maintained in the control room.

8. RECOVERY ACTIONS

A. Verify that the hazard or threat condition that caused the shutdown is clear.

B. If the combustion turbine(s) were automatically or manually tripped due to the hazard or threat condition, verify the actions of EOP-3 Combustion Turbine Trip and OP-201 for the shutdown have been complete as necessary.

C. If the units were shutdown utilizing normal shutdown procedures, verify all steps of OP-107 have been completed as necessary to prepare for a safe startup.

D. Validate all systems impacted by the threat or hazard are ready for return to service.

E. Verify with the OPS Manager, Maintenance Manager, and the Plant Manager that the plant is ready to be returned to service and no other outstanding actions are in place.

F. Communicate with the QSE(EDF) plant status when ready to restore the unit(s) to serve.

G. Refer to the applicable Operations Procedures as referenced in the REFERENCE PROCEDURES section of this document to restore as directed.

Approved for use by:

____

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REFERENCES

1. The information in this Pandemic Response Plan was primarily obtained from:
   Center for Infectious Disease Research and Policy, University of Minnesota
   http://www.cidrap.umn.edu/
   North American Electric Reliability Council
   http://www.nerc.com
   United States Center for Disease Control
   http://www.cdc.gov/flu/avian/index.htm

2 Other websites with useful pandemic information:
   http://www.pandemicflu.gov/ - U.S. Government Public Information Site

   http://www.who.int/topics/influenza/en/ - World Health Organization Site

   http://www.pandemicflu.gove/plan/businesschecklist.html - DHS site (U.S.)

   http://www.phac-aspc.gc.ca/influenza - Public Health Agency of Canada

SUB-SECTIONS

None

DOCUMENT REVISION HISTORY

Rev	Rev Date	Description of Changes / Comments
R1	30 Mar 15	Quail Run Initial
R2	15 Mar 16	Update employee list, re-format Appendix F, update out-of-date links
R3	10 Jul 18	Update employee list, update logos
R4	26 Nov 19	Update employee list
R5	17 Mar 20	Added an Appendix H for visitor Pre-screening Checklist
R6	26 May 21	Revised Covid Form in Appendix H to new version sent out by corporate

1. INTRODUCTION

The objective of this Safety Manual Procedure is to describe potential pandemic threats, to identify and prioritize the critical operations and business functions of this facility, and to provide appropriate response guidelines. The information in this Plan is based on generally accepted assumptions about the development, outbreak, and expected progress of an influenza pandemic. Site-specific information required for implementing this Plan (contact lists, recovery details, etc) is provided in Appendices A through G at the end of this Procedure. Control and survival of a pandemic will depend on the ability of thoughtful individuals to conduct a well planned and well organized response. The ultimate objective of this Plan is to prepare those individuals for success.

A. PANDEMIC CHARACTERISTICS

1. Timing and severity of the outbreak of a pandemic are uncertain and may not be immediately recognized. The most feared pandemic strains (such as avian influenza or "bird flu", H5N1) exhibit the following characteristics:

   a. Able to cause severe disease in humans

   b. Global human population has no pre-existing immunity

   c. Able to spread rapidly through human to human contact

2. Once human to human transmission begins, the disease will spread very rapidly around the world within three to eight weeks. It is likely that 20 to 30 percent of global population will contract influenza during the first wave and will become very ill for several weeks. Additional waves will follow over one to two weeks.

3. Absentee rates for employees may be in the range of 25 to 60 percent for the duration of the pandemic, due to employee illness and to other factors such as caring for family members. Absentee rates will normally vary across an organization based on location and isolation.

4. With the expected high percentage of ill people, the existing healthcare system will be overwhelmed. Most government and health organizations will not have sufficient stockpiles of anti-viral agents or vaccines to treat those who are exposed or who will become ill if a pandemic occurs in the next one to two years.

5. Persons who contract the virus are not expected to contract it a second time due to a buildup of personal immunity. However, if the virus mutates, recurrences for the same individuals could be possible.

6. Personnel management will need to be modified to continue essential plant operations and business processes, while minimizing the spread of the virus.

7. The organizational response will need to include the distribution of accurate and timely information to employees, families, and customers.

8. Because of the percentage of affected people around the world, global trade and the global economy will be significantly impacted by the pandemic, limiting the supplies of food and manufactured goods.

9. Other cross dependencies with other segments of the utility sector (generators, transmission operators, distribution providers) and other critical infrastructure (communications, nuclear, natural gas, petroleum, transportation, emergency services, etc) as well as contractors and suppliers will be severely tested during influenza pandemic.

B. PANDEMIC PHASES

Information developed by the World Health Organization (WHO) defines five phases of a possible pandemic as listed below. These five phases provide a useful framework for pandemic response planning.

1. Phase 1 -- Pandemic Alert

   Governments, owners, and operators are notified that a pandemic is possible and preparedness plans should be reviewed and updated.

2. Phase 2 -- Pre-Pandemic

   Localized outbreaks are occurring with human to human transmission. Governments and electricity sector entities begin to assign resources, prepare staffing, and implement contingency plans. Begin an information distribution program to promote appropriate responses by employees.

3. Phase 3 -- Pandemic Outbreak

   General outbreaks across borders and continents. Organizations implement response plans.

4. Phase 4 -- Maximum Disruption

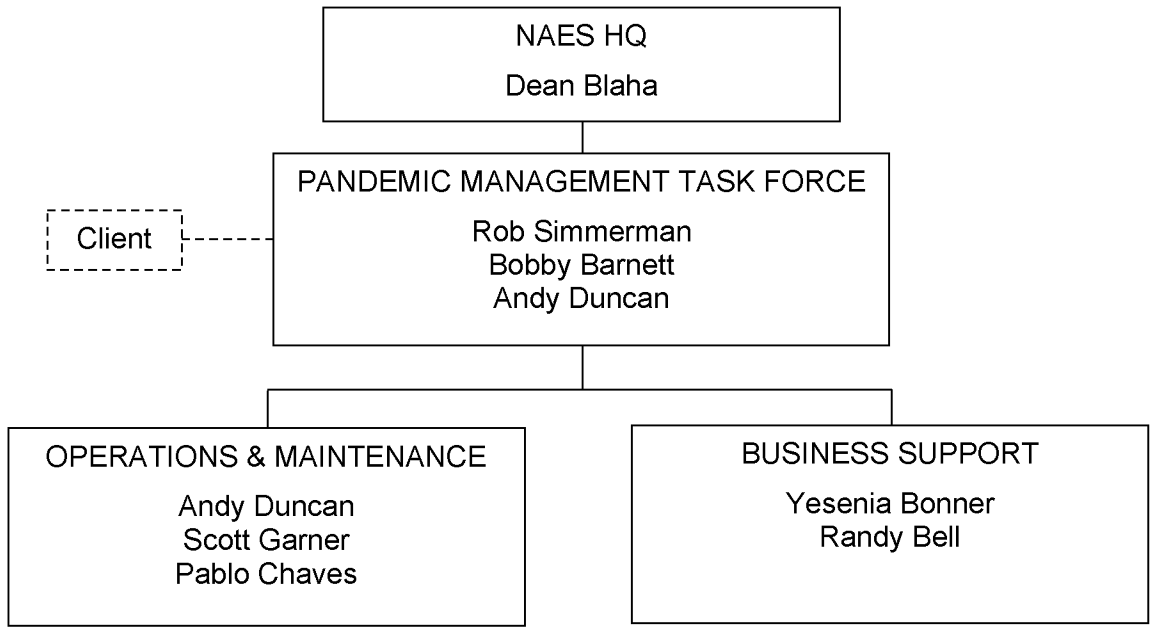
   High absentee rates occur and fatalities begin to impact the workforce. This phase could last for several months.

5. Phase 5 -- Prolonged Recovery

   Recovery will be slow and the underlying economy will weaken. Altered business conditions will be prevalent for large and small firms. This phase will last for at least three months and possibly up to six months.

2. PLANNING RESPONSIBILITIES

The diagram below is the organization chart for the NAES Pandemic Management Program Team (PMPT) for this facility. The PMPT task force is responsible for the preparation, the continuing readiness, and (if needed) the implementation of this Plan.



A. CORPORATE RESPONSIBILITIES

1. Plan Development

   a. Recognize threat and authorize a planning and response effort

   b. Identify critical departments needing response plans

   c. Require preparation of approved Pandemic Response Plans

   d. Provide schedule for preparation of Plans

   e. Request draft policy changes needed for pandemic management

   f. Adjust strategy and response level as needed

2. PMPT Inputs

   a. Pandemic threat and impact information

   b. Program coordination

c. Initiation criteria

d. Threat monitoring updates

e. Department pandemic management plan templates and coaching

f. Coordination with support departments (Human Resources, Information Services, etc)

3. NAES Headquarters Inputs

a. General pandemic information (issues, impacts, mitigation strategies, pandemic management, suggested plan outline)

b. Guidance and coaching

c. Plan templates

d. Family care outline and websites

4. Plant Staff Responsibilities

a. Brainstorm critical business functions and priorities

b. Determine locally appropriate mitigations

c. Prepare and test draft Pandemic Response Plans

d. Assist employees with family care plans

e. Manage work continuation if a pandemic strikes

f. If NAES corporate management is not available, plant managers shall take control

B. EMPLOYEE RESPONSIBILITIES

1. Perform critical department work if a pandemic strikes

2. If management is not available, senior personnel will provide leadership

3. Remain individually healthy by following guidelines

4. Review family care outlines and websites; prepare a family response plan and discuss with family members

5. Stockpile essential supplies

3. PANDEMIC RESPONSE PLAN DEVELOPMENT

This section will provide guidelines for corporate departmental planning to meet the challenges of an influenza pandemic. Various charts and tables are provided throughout this section for planners to use during these assessment processes. Some limited information (typically applicable to power plant operations) has been included in these tables for demonstration purposes, but each organization shall develop a site-specific Plan by filling local information into the various assessment tables provided in this Section. Any text that is highlighted in yellow in these tables has been inserted only as an example of a possible data entry.

A. BUSINESS PROCESSES ASSESSMENT

In planning for a potential Pandemic, it is important to identify the major business processes in the organization. It is also important to determine the critical inputs that are needed to accomplish those processes. Other departments in the company may depend on some of your organization's output to do their work. The most important outputs should also be defined.

As you identify critical inputs and outputs, consult with upstream and downstream organizations. They may have priorities that are different from your own and negotiation with them may be necessary. Critical information should include Contact Lists, Vendor Lists, etc. To set the Priority Ranking, #1 is for most important, and #5 is for least. For example, the critical business functions needed for the business to survive should be in the #1 category.

The following "Major Business Functions" assessment chart is recommended as a starting point for the NAES Pandemic Management process. Several follow-up assessment charts are shown on the ensuing pages.

Table 1. Major Business Functions

Major Business Processes	Priority Ranking	Critical Inputs and Outputs
Power Generation	1	EDF Trading – Fuel, generation scheduling, outage scheduling – See APPENDIX F
Operations CRO APO	1 1 1	See APPENDIX E
Maintenance	3	See APPENDIX E
Administration	5	See APPENDIX E
Water Supply	1	City of Odessa and Texland - See APPENDIX H

Support Services	2	Chemicals, waste water disposal, cranes, welding, DCS support, insulation, and general contractors. - See APPENDIX H

B. PANDEMIC RISKS ASSESSMENT

Once the major business processes have been identified, it will be important to determine what the largest risks to those functions are. What problems would be caused by loss of key staff inside or outside of the company (loss of key department personnel, loss of vendors, bankruptcy of a large customer, stock market crash, late or no payments, inability to communicate with other businesses, failure of service providers, etc. Once these largest risks are determined, appropriate mitigation strategies can be established.

Table 2. Largest Risks

Major Business Processes	Priority Ranking	Critical Inputs and Outputs
Power Generation	1	EDF Trading – Fuel, generation scheduling, outage scheduling – See APPENDIX F
Operations CRO APO	1 1 1	See APPENDIX E
Maintenance	3	See APPENDIX E
Administration	5	See APPENDIX E
Water Supply	1	City of Odessa and Texland - See APPENDIX H

C. LOSS OF KEY PERSONNEL

1. For Influenza Pandemic Only

This case differs from the normal Business Continuity case because all the supporting departments and vendors that the department might call upon in an emergency will also be having a personnel shortage. This means many more vendors will be needed, more work must be cancelled or postponed, and more drastic measures to protect the remaining employees must be taken.

Major Business Processes	Recovery Strategies
Power Generation	

Operations CRO APO	
Maintenance	
Administration	
Water Supply	
Support Services	Contractor substitution

Table 3. Recovery Strategies

2. For Influenza Pandemic with Emergency Succession

In the following table, identify key persons doing critical work for each major business function. These key people are those persons without whom, the Major Business Function could not be done. This might be a senior department employee, group leader or supervisor.

After naming the current key personnel, enter the name(s) of the person(s) that could take over the work in an emergency where the current key person is not available. In other words, this table is an emergency succession plan for the work that is most important to the company.

Major Business Processes	Key Person(s) & Emergency Alternate(s) for Organizational Assignments
Power Generation	EDF Trading/Scott Garner
Operations	Scott Garner/Andy Duncan/Cliff Pate
Maintenance	Pablo Chaves/Andy Duncan
Administration/Warehouse	Randy Bell
HR/Payroll/Accounting	Yesenia Bonner/Andy Duncan

Table 4. Key Personnel and Critical Functions

D. EMPLOYEE CRITICAL SKILLS INVENTORY

Use the table below to list your personnel who have skills in high demand critical areas that could fill in for others in an emergency. The table lists some typical skill sets for plant operations, but should be modified as needed for the skill set categories that suit your department's needs.

Table 5. Critical Skill Inventory

List of Employee Names	Critical Skill Sets						
	CRO	APO	Mechanical Skills	Electrical Skills	Plant DCS	Other PLC	Ware-house
Plant Manager			X				
Operations Manager	X	X	X				
Maintenance Manager			X	X	X	X	X
Lead CRO	X	X	X				
CROs	X	X	X				
APOs		X	X				
Maintenance Techs			X				X
I&E Techs			X	X	X	X	X
Warehouse Tech			X				X

E. INFORMATION SYSTEMS (IS) INVENTORY

1. Critical Systems

Use the table below to list the critical Information Systems and IS Applications which are essential to the most important work done in the department. The following acronyms used in this table are defined as:

a. RTO (Recovery Time Objective) - The period of time within which systems, applications, or functions must be recovered after an outage.

b. WRT (Work Recovery Time) - The period of time needed to complete the disrupted work on a recovered/repaired resource in order to return it to normal operational status.

Table 6. Work Recovery Time

Critical Business Functions	Critical Business Processes	Critical IT Systems and Applications	RTO	WRT
Operations	Maintain Plant Control	Plant DCS	1 Hr	
Operations	Maintain Water Treatment	PLC	4 Hrs	
Operations	Internet	RTU	4 Hrs	

2. Loss of Software, Hardware or Data Assets

Use the table below to help list hardware loss strategy. In the event that your critical IT Systems and Applications are not available, what is your strategy to continue work? Would you use a simple Excel spreadsheet to record and manipulate data until the main application was restored? Would you use another application that could do some of the important functions? Is there an old or newer program that would work? Would you cease work? Are there any other relevant questions?

Table 7. Information Systems (IS) Recovery Strategies

Major Business Functions	Loss of Systems	Emergency Software Recovery Strategies
Operations	Plant DCS	1 HMI replacement
Operations	PLC	No Replacement available, Software needs to be reloaded
Operations/Maintenance	PCs	Temporary replacements/iV4

3. Recovery of Lost Software, Hardware, or Data Assets

Assume that the loss of Software, Hardware or Data Assets scenario has occurred and the recovery team has been activated. The general strategy from the previous sections applies but more detail is needed to describe the steps that would be taken.

In the following table, replace the example by listing the detailed tasks that must be initiated and indicating which member(s) of the recovery team (e.g. team leader, team member, or names of individuals) will perform it.

Detailed current backups of the following software and systems are maintained on file in a fireproof cabinet in an area separate from the main control area:

Table 8. Detailed IS Recovery Strategies

Major Equipment	Contact
Plant DCS	Pablo Chaves
PLC	Pablo Chaves
PCs/Servers	Pablo Chaves/Scott Garner/iV4
Internet	Pablo Chaves/Scott Garner

4. Pandemic Plan Validation

Identify the known gaps, issues and problems with this Pandemic Plan that would make it difficult to succeed, contribute to its failure or make the recovery from a significant event slower and less efficient. Identify the expected time frame to eliminate these problem areas. If an economic, time related, organizational or technical issue is causing the gap, include the description of this cause. Describe the gaps in order of importance, with the most important one listed first.

5. Qualified CROs

   a. Long term action is to get APOs sufficiently trained and qualified to fill in as CROs.

   b. Cross training of plant personnel is required for better flexibility.

6. Limited Vendor Resources

   a. Resources critically tied to interstate transportation. These include lime, soda ash, hydrogen, caustic, acid, and ammonia.

   b. Some staff may not be from the local area. This makes alternate transportation more difficult and timely relief for ill personnel may not be readily available.

4. THREAT MITIGATION - GENERAL GUIDELINES

The purpose of a Pandemic Management Program is to assist NAES plant management in preparing for a potential pandemic by developing plans to manage the threat. The actions listed below could be taken by all departments to help them minimize the impact if the pandemic threat becomes real.

A. Review existing emergency plans. Update these and inform essential personnel.

B. Update the contact list of all employees in your department. Include after-hours contact number(s); some of these phone numbers may be out of this region, such as parents, or other family members or friends.

C. Identify employees and key customers with special needs, and incorporate the requirements of such persons into your preparedness plan.

D. Consider the impact of community containment measures and quarantines, school and/or business closures, and public and financial institution closures.

E. Expand the use of teleconferencing and videoconferencing to limit the frequency of meetings and other types of face-to-face contact.

F. Implement guidelines to modify the frequency and type of face-to-face contact (e.g. hand-shaking, seating in meetings, shared workstations) among employees and between employees and customers.

G. Train and prepare ancillary workforce (e.g. contractors, employees in other jobs or other departments, retirees, etc).

H. Develop cross training programs to assure adequate staffing of essential functions; consider strategies such as developing "job sheets" that outline key activities by position.

I. Consider a transportation plan in case of fuel shortages and loss of public transportation.

J. Develop a plan to send home non-critical staff and shift workers to home offices or other sites or change work hours that would minimize exposure risks, address potential fuel shortages, and curtail dependence on public transportation.

K. If services are contracted to outside organizations, contact vendors and find what type of contingency plans they may have in place.

L. Consider the impact of a disruption of social systems and services on your organization (assume the possibility of no response or slow response from emergency first responders, other basic services not available, etc.)

5. MITIGATION STRATEGIES

There are several possible risks and mitigations to be considered when planning your strategies. Appendix A contains a listing of the most common risks and the associated mitigations. Each specific facility or department may have more or different risks than those listed in Appendix A.

A. Protect Work Force

1. Protect the workers that you have.
2. Provide the personal protective equipment that may be needed.
3. Minimize meetings and face to face contact.
4. Where ever possible, get priority medical treatment arranged.
5. Provide essential medical training for on-site emergencies.
6. Gather essential health and protective equipment.
7. Gather the contact phone numbers for your employees and their "out of area" contact numbers.
8. Be prepared to have an alternative way to transport essential employees to work or locations where they can work.

9. Consider the impact of civil unrest and a breakdown in social order if police, fire and other personnel are not available. How will your protect your work site and employees?

10. Should you be prepared for some employees to live on the work site for several days or weeks?

B. Help Employees Protect Their Families

1. Provide information so employees can protect their families and can feel free to work.

2. Provided the personal protective equipment that may be needed.

3. Counsel employees that need help coping with illness or losses.

C. Augment the Work Force

1. Broaden the vendor base in type and geographic area.

2. Gather the contact phone numbers for your vendors and their after-hours contact numbers.

3. Ask that your most critical vendors also have and carry out Pandemic Planning and Mitigation.

4. Ask to see their plans and be briefed on them.

5. Identify groups of additional workers from other departments, retirees, employment agencies, etc. The lists should be long and geographically diverse.

D. Protect Work Processes

1. Be prepared to alter your work process and use alternative methods. Your normal software may become disabled due to routine failure and there may not be personnel to get it repaired. Your software or application recovery may not be on a high priority list.

2. Cross train your personnel to be more generalists rather than specialists so they can support and stand in for each other.

3. Is it possible for vendors to help with more routine work or to outsource the some of the work?

4. Buy, write or update procedure or instruction manuals so that a broader segment of the department could do the work. Train the work force on these procedures.

5. Maintain essential data on backup CD-ROMs or other sources. Make sure several people know how to access this data.

6. Move some processes away from "just in time" methods. The "just in time" processes might collapse when critical materials or data are not available. Some stockpiling or source diversification may be necessary.

7. How will you work if the city or state is broken up into quarantined areas?

8. Have a current and workable succession plan.

E. Stockpile Resources

1. Stockpile critical materials (parts, supplies, protective equipment, routine but necessary supplies, fuel, etc.)

2. Consider alternative transportation methods to get workers to and from work.

3. Consider storing bottled water, canned goods, and emergency meals. Include flashlights, batteries, radios, masks, disposable gloves, soaps and disinfectants.

F. Reduce Non-essential Work

1. Each department should identify its most critical business functions and the overall mitigation strategies for them. Determine what lower priority work to cut.

2. Each department should determine its essential inputs needed for its work and the critical outputs that others need for their work.

3. Reduce work to the most important tasks.

4. Reduce personal contact and make essential contact safer.

5. Have people work from home where possible.

6. Reduce or "sanitize" customer contact.

7. Teach proper hand washing, use of sanitizing wipes, use of disinfectant soaps, proper use of effective masks and gloves and other personal protective measures.

8. Teach people how to handle potentially contaminated material from other people.

G. Develop Communication Plans

1. What are the essential information data and messages that need to reach employees, vendors, their families, customers and the public.

2. What is the structure of these messages, what is the likely content that is needed?

3. Develop specific, honest, timely and helpful messages that give the whole, unvarnished truth. Have these messages available and ready to fill in the blanks.

4. Have enough people to do the information gathering and to do the communication.

5. Test the messages on people outside of the communications department. Are the messages clear and do they give the intended information?

6. What alternative ways will the company use to communicate if normal services are not available? Can Webcasts, internet sites, phone recordings, or other sources be of help?

Appendix A: Matrix of Major Risks and Mitigations

Description of Major Risks/Problems	Recommended Mitigation Options
Loss of Key Personnel (for up to several weeks)	Identify critical/non-critical functions Cross training Temp/contract workers/retirees/students Documentation of processes
Supply Chain • Fuel Storages • Lack of transportation • Supplies/Materials/Equipment Storages	Partner with vendors on continuity plans Alternative sources Stockpiling Continuity plans for employee transportation Continuity plans for power plants Hygiene supplies (hand soap, disinfecting agents, PPE)
Human Resources/Healthcare • Employee/customer special needs • Policies • Insurance • Personal Hygiene • Public Health • Family Care	Establish policies for: Preventing influenza spread Sick leave unique to pandemic Flexible work hours Travel Increased medical insurance claims Establish communications with healthcare facilities to promote information on prevention and treatment of influenza.
Communications • All aspects of communication • Family Care	Beware of assurances of safety Explain new policies & procedures Educate workforce regarding conditions and risks Develop an emergency communications plan that includes key contacts, back-ups, medical contacts, communication chains, and processes to track and communicate business and employee status. Provide websites that contain vital information.
IT/BTS • Infrastructure capabilities	Put in place plans to have an increased number of employees work from their home. Ensure IT system infrastructure can support this action.
Mail Delivery • Reduced or Non-existent service • Contaminated mail	Treasury, Payroll, and A/P need continuity plans.

Description of Major Risks/Problems	Recommended Mitigation Options
Contractual Obligations • Labor Unions contracts may need to be amended • Unable to perform under existing conditions	Contract analysis Limits of liability Best efforts clause Impossibility exclusion Exclusivity provision
Security	Consider security issues and the limitations that law enforcement agencies will face during an influenza pandemic.
Regulatory	Work with regulators to ease restrictions if necessary.
Face-to-face Exposure	Utilize videoconferencing and teleconferencing Telecommuting capabilities Workforce separation Shift work Device an alternative to customer/employee contact

Appendix B: Critical Equipment and Materials

Equipment & Materials	Intended Users	Needed Upgrades or Special Features	Equipment Supplier	Recovery Quantity	Rebuild Quantity
Bulk Chemicals	Operations	None	Univar (acid & bleach), FSTI (acid bleach), Southern Ionics (ammonia)	3,000 gallons	3,000 gallons
Specialty Chemicals	Operations		Chemical Vendor	1,000 gallons	
COMMENTS:					

Appendix C: Vital Records Access and Storage

Media Types: E – Electronic, P – Paper, M – Microfilm/fiche

Key Business Process	Associated Vital Records Required for Process	Media Type (E/P/M)	Vital Record Storage Locations and Access
Operations	O&M Agreement	P	Administrative Office
Operations	Employee Health and Medical Records	E, P	NAES HQ Personnel Office
COMMENTS:			

Appendix D: Plant-Specific Manuals and Procedural Instructions

Media Types: E – Electronic, P – Paper, M – Microfilm/fiche

Title of Manual or Procedure	Description	Storage Location	Media Type (E/P/M)	Quantity Available
NAES Safety Manual Procedures (SMPs)	Safety Manual	Library Server S	3-ring Binders (P) SMP .doc files (E)	4 copies
NAES HR Manual Procedures (SMPs)	HR Manual	Library Server S	3-ring Binders (P) .doc files (E)	4 copies
Operations Procedures	Operations	Library Server S	3-ring Binders (P) .doc files (E)	2 copies
Maintenance Procedures	Maintenance	Library Server S	3-ring Binders (P) .doc files (E)	2 copies
COMMENTS:				

Appendix E: Employee Contact List

See file on the S drive under QREC Contact Info

Appendix F: Emergency Contacts List

Organization	Emergency Telephone	Business Telephone	Street Address or Website	Comments
PUBLIC SAFETY SERVICES				
Local Fire Department	911	432-257-0502	1100 W. 2nd Odessa, TX 79763	Available 24 x 7
Local Police	911	432-333-3641	205 N Grant Odessa, TX 79761	Available 24 x 7
County Sheriff	911	432-335-3050	2500 US-385 Odessa, TX 79766	
State Police	911	432-332-0637	1910 W. Interstate 20 Odessa, TX 79763	
American Red Cross	(800) 733-2761		http://www.redcross.org/	Available 24 x 7
National Poison Control Center	(800) 222-1222		http://www.aapcc.org/	Available 24 x 7
FBI	911	432-570-0255	1004 North Big Spring Street Suite 600 Midland, TX 79701	Available 24 x 7
Local Clinic – Urgent Care – MCH Campus	911	432-640-1963	315 N Golder Odessa, TX 79763	
Local Hospital – Medical Center Hospital	911	432-640-6000	500 W 4th ST Odessa, TX 79761	Available 24 x 7
FEMA Office		202-646-5000	500 C St. SW Washington, DC 20472	
City/County/State Emergency Management		432-335-3232	411 W 8th Odessa, TX 79761	

Dispatcher – EDF Trading	281-653-1606	281-653-1606		
Fuel Gas Supplier – OneOk	918-588-7830	918-588-7830		

EMERGENCY BUSINESS SERVICES				
NAES HQ	(425) 961-4700		http:/www.naes.com	

Appendix G: Emergency Information Resources

Organization	Emergency Telephone	Business Telephone	Street Address or Website	Comment
Radio Station KXWT		432-580-9130	2000 E 42nd Street, Ste C-193 Odessa, TX 79762	West Texas Public Radio
Odessa American		432-337-4661	222 E 4th St Odessa, TX 79761	
Public Service Agency			http://www.odessatx.gov/index.aspx?page=198	

Appendix H: COVID-19 Visitor Restriction checklist.

In response to government precautions concerning COVID-19, we have instituted the following Contractor/Visitor Restriction Policy, until further notice. Note: The wearing of a facial covering will be determined by the plant in accordance with NAES policy and CDC guidelines.

Contractors/Visitors will be restricted from entering our facilities if they have returned from any international travel and have not had a negative COVID-19 test within 3 days of entering the United States as required by the Center for Disease Control and Prevention (CDC).

NOTE

All Contractors/Visitors should Self Check their temperature and record as Pass____/Fail______ Fail is when a person's temperature is above 100.4 degrees F.

In accordance with this Policy, please complete the questions below:

- Have you traveled from outside the United States, returned in the last 3 days and tested negative for COVID-19?
  Yes ___ No ___

- Do you currently live with or are in close contact with someone who has tested positive for COVID-19?
  Yes ____ No ____
- Are you experiencing flu like symptoms such as fever, chills, muscle pain, cough, loss of smell, or difficulty breathing or shortness of breath?
  Yes ____ No ____

Optional Questions

- Have you been fully vaccinated as defined by the CDC in the past 15 days?
  Yes ___ No ___

- Would you voluntarily provide proof you have been fully vaccinated as defined by the CDC in the past 15 days?
  Yes ___ No ___

By signing below, you acknowledge that you have completely read and fully understand the COVID-19 Contractor/Visitor Restriction Policy and to the best of your knowledge you do not have COVID-19 or within the last seven days been in contact with a person having COVID-19.

Upon review of the completed questionnaire, the plant will determine if access to the facility is granted and any requirements or restrictions for access.

____
Contractor/Visitor Signature

______________________________________ ______________________________________
Contractor/Visitor Print Name Date

NAES	**OPERATIONS MANUAL** VOLUME II – OPERATING PROCEDURE
Number: **EOP-3**	Subject: **Combustion Turbine Generator Trip**

Approved for plant use by:	Current Issue: **R1**	Issue Date: **22 OCT 20**

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CHECKLISTS

None

REFERENCES	Rev.	Date

None

1. INITIAL CONDITIONS

A. Plant conditions, which can result in the loss of a combustion turbine generator (CTG), arise from two primary sources. A major fault in the electrical distribution system can trip the turbine fuel supply as well as realign the electric plant. A fault in the turbine itself or in any of its vital support systems can also result in a turbine trip and opening of the associated generator output breaker.

B. The CTGs are designed to operate continuously and automatically at either Base Temperature loading or at Peak Temperature loading to supply electrical power to the Substation and to plant auxiliary loads. Thus, the loss of any one CTG will have an effect on the electrical power available to Utilities Substation customers and on the functional capabilities of the facility itself.

C. Since there are normally two CTGs available for use during plant operations, a single unit trip will have a limited effect on overall plant operations, primarily reducing the amount of electrical power that can be produced and sold. Still, in order to ensure that the CTG casualty does not adversely affect other plant systems and to minimize the effect of the fault on the unit itself, a series of actions must take place in any "Loss of CTG" emergency to realign the plant and applicable CTG systems in a safe condition.

2. SYMPTOMS AND INDICATIONS

A. The Distributed Control System (DCS) graphic mimic bus displays show the applicable CTG output circuit breaker OPEN and/or the associated electrical meters for CTG MW, MVAR, amperage, or voltage indicate "0".

B. "Tripped" alarms are audibly and visibly annunciated at the DCS control room operating stations or at the CTG local Packaged Electrical and Electronic Control Compartment (PEECC).

C. The declining-pitch locally audible sounds of a CTG coastdown are recognized.

3. POSSIBLE CAUSES

The "alarm" and "trip" parameters and conditions listed in the CTG manufacturer's Operation and Maintenance Manual are programmed to be recognized by the DCS via the CTG integral Mark V E/VI E automatic control system. These systems then respond by immediately shutting down the CTG that is at risk. Each "trip" includes three major immediate actions: Generator Output Breaker Trip, Turbine Fuel Supply Shutoff, and Main Compressor Air Intake Shutoff. Operators should become familiar with the many possible causes for the loss of a CTG, which can occur during unit startup, shutdown, or normal operation.

4. IMMEDIATE ACTIONS

A. Immediately OPEN/CHECK OPEN the generator output circuit breaker of the affected CTG.

B. DISPLAY the ALARM LOG screen on the DCS or local control system to determine the source of the automatic shutdown. Analyze the listed CTG parameters and review the ALARM SUMMARY screen to help identify the malfunction or defect that first caused the trip. Remember that some indicated failures may have been caused by a preceding failure and therefore do not directly reflect the original malfunction or defect.

C. If CTG internal damage (possibly from overheating or vibration) is suspected as a result of the fault analysis, turn OFF the turning gear motor to block the automatic cooldown cycle on the tripped turbine. Ensure the AC lube oil pump remains energized and operating so that continuing oil flow can remove residual heat from the turbine and generator bearings.

CAUTION

After an emergency shutdown in which internal damage of rotating equipment is suspected, do not turn the CTG rotor. Continue AC lube oil pump operation to prevent rising bearing temperatures, which can result in damaged bearing surfaces.

D. If the malfunction that caused the shutdown can be quickly repaired, or if inspection reveals no internal damage affecting rotating parts, reinstate the normal automatic cooldown cycle (see OP-201).

E. If there has been an emergency CTG trip and the cause has been identified but the turbine has not been turned during the shutdown period, the following guidelines apply to any subsequent turbine restart.

1. Within 20 minutes after the rotor has stopped, the gas turbine can be restarted without cooldown rotation if the fault causing the shutdown has been determined and resolved and if inspection reveals no internal damage.

2. Between 20 minutes and 48 hours after the rotor has stopped, a CTG restart can be performed only after at least 2 hours of turning gear operation and only after the fault has been repaired and inspection has verified no internal damage affecting rotating parts.

3. If the unit has been shut down longer than 20 minutes and has not been rotated at all, it must remain shut down for 48 hours to minimize the risk of bowing the shaft. Do not try to restart the CTG until the required cooling period has passed.

5. SUPPLEMENTARY ACTIONS

A. Complete the full shutdown process for the tripped CTG and its auxiliaries in accordance with OP-201.

B. Notify the on duty Dispatch supervisor of the casualty situation and the change in electrical power output capacity of the facility.

C. Notify the facility management authorities of the nature of the casualty, the actions taken, and the estimated time to return the CTG to normal operation and restore the plant to full power production capability.

D. Correct the identified fault of the shutdown and re-establish initial conditions for normal start-up of the CTG and its associated auxiliaries.

NAES	**OPERATIONS MANUAL** VOLUME II – OPERATING PROCEDURE	
Number: **EOP-6**	Subject: **Loss of AC Power**	
Approved for plant use by:	Current Issue: **R1**	Issue Date: **26 OCT 20**

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SECTION TITLE PAGE

CHECKLISTS

None

REFERENCES Rev. Date

None

1. INITIAL CONDITIONS

A. During normal plant operation, various combinations of the two gas turbine generators (CTGs) and the single steam turbine generator (STG) of each Power Block are online to provide electrical power to the Substation. Through branch circuits off the output lines, medium and low voltage auxiliary power is also supplied to Facility and CTG/STG loads within the plant.

B. This procedure discusses the loss the of an electrical utility feeder causing one or more of the 345 kV circuit breakers and/or CT generator output breakers to trip open, resulting in a loss of some or all plant auxiliary AC power. In any loss of plant AC power, the immediate operational focus is on placing the plant in a safe shutdown condition and then restoring power to the plant by performing a normal startup when the Substation can provide the AC power necessary to support the startup.

2. SYMPTOMS AND INDICATIONS

A. The CTG(s) and/or STG are coasting down, with TRIP indications on the associated control system display.

B. Generator output breaker(s) indicate TRIPPED on the DCS and/or the CTG/STG control station power generation displays.

C. One or both auxiliary power transformer output breaker(s) indicate TRIPPED in the plant Electrical Equipment Building (EEB).

D. Secondary Unit Substation (SUS) switchgear and/or motor control center (MCC) load distribution circuit breakers indicate TRIPPED.

E. Meters measuring electrical parameters associated with the generator's transformers (MW, MVAR, amperage, voltage) indicate zero ("0").

F. Normal plant AC lighting is lost with subsequent visible start-up of emergency lighting systems.

G. All AC-power driven motors stop with subsequent audible start-up of emergency DC motors.

3. POSSIBLE CAUSES

A. Trip of Substation 345 kV output breaker(s).

B. Breaker failure or trip of the CTG #1, CTG #2 and/or CTG #3, CTG #4 generator in-line 13.8 kV output circuit breaker(s).

C. Failure of a CTG #1/CTG #2 or CTG #3/CTG #4 generator step-up (GSU) output transformer or an associated auxiliary power transformer.

D. Major electrical distribution casualty and simultaneous plant CT trip(s).

4. IMMEDIATE ACTIONS

A. Place the plant in a safe condition as follows:

1. VERIFY that the CTG has automatically tripped.

2. VERIFY that the Essential Service 120 Vac Inverter and the battery-powered 125 Vdc panel boards remain online and are operating properly in accordance with the abnormal operation procedures specified in OP-702. If required, STOP/CHECK the plant main battery chargers and all affected CTG integral battery chargers off-line.

3. VERIFY that the affected CTG and STG DC lube oil pumps are operating to support safe turbine coastdown and cooldown.

B. Isolate the electrical fault as follows:

1. If required, OPEN/CHECK OPEN the CTG #1, CTG #2, CTG #3 and CTG #4 generator output high-voltage circuit breakers.

2. If required, OPEN/CHECK OPEN the plant Auxiliary Transformer output medium-voltage circuit breakers.

3. If required, OPEN/CHECK OPEN the switchgear low-voltage supply and load circuit breakers.

4. If required, OPEN/CHECK OPEN the MCC low-voltage supply and load circuit breakers.

C. ESTABLISH phone communications and NOTIFY the Dispatch Supervisor of the shutdown, the cause (if known), and the estimated recovery time.

5. SUPPLEMENTARY ACTIONS

A. Notify the on-duty Dispatch supervisor of the casualty situation and the change in electrical power output capacity of the facility.

B. Notify the plant management authorities of the nature of the casualty, the actions taken, and the estimated time to return the CTG to normal operation and restore the plant to full power production capability.

C. VERIFY and CORRECT the cause of the loss of power. Determine if an immediate re-start can be performed within the turning gear operating requirements listed for the turbine in OP-201 for the CTG(s) or in OP-301 for the STG.

D. With the permission of the Operations or Maintenance Supervisor, RESET all system alarms and protective relays. Identify and record all tripped protective relays and any other relevant fault indicators.

E. If an immediate Station re-start can be performed with backfeed auxiliary power from the Substation 345 kV transmission line via either the CTG #1, CTG #2 or CTG #3, CTG #4 output transformer and the associated plant auxiliary power transformer, proceed as follows.

1. INFORM the Dispatch Supervisor and receive concurrence to close any tripped facility Substation 345 kV circuit breakers.

2. VERIFY that all Substation control room indications on the 345 kV line are normal and inform the Dispatcher that the circuit breaker(s) are closed.

3. VERIFY the CTG #1, CTG #2 and/or CTG #3, CTG #4 output transformers are energized with an input (backfeed) voltage of 345 kV and an output voltage of 13.8 kV.

4. ENERGIZE the Electrical Equipment Building (EEB) 4160 Vac power distribution center switchgear as follows:

   a. ENERGIZE at least one of the two auxiliary power transformers and VERIFY the switchgear front panel voltmeter(s) show 4160 Vac.

   b. CLOSE the appropriate 4160 Vac main switchgear supply circuit breakers to energize both medium-voltage power distribution centers, either separately from both auxiliary transformers, or both together from one available auxiliary transformer.

   c. VERIFY the switchgear front panel voltmeter(s) for the CTG 101/201 LCI starter transformers show an output voltage of 2080 Vac.

5. ENERGIZE the 480 Vac SUS switchgear as follows:

   a. VERIFY that all 480 Vac SUS supply breakers (including the Cooling Tower MCC supply) are closed by noting the illumination of the red Closed lights on the switchgear panel.

   b. If required, SHUT the SUS bus-tie circuit breaker(s) to re-energize any SUS which has lost its normal power source (see OP-702).

   c. CHECK for proper operating voltages and indications.

   d. SHUT all motor control center (MCC) feeder breakers.

   e. START all necessary 480 Vac loads.

6. RE-ESTABLISH the necessary normal or abnormal electrical power distribution system line-up in accordance with OP-702.

7. PERFORM any necessary unit startup(s) in accordance with OP-201 for CTG(s) and/or OP-301 for the STG.

NAES	**OPERATIONS MANUAL** VOLUME II – OPERATING PROCEDURE	
Number: **OP-106**	Subject: **Plant Startup**	
Approved for use by: [signature]	Current Issue: **Revision 1 (R1)**	Issue Date: **20 Apr 21**

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CHECKLISTS

NONE

DRAWINGS	Rev.	Date
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1. INTRODUCTION

The purpose of this plant startup operating procedure is to describe the manual and automatic plant startup sequencing to assist with understanding the recommended overall plant startup sequence and operation with respect to the following plant conditions:

a. Cold startup

b. Warm startup

c. Hot startup

This procedure is only intended to provide the general procedures and guidelines for plant overall operation. For specific system-by-system operating procedures, refer to the specific system procedure and/or vendor O&M manuals.

It is assumed for the purpose of this procedure that the Utility 345 kV system and the on–site switchyard is energized; also, that natural gas is available at the plant boundary from one of the two gas suppliers.

It is also assumed that all plant equipment is available for normal operation and that there are no significant maintenance activities ongoing that would prevent normal plant startup and operation.

Before a unit can be started a number of prerequisite conditions (permissives) must be fulfilled. This covers permissives that are part of the startup sequence.

The startup is initiated by the plant operator and performed by the DCS and the operator. The startup sequence is essentially fully automated; however, several operator actions are required, e.g. operate superheater drains and sky vents, establish sealing steam and to initiate the STG startup sequence in the Mark V.

Prior to bypassing any automatic startup sequence, it must be verified that all permissives are met and that the plant equipment will not be exposed to conditions outside of recommended operating ranges or allowances.

The first of the two CTG / HRSG units that is started is called the "lead" unit. The remaining CTG / HRSG unit is called the "lag" unit. The lag unit is brought into service by commands from the startup sequence.

The system process permissives and logic sequences are the same for a cold, warm or hot start of the steam cycle. This starts with a cold startup but focuses on warm startups. All actions required for warm and hot startup are also required for a cold start, only temperature limitations vary.

The plant is designed to startup with STG preheating provided from the auxiliary boiler. The duration of the startup and some DCS actions are dependent on the initial temperature conditions of the STG and to a lesser extent the conditions of the HRSG. The STG must be warmed up gradually from a cold condition to limit stresses and thermal expansion imposed on the machine and to maintain critical rotor clearances. The HRSG warmup time is also limited by the allowable stresses on the HP drum.

The following table outlines the reasonable startup requirements for plant initial conditions defining cold, warm and hot starts. The actual STG temperature categories and limitations for startup are to be specified by GE. STG guideline values per GE Station Designers Manual GEK-100498 and 107034 are shown below for reference:

Table 1

STG Startup Temperatures and Limitations

STG STARTUP	COLD	WARM	HOT
Time since Shutdown (hours)	>120	120-48	<24
ST Metal Temperature (°F)	<300	301-700	>700
If ST Metal Temperature (°F)	130-400	401-700	>700
Then Recommended Mismatch (°F)	+300	+250	+250
Maximum Mismatch (°F)	+600	+350	+350
HP Steam Temperature Recommended (°F)	430-700	650-950	>950
HP Steam Temperature Maximum (°F)	730-1000	750-1050	>1050

The above guidelines are just a starting point, the actual numbers need to be inputted once the initial startup and commissioning has been complete. The plant has decided to normally have either a hot start (overnight shutdown) or to bring the auxiliary boiler online 2-4 hours prior to the plant start to allow the steam turbine to meet the warm startup conditions.

The typical warm startup will fire the auxiliary boiler (a few hours before startup), warm the condenser hotwell, ensure ST sealing steam and ST bowl metal temperature close to 300 °F. This would be the "cooler" scenario for a warm startup.

Higher STG temperatures should occur for shorter shutdown durations and by the retaining STG gland sealing and vacuum during warm layover to minimize STG cooling.

Cold starts (plant shutdown a week or longer) require slow warmup of the STG on turning gear by prolonged firing of the auxiliary boiler and/or running the CTG at lower loads for the lower exhaust temperature to generate cooler steam and to more closely match the cold ST metal temperatures. Each startup sequence will include opening the HP and LP steam system drains essential to protecting the equipment when the plant is restarted.

2. OPERATING PRECAUTIONS AND LIMITATIONS

A. PRIOR to startup the off site and balance of plant support systems must be on-line and operating properly.

B. VERIFY that the Utility 345 kV system is energized.

C. NOTIFY the Utility dispatch center and / or ERCOT of your intent to produce power to the grid.

D. VERIFY that the natural gas fuel supply system is available for operation.

E. VERIFY that there are sufficient cooling tower and HRSG water treatment chemicals in the plant storage tanks.

F. VERIFY that there is sufficient aqueous ammonia for the HRSG SCR systems in the plant storage tank.

G. VERIFY that any equipment maintenance tags are removed and that all necessary equipment is ready for normal operation.

H. VERIFY that the fire water system is pressurized and that the fire alarm system is activated and operational.

I. VERIFY that the City of Odessa water supply system is available.

J. VERIFY that the raw water tank level is sufficiently high.

K. VERIFY that the raw water pre-treatment system is operational.

L. VERIFY that the DI tank water level is sufficiently high.

M. VERIFY that the DI water treatment system is operational.

N. VERIFY that the CEMS and DAHS are available for operation.

O. VERIFY that the plant DC power systems are available for operation.

P. VERIFY that the plant UPS systems are available for operation.

Q. VERIFY plant/instrument air system is ready.

R. VERIFY potable water supply is operational.

S. VERIFY that the cooling tower basin water level is normal.

3. STARTUP PROCEDURE

A. PLANT PREPARATIONS

1. ENERGIZE the following plant electrical buses:

   • 15 kV Switchgear 11S702, 12S702, 15SA702

   • 5 kV Switchgear and Motor Control Center 15S720A / B, 16S720A / B

   • 5 kV Motor Control Center 15C720A / B, 16C720A / B

   • 480 V Switchgear 10S700A / B, 15S730A / B

   • Transformers 11T701 [CTGs 1/2 GSU], 15T701 [STG5 GSU], 13T701 [CTGs 3/4 GSU], 16T701 [STG6 GSU],15T706 [UAT], 16T706 [UAT] 10T700A / B [Common Services SSTs], 15T710A / B [Plant SSTs] and 16T710A / B [Plant SSTs]

   • 480 V Motor Control Centers 11B130 [CTG1 MCC1-AC and MCC2-AC], 12B130 [CTG2 MCC1-AC and MCC2-AC], 15C707 [STG5], and 15C717 [STG5 Emergency], 13B130 [CTG3 MCC1-AC and MCC2-AC], 14B130 [CTG4 MCC1-AC and MCC2-AC], 16C707 [STG6], and 16C717 [STG6 Emergency].

   • 480 V Motor Control Centers 10C718A / B [Common Services], 11C723 [HRSG1], 12C733 [HRSG2], and 15C708 [Cooling Tower], 13C723 [HRSG3], 14C733 [HRSG4], and 16C708 [Cooling Tower].

   • 480 V Power Panels 15P771A / B [Plant 1A / 1B], 15P719 [Block 1 Essential], 16P771A / B [Plant 2A / 2B], 16P719 [Block 2 Essential]

   • Fuel Gas Heaters 11H480 [Unit 1] and 12H480 [Unit 2], 13H480 [Unit 3] and 14H480 [Unit 4]

   • Ammonia Vaporizers 11T230 [HRSG1] and 12T230 [HRSG2], 13T230 [HRSG3] and 14T230 [HRSG4]

2. START or CHECK operating the compressed air system [15C600 A / B / C] and pressurize the instrument air header.

3. START a demineralized water transfer pump [10P452A / B] to provide demineralized water to the plant distribution system.

4. START the plant condensate collection and waste water collection systems and ENSURE that the following equipment is operational:

   - Oil / water separator [15(16)T440]

   - Plant wastewater sump pumps [15(16)T441]

5. SELECT AUTO for condenser hotwell level control.

6. SELECT AUTO for condenser flashpipe STG drain transfer pumps.

7. SELECT AUTO for flashpipe temperature control.

8. VERIFY that all HP and LP steam drain valves and bypass valves are "CLOSED" and steam systems are bottled up.

9. OPEN the lead HRSG to header HP and LP steam outlet MOV isolation valves (assuming closed due to warm layover bottle-up). It is assumed the differential pressure and the differential temperature measured across the valve is minimal, but it's preferable that it is less than the values listed in the following table:

Table 2

Allowable Differential Pressures/Temperatures

Stream	Differential Pressure (psi)	Differential Temperature (°F)
HP Steam	90	100
LP Steam	25	100

10. VALVE in a closed cooling water heat exchanger [15(16)H475A / B] and START a closed cooling water pump [15(16)P451A / B].

B. STG PREPARATIONS FOR NORMAL LOAD OPERATIONS – MARK VIE

If the STG control cabinet is still energized and the STG is tripped from the last shutdown then skip next five items and proceed to verify display that STG is tripped.

1. VERIFY STG is off turning gear and cold

2. ENSURE HPU is not running

3. TURN OFF all hydraulic oil pumps
4. ENERGIZE STG control cabinet
5. PRESS EMERGENCY TRIP
6. VERIFY HP throttle and LP admission stop valves are closed
7. VERIFY excitation controls, generator controls, & generator breaker is ready for operation.
8. VERIFY generator & exciter protective relays in RESET
9. SELECT AUTOMATIC MODE for automatic turbine startup (ATS)
10. INITIATE STG auxiliaries start sequence
11. READY lamps "ON"
12. SELECT lube oil pump motor 1 or 2
13. SELECT AUTO: lube oil pump motor 1
14. RUN lamp "ON": lube oil pump motor 1
15. SELECT AUTO: lube oil pump motor 2
16. SELECT hydraulic fluid pump motor 1 or 2
17. SELECT AUTO: hydraulic fluid pump motor 1
18. RUN lamp "ON": hydraulic fluid pump motor 1
19. SELECT AUTO: hydraulic fluid pump motor 2
20. SELECT START: vapor extraction motor
21. RUN lamp "ON": vapor extraction motor
22. SELECT START: HF cooling circuit fan motor
23. RUN lamp "ON": HF cooling circuit fan motor

NOTE

Generator space heater will automatically energize when generator circuit breaker is open and de-energize when circuit breaker is closed.

24. START ST turning gear in Mk VIe (Note: CHECK how many hours on turning gear are required before STG cold start. Refer to GE STG O&M manual).

25. GE STG Group A, B and C drains are OPENED following turning gear prewarming and will automatically CLOSE at specific process conditions (e.g. 10 – 30 percent load). Group A) includes HP before and after seat drains, B) HP ST shell drains, steam packing drain and C) LP before and after seat drains. Note: Because the HP and LP before seat valves drain to the condenser flash pipe (under vacuum), these two valves should only be opened when the headers are sufficiently pressurized from the HRSG. If on prolonged warm standby with these valves open, the bottled-up steam system could eventually be depressurized.

26. CORRECT all alarm and trip fault conditions in the ALARM listing. PRESS ACKNOWLEDGE and RESET alarm display. RESET turbine controls. Main stop valves open wide. VERIFY both ETDs (electrical trip device) are operating. TEST TRIP function. VERIFY speed & load setpoints are at "0" percent. VERIFY STG is ready to receive external seal steam.

27. When HP header pressure exceeds 125 psig, operator may activate "STEAM SEAL CONTROL ON" signal in the Mk VIe to start the STG steam seal system. This is the minimum pressure that will ensure the minimum steam temperature requirement of 300 °F in the seal steam header. Mark VIe opens and controls valve AOV-SSFV after receiving this signal. The gland steam condenser exhauster is started. CONFIRM STG seals established

28. VERIFY condensate system ready for operation, systems filled, vented, loop seals full, hotwell level satisfactory and all valves correctly lined up.

29. CLOSE vacuum breaker valve HV655, if open.

30. START a condenser vacuum pump [15(16)P403A / B] to pull vacuum in the main condenser. If a more rapid condenser vacuum startup is desired, the operator can operate both vacuum pumps. If both vacuum pumps are in operation, shut down one of the vacuum pumps after the condenser vacuum is pulled to the desired level. Only one vacuum pump is needed to be online for normal plant operation.

C. STG WARMING PERIOD (READY FOR STARTUP)

1. START condensate pump [15(16)P417A / B], should be operating in AUTO on minimum flow recirculation.

2. VERIFY STG ready to accept steam to roll start.

3. Start circulating water pumps [15(16)P470A / B / C] as needed to provide cooling water to the main condenser as condenser temperature and pressure begin to rise. Two pumps should be in operation.

4. As heat load increases with plant equipment being brought on–line, START a cooling tower fan [C410A / B / C / D / E / F]. Additional fans will automatically come on and drop off as necessary to maintain proper water supply temperature.

5. As plant equipment is brought on–line, start the steam and water sample analysis system to allow the maintenance of plant water chemistry. Most of the plant chemical addition systems as well as HRSG and cooling tower blowdown systems are automatically controlled from the DCS in response to the sample analyzers.

D. UNIT ACTION PRIOR TO STARTUP

1. VERIFY CTG, HRSG and FW systems ready for startup.

2. CONFIRM systems filled with water and drum levels are at startup level, vents and drains closed and valves are lined up.

3. START BMS and duct burner flame scanner cooling air fan [11(13)C212A / B] for HRSG1(3) or [12(14)C212A / B] for HRSG2(4).

4. VERIFY that a demineralized water transfer pump [10P452A / B] is in operation.

5. START HRSG FWH recirculation pump and SELECT AUTO FWH recirculation temperature control.

6. START the CEMS system [11(13)J430 for HRSG1(3) or 12(14)J430 for HRSG2(4)].

7. START an aqueous ammonia transfer pump [15(16)P450A / B].

8. START the HP feedwater pump [11(13)P460 for CTG1(3) or 12(14)P460 for CTG2(4)] required for HP and LP steam drum level control.

NOTE

If the LP Drum is cold and depressurized, the FW pump should be allowed to circulate on the minimum flow bypass until the drum pressure builds to about 50 psig. This procedure will provide a gradual warmup for the FW pump and for the HRSG to avoid excessive stresses when the HRSG is started up.

9. VERIFY that the water level in the HRSG steam drums is at start level or above the minimum operating level. It is recommended that the initial cold-water level be slightly above the low water level alarm point to allow for normal steam drum swell as the HRSG warms up.

10. CONFIRM condenser vacuum pressure less than 15 inches HgA as permissive allowing for steam bypass operation.

11. START the Fuel Gas Heater for the lead CTG being started [11(13)H480 for CTG1(3) or 12(14)H480 for Unit 2(4)].

12. START CTG in accordance with established procedures.

13. The CTGs are prepared for startup according to the OP-201. The Mark VIe control system must be ready for operation.

14. The following checks prior to operation are performed:

    a. CTG is off cooldown, and in a ready to start condition (The CTG may need to be on turning gear e.g. 60 minutes)

    b. SELECT MAIN from the MV DEMAND DISPLAY menu

    c. SELECT AUTO and EXECUTE in MV

    d. VERIFY "STG ready to start"

    e. SELECT synchronizing selector switch on generator panel to AUTO

    f. VERIFY CTG start permissives, ready to start

    g. CTG IGVs will close controlling exhaust temperature ramp.

    h. CTG can be loaded to increase steam flow and temperature once IGVs are closed.

    i. SELECT CTG target load.

    j. REPEAT procedure for lag CTG as required.

15. VERIFY condenser pressure sufficiently low for STG startup (e.g. less than 5 inches HgA).

16. DCS signal INITIATE START SEQUENCE allows the Mark VIe start sequencing to begin checking various STG internal conditions such as STG in AUTO mode.

17. SELECT START Command to Mark VI to start lead CTG
18. IF the following conditions are not already met, they will be carried out by the lead CT Mark VIe.
    a. CT auxiliaries will be started including a motor driven lube oil pump.

E. SEQUENCE IN PROGRESS

1. When permissives are satisfied:
    a. CT shaft will begin to rotate with starting device
    b. Fuel supply on
    c. CT shaft accelerating
    d. Accelerate to purge speed
    e. Purge
    f. Coast down to ignition speed
    g. Ignition
    h. Starter accelerates until combustion supports acceleration (~60-90 percent speed)
    i. Starter off
    j. Synchronization
    k. CT will load to & hold at spinning reserve of (10 - 15 percent of baseload)
2. The lead "CT Started" is triggered when TE322 > 570 °F. This CT exhaust temperature signal determines a successful CTG start and is used to indicate initial heat input into the HRSG from the CTG.
3. At "CT Started", OPEN the Deltak(VOGT) HRSG HP and LP superheater MOV drain valves through the DCS to removed accumulated condensate. FOLLOW Deltak(VOGT) recommendations when these are to be closed, but as a suggestions these should be open for a minimum of five minutes, then close when HP pressure has exceeded approximately 10 -90 psig, and when LP pressure has exceeded 5 – 15 psig.

4. At "CT Started", the HP and LP steam system drain valve logic opens the valves. The valves close when more than 25 – 45 °F superheat has been indicated in the drip leg. STG warmup valve XV533 closes after 100 °F superheat has been reached.

5. At "CT Started", START the condensate-FW-steam chemical feed pump systems.

6. START HRSG SCR system (energize ammonia vaporizer electric heaters) as soon as there is sufficient catalyst temperature at the face of the catalyst. INITIATE operation of the SCR system as soon as possible during HRSG startup to minimize startup NOx emissions.

NOTE

As the volume of water in the HRSG expands due to increasing water temperature, excess water may be removed via the intermittent blowdown system as required.

As HP and LP steam begins to be generated in the HRSG, the MOV superheater startup vents should be opened through the DCS to assist venting and ensure superheater cooling flow is established.

As pressure rises in the HP and LP steam systems, steam shall be bypassed to the main condenser via the STG bypass system. The ramp rate is controlled by the bypass valve in accordance with DELTAK's(VOGT) allowable stress limits. The rate of HP drum temperature increase is 9 °F per minute.

7. At "CT Started" the STG bypass pressure controllers (PIC–1702 for HP and PIC–1722 for LP) are active with a ramp rate corresponding to 9 °F/min and set at the minimum floor pressures of 665 psig for HP and 30 psig for LP.

8. DCS signal START PERMISSIVE provides input to the Mark VIe verifying all the balance of plant is ready and the steam conditions are ready for STG roll. Only after all Mark VIe parameters are met will the Mark VIe begin to roll the STG.

9. During startup when sufficient steam flow has been established according to Deltak(VOGT) guidelines, HP drum level control may be switched from one to three element control e.g. at 25 percent steam flow (e.g. shutdown switch at ~15 percent flow). Once the FW flow reaches approximately 25 percent, feed forward control (matching input flow to HP and attemperator water demand) is added to the LP drum single element control. The startup levels should be raised to normal level e.g. after 25 percent steam flow is reached.

10. Once the CTG is brought up to full speed – no load (FSNL), synchronize the CTG with the grid and load the CTG slowly up to target load. If HRSG sky vents were open, they should be closed at 25 percent unfired steam flow.

11. IF the ambient temperature is below 40 °F, ADJUST CTG inlet bleed heat to warm the CTG intake air to prevent ice formation.

F. PREPARATION FOR STG STARTUP

1. AS HP header pressure exceeds 150 psig, SHUTDOWN the auxiliary boiler if it was operating and CLOSE steam supply valves to HP header and to condenser hotwell from the auxiliary boiler supply header.

2. VERIFY water and steam purity requirements are met.

3. INITIATE STG start sequence using established procedures. STG governor valves open to roll the STG and accelerates up to speed determined by the Mark VIe (e.g. 250 - 500 rev/min). A hold may be imposed by the controller (e.g. 5 – 10 minutes at 1000 rpm) depending on the metal temperatures. Mk VIe controls speed with the steam flow while observing the stresses on up to full speed where the STG is synchronized.

NOTE

During startup the turbine bypass steam conditioning valves will be controlling to a minimum system pressure. After the STG is synchronized, the control valves will be controlling to a minimum system pressure on inlet pressure control (IPC), but with a slightly lower setpoint pressure than the bypasses. The STG minimum system pressure is the floor pressure controlled by the inlet valves and is approximately 645 psig for HP and approximately 20 psig for LP.

NOTE

As the STG governor valves open more to accept more steam, the bypass control valves continue to close until all steam is directed to the STG and no steam is bypassed. As the steam production increases, the natural system pressure increases until the pressure exceeds the floor pressure. At this point the inlet control valves are valve wide open (VWO). The steam system will be in sliding pressure mode (e.g. after lag CTG/HRSG starts up).

4. The STG is loaded according to the GE recommendations and within the stress limits. The typical STG limitations to carefully monitor are thermal stress, vibration and rotor to shell differential expansion. Any of these

may occur from excessive temperature mismatches, and/or rates of temperature change.

5. IF the CTG is at full load and additional STG electrical output is desired, INITIATE a start of the HRSG duct burner OR START the lag CTG.

G. LAG CTG/HRSG TRAIN READY FOR START

1. Same as for lead train described above
2. Lag CTG Preparations for Normal Load Operation — Mark VIe
3. Same as for lead train described above
4. SELECT START Command to Mark VIe to start lag CTG
5. Same as for lead train described above

NOTE

The lag "CT Started" is triggered when TE322 > 570 °F. Same as for lead train described above, except the header drains will not open automatically. If there is insufficient superheat measured in the drip leg, there will be an alarm and the drain valve may be opened through the DCS as needed.

As HP and LP steam begins to be generated in the lag HRSG, the MOV superheater startup vents may be opened or closed through the DCS to assist venting, reduce pressure gradient and ensure superheater cooling flow as needed. The lag HRSG drum temperature gradient cannot be controlled by the STG bypass valves until the MOV opens to join flows.

6. The lag HRSG to header isolation valves may be opened when the differential pressure and the differential temperature measured across the valve is less than the values listed below: (these values are guidelines and should be finalized during commissioning).

Table 3

Allowable Differential Pressures/Temperatures

Stream	Differential Pressure (psi)	Differential Temperature (°F)
HP Steam	50-90	100
LP Steam	25	100

NOTE

Both lead and lag CTG's are loaded to their target load setpoints, with the additional steam directed to the STG and assuming the STG is within allowed stress limits.

7. The plant output will be determined by ERCOT.

4. AUTOMATIC LOAD CONTROL

Once the STG is warmed up and operating on inlet pressure control, the DCS automatic generation control (AGC) can be engaged to control the output of the plant. The operating range of the AGC is approximately 65 percent to 100 percent plant output (165 MW to 250 MW) with both gas turbines operating and about 33 percent to 50 percent of plant output (85 MW to 125 MW) with one gas turbine operating. The unit load range is limited by gas turbine emission limits. GE's gas turbine emissions are only guaranteed between 65 percent load to baseload as the CTG does not operate in DLN mode at loads less than 49 MW (75 MW * 65%). For this reason, the AGC has not been configured to support operation at lower gas turbine loads. The AGC will control the output of the plant (250 MW block). The AGC will vary the gross output required to get the target net unit output to the grid. Three meters located in the substation are summed to provide the plant net output to the grid.

There is a DCS selector to accept a load target from the plant load control target logic.

The operator must select "AUTO" unit load control from the DCS CTG startup graphic for each CTG to start the AGC. Duct burner firing rate is included in the AGC once the fuel gas valve has been released for modulation and placed in "AUTO" control from the DCS BMS graphic.

The DCS continuously add the two CTG outputs to the STG output, then subtracts the plant auxiliary loads providing the net export power of the plant. The resultant export power value is then applied as the process variable to the AGC load controllers for the CTG's and HRSG duct firing.

Automatic load control will vary CTG and duct burner fuel flow controllers enabled for load control to achieve the desired overall plant target export power. The operator may select any combination of CTG and HRSG duct firing for manual loading and the other for automatic loading.

5. HRSG SUPPLEMENTARY FIRING

When the "on Temp Control" for the Inlet Guide Vanes (IGV) is at 84 °F, the operator is able to select baseload operation on the HMI interface. Once the CTG's reach baseload (actually 95 percent is the start permissive for the duct burner BMS) and additional output is required, the operator will light off the duct burners to produce more steam and make the additional STG power. The BMS will not allow the duct burners to start until the DCS sends a signal indicating all the external duct burner process permissives are met.

The control room operator uses DCS hand switch to place the BMS system in local or remote control.

Once safe conditions operating conditions required by the BMS have been fulfilled, the BMS releases control of the fuel valve to the DCS. As the load demand increases, additional burner elements are lit off as required. If an element fails to light in sequence, an element fail alarm is generated and the DCS proceeds to light off the next higher element. If the next highest element fails to light off, the DCS will then generate another element fail alarm and proceed to light off the next element.

Similarly, when the firing demand falls off, the DCS will extinguish elements as necessary.

When the "released for modulation" signal is true, the DCS fuel flow controller regulates the duct burner fuel gas valve. The FG flow controller may either have direct setpoint entry by the operator or be selected for automatic setpoint control from the AGC load controllers. If the STG load output is at maximum, the DCS will prevent the AGC load controller setpoint demand from increasing further. It is also possible that a lower plant export power could be entered after the duct burners are firing. To achieve a lower plant load setpoint, the DCS will first reduce duct firing to the minimum fire position and if further power reduction is required lower the CTG load down to a low limit of 95 percent. An operator advisory will be provided that automatic load limiting cannot proceed further. If the export power demand is then increased, the DCS will first ramp up the CTG setpoint and only after baseload is achieved ramp up the fuel flow setpoint. The 95 percent CTG load lower limit for automatic AGC regulation is imposed because duct firing is automatically extinguished if the CTG load falls below 95 percent.

At all times the DCS compares the actual fuel flow to the maximum allowed for the number of elements that are on. If the fuel flow reaches the maximum allowed for the number of elements on, the DCS prevents the output to the fuel valve from increasing.

NAES	**OPERATIONS MANUAL** VOLUME II – OPERATING PROCEDURE	
Number: **OP-201**	Subject: **Combustion Turbine Operations**	
Approved for plant use by:	Current Issue: **R1**	Issue Date: **20 APR 21**

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CHECKLISTS

DRAWINGS	Rev.	Date
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REFERENCES	Rev.	Date
GE Power Systems GEK 107227	-	JAN 01

1. PRECAUTIONS AND LIMITATIONS

A. GENERAL PRECAUTIONS

1. Recognizing the normal operating conditions of CT systems and its components can help to identify variations from normal parameters and functions. Abnormal conditions or malfunctions are to be reported to the Operations Manager.

2. Equipment failures most frequently occur within the first 30 minutes of operation. During this startup period, the CTs should be closely monitored for both normal and abnormal vibration, leakage, temperature, and noise.

3. Prolonged operation with wheelspace temperatures above the manufacturer's recommendations will damage hot gas path components. Wheelspace temperatures vary with load and high temperature values will not directly cause an automatic turbine trip through the control system. However, all high wheelspace temperature readings must be recorded and must then be reported to the manufacturer's technical representative as soon as possible.

4. Before the CTs can be started, all maintenance work must be complete, and all Danger Tags and Lockouts must be cleared and removed from the equipment.

5. The maximum overall vibration velocity of the gas turbine should never exceed 1.0 inch per second in either the vertical or horizontal direction. Corrective action should be initiated whenever vibration levels exceed 0.5 inch per second as shown on the CT Operator Control Panel.

6. A sudden emission of black smoke from the exhaust stack may indicate an outer casing failure or other serious combustion problem. If smoke is observed, immediately shut down the turbine and ensure all personnel stand clear of access door openings. When conditions stabilize, perform a complete system inspection.

7. Transfer periods are defined as that period of time from the initiation of the transfer process between gas and liquid fuels, until the process is complete. Transfer periods should not exceed 30 minutes.

8. The CT fire extinguishing system, when actuated, will trigger several functions in addition to actuating the CO_2 discharge system. The turbine will trip, an audible alarm will sound, and the alarm message will be displayed on the operator control console. The fire extinguishing system must be replenished and reset before it can automatically react to a subsequent fire.

9. If the turbine rotor is not turned following an emergency shutdown or for any other reason, there is a risk of bowing the shaft. This could result in unbalanced rotation and severe turbine damage.

10. Turbine components in the hot gas path can be damaged by high temperatures. Exhaust gas temperatures should be monitored during all phases of startup and operation to prevent exceeding thermal limits. The exhaust gas temperatures during the low-speed gas-fired warm-up (1000 rpm) should not exceed 550 °F. Later in the starting sequence, the exhaust gas temperatures during final acceleration to full speed (3600 rpm) should not exceed 800 °F before load is applied to the unit.

11. When changing generator load manually (if required), increases and decreases should be made in a slow and deliberate manner no faster than 7 MW per minute. This will allow the associated fluid systems to properly adjust and compensate for load changes. When raising generator load manually, operate the RAISE controls carefully. If fuel gas input increases too quickly, the gas turbine may trip as a result of exceeding the maximum allowable difference between the highest and lowest exhaust gas temperatures.

12. Under no circumstances should any attempt be made to start the turbine if the extraction air (11th stage) bypass valves are not fully open. Serious damage to the gas turbine may occur if these valves are not open to relieve the pressure pulsations that develop during either the acceleration or deceleration cycles of turbine operation.

B. VIBRATION LIMITS

1. The maximum overall vibration velocity of the gas turbine must not exceed 1.0 inch per second (ips) in either the vertical or horizontal direction. Action should be taken to reduce vibration whenever levels exceed 0.5 ips. This is true for all operations except during startup or shutdown when progressing through critical speeds (approximately 1265 and 1437 rpm). Startup and shutdown vibration velocities should not exceed 1.0 ips above acceptable values established during initial performance testing of each unit.

2. If vibration velocity exceeds the above limitations at any speed, the turbine must be shut down and rotated for a minimum of one hour prior to attempting restart. If seizure occurs during turning operation, the turbine should be stopped, remaining idle for at least 30 hours, or until the rotor is free, prior to restart. The turbine may be rotated briefly during the 30 hour period if the rotor is free; however, audible checks should be made to check for rubbing.

C. LOAD LIMITS

1. Do not operate the turbine in a manner that will exceed the limitations of the driven generator. The rated power output of the combustion turbine is designed to provide ample margin from maximum component stress limitations in order to ensure equipment reliability. Therefore, the unit is capable of safely operating above the nameplate rating. Any malfunction or damage occurring as the result of operation in excess of contracted power output ratings is the sole responsibility of the operator.

2. Several factors can affect combustion turbine power output, including changes in ambient air temperature. Low ambient air temperatures can result in power levels in excess of the nameplate rating due to the increased density of the air. Advantage can be taken of the increased capability during such conditions (within prescribed limits) without exceeding the maximum allowable turbine inlet temperature. In any case, the maximum load limit of the turbine-generator must not be exceeded, even if ambient temperature is below that at which the limit is reached. Under these conditions, the turbine will operate at this load with reduced turbine inlet temperatures, and the designed stresses on the load coupling and turbine shaft will not be exceeded.

3. The Mark VIe senses turbine exhaust temperature and provides the necessary bias to limit fuel flow in order to prevent exceeding the maximum allowable turbine inlet or exhaust temperatures. If the turbine is overloaded such that the prescribed exhaust temperature schedule is not followed (for reasons of malfunctioning or improper exhaust temperature control system settings), the maximum turbine inlet and/or exhaust temperatures will be exceeded. This can result in accelerated wear of hot gas path parts and, in extreme cases, catastrophic failure. Every effort must be taken to ensure that temperatures are maintained within prescribed limits at all times.

D. TEMPERATURE LIMITS

1. Lube oil and bearing metal temperatures must be monitored continuously during turbine operation. Thermocouples are imbedded within the babbit of No. 1 and No. 2 Journal Bearings, the thrust bearing (both active and inactive sides), and both generator bearings. Thermocouples are also provided in each of the bearing oil drain lines. The following limitations are imposed:

    a. Maximum allowable bearing metal temperature is 265 °F for all bearings.

    b. Lube oil flow must be maintained after turbine shutdown until all bearing metal temperatures are less than 200 °F.

2. The following control features are provided to protect against overheating of the starting motor:

   a. When startup is performed with the rotor at rest, if breakaway is not achieved within 45 seconds of initiating startup, the starting motor is unloaded (torque converter drained), and will continue to run (unloaded) for 15 minutes to cool down. This feature will provide proper cooling for motor windings.

   b. If the starting motor becomes bogged down (turbine speed more than 5 percent below motor speed for longer than 1 second), the motor will be tripped. This trip is not enabled during the coast down period from full crank speed for purge before firing.

   c. Continued cranking at high speeds as resulting from repeated purge cycles may overheat the starting motor. No more than two consecutive start attempts are permitted in order to prevent overheating. Further start attempts will be blocked for 4 hours.

E. PRESSURE LIMITS

The following pressure limits should be observed during normal turbine operations:

1. Normal lube oil pressure in the bearing supply header must be a nominal 25 psig. If the Main (shaft-driven) Lube Oil Pump fails to maintain proper pressure, the AC Lube Oil Pump will automatically start upon sensing bearing header pressure of 15 psig. In the event of a loss of AC power, the DC Lube Oil Pump will start automatically along with a turbine trip. The DC pump will provide sufficient pressure for lubrication and cooldown purposes. A turbine trip will occur if lube oil pressure falls to 8 psig.

2. Hydraulic system pressure is normally maintained at 1510 $\pm$10 psig. The AC Hydraulic Supply Pump will start automatically if pressure falls to 1350 psig. Bladder accumulators are provided to absorb pressure transients when starting pumps or operating hydraulic system components.

3. Normal inlet air filter pressure drop should not exceed 4" H_2O. The automatic self-cleaning air pulse system should cycle on at this point, terminating cleaning when pressure drop is restored to 2" H_2O. An alarm will occur if the pressure drop exceeds 6" H_2O. A CT trip will occur at 8" H_2O.

2. PREREQUISITES

A. The Mark VIe Speedtronic® control system must be aligned, calibrated, and placed in service in accordance with the Control Specifications of the GEK 107227 Service Manual.

B. The natural gas fuel system must be placed in service in accordance with OP 301.

C. The Facility demineralized water supply system must be operating in accordance with plant operating procedures.

> **CAUTION**
>
> Ensure the demineralized water supply system is capable of supporting injection water requirements and operations. Water Injection from FSNL to Full Load is permissible at ambient temperature from 0 to 120 °F. Water conditions shall not exceed 350 psi and 675 °F to stay within design limits for the combustor end cover.

D. The associated fire extinguishing system must be properly charged with CO_2 and aligned for the CT to be started. Ventilation dampers must be manually opened if they were shut due to a fire trip.

E. Auxiliary 480 Vac power must be supplied to the associated CT MCC in accordance with OP-402

F. Auxiliary 125 Vdc power must be available to the associated CT vital load power panels in accordance with OP-403.

G. A restoration valve lineup shall have been performed after any maintenance activities within the CT enclosure. The support systems shall always be realigned to allow CT operation as required in accordance with the GEK 107227 Service Manual.

H. The procedures in this Operations Procedure are intended to be performed locally at the Mark VIe Speedtronic Control Panel in the Packaged Electronic and Electrical Control Center (PEECC) compartment of the CT being operated.

I. CEMS system is in service per OP-505.

J. VERIFY the Fogging System is available for service and sufficient water is available for use.

K. Operating Logs - Measured readings should be taken as specified by the Plant Manager for applicable operating logs.

3. NORMAL OPERATIONS

Normal startup and shutdown should be performed in accordance with the system lineups and operator checklist provided. System valve lineups and motor controller positions are used to establish a consistent starting point. From that starting point, the required actions for each normal operating evolution will be specified in the startup checklists.

The turbine will operate with fully automated control requiring minimum operator intervention. All specified log readings should be taken at the appropriate intervals to ensure proper operation of the turbine and its auxiliaries. More frequent checks of monitored parameters will facilitate early detection of abnormalities and minimize forced outages. Key indicators of abnormal conditions include lube oil temperatures, turbine wheelspace temperature spreads, and vibration velocities. The turbine and all of its auxiliary systems should be checked regularly in order to detect abnormalities that are not readily evident on Mark VIe displays (noise, leakage, etc.). Turbine exhaust emissions are monitored continuously by the Mark VIe, and should be regularly verified not less than 10% below the allowable limits for NOx. This ensures acceptable emissions levels are maintained.

A. TEMPERATURE CONTROL

Changes in ambient temperature may cause turbine output to vary. At lower ambient temperatures, air density is higher. The increased density adds to the mass flowrate of air through the unit, thereby increasing power output. Conversely, at higher temperatures, air is less dense. Mass flowrate through the unit is lower; therefore, power output is reduced. When the turbine is operated near its full load rating, the turbine is controlled as based on exhaust temperature (Temperature Control mode). In the Temperature Control mode, turbine firing, and thus load, is controlled to maintain exhaust temperature at or near 986°F. Excessive exhaust temperatures may result in protective shutdown.

B. AUXILIARY SYSTEMS OPERATIONS

During turbine operation, auxiliary systems operations are fully automated, with a limited number of components requiring service.

4. SYSTEM ALARMS

A. ALARM RESPONSE

The following steps should be used to silence, acknowledge, and reset any annunciator alarming conditions on the Primary Operator Interface <I>.

1. To acknowledge any or all alarms, an operator can press the ACK ALL target of the Alarm Display. Once alarms are acknowledged, an asterisk (*) denoting their unacknowledged condition will be deleted from the

Alarm Display Acknowledgement Status column and the associated alarm message removed from the Alarm Window. Alarms may be individually acknowledged from the Alarm Display by selecting the alarm message. The alarm message is highlighted and changes to a green color. Display targets at the bottom of the screen change to allow individual acknowledgement and resetting of a selected alarm. Clicking the ACK ALARM display target will acknowledge only the selected alarm. An alarm may also be acknowledged by clicking on one character/space on either side of the Acknowledgement Status asterisk in the Alarm Window.

2. To silence an audible alarm, there are two methods. The simplest is to click anywhere on the Alarm Window. The second is to click on the Alarm Display target and clicking on the SILENCE target at this screen.

CAUTION

Before alarms can be reset, they must be acknowledged (no asterisk in the Acknowledge Status column) and the alarm conditions no longer exist (a logic "0" in the Status Flag column).

3. Once an alarm condition has been corrected, the Status Flag of the alarm message changes to a logic "0". To remove acknowledged invalid alarm messages from the Alarm Display once conditions are satisfied, the operator will perform an alarm reset action by clicking on the RESET ALL display target. Resetting an alarm will allow future occurrences of the alarm to be annunciated by an audible signal. All alarms will be logged to the printer and in the Historical Log Alarm Queue. Individual acknowledged alarms may be reset from the Alarm Display by selecting the desired alarm message and clicking on the RESET ALARM target. The highlighted alarm will be erased from the Alarm Display.

B. LUBE OIL SYSTEM ALARMS

- Low Lube Oil Pressure
- Low Lube Oil Level
- High Lube Oil Temperature
- High Main Lube Oil Filter Differential Pressure
- ALOP/ELOP Running
- CT Trip

The following actions should be performed in response to a lube oil system alarm:

1. Verify the AC lube oil pump has started, if not start the AC lube oil pump.

2. Check filter differential pressure indications. If the liquid lube oil filter differential pressure exceeds 15 psid, shift the on- service filters as follows:

    a. Slowly open the fill valve until a steady stream of oil is visible in the sight glass in the filter vent line.

    b. Shift the transfer valve with a wrench to place the standby filter in service.

    c. Close the fill valve.

    d. Verify differential pressure less than 15 psid.

    e. Replace and inspect the off-service lube oil filter cartridge.

3. If pressure decreases below 8 psig and the turbine does not trip, manually trip the turbine.

4. Walk down the lube oil system to check system integrity and to verify that lube oil supply temperatures and pressures are within normal system values. When possible, use local instruments to verify each temperature, pressure, or level indication.

5. If differential temperature across the bearings of the CT or gear assemblies exceed 50 °F or experience an abnormal rise, unload the CT to a full speed, no load (FSNL) condition.

6. If pressure cannot be restored to normal, shut down the turbine and effect repairs.

7. If a pump, temperature control valve, or other component of the CT lube oil system is suspected of failure, refer to the MS-7001EA Service Manual for troubleshooting guidance.

C. HYDRAULIC SYSTEM ALARM

- Hydraulic Trouble
- Low Hydraulic Supply Pressure
- Low Liquid/Gas Fuel Hydraulic Trip Pressure
- High Hydraulic Filter D/P
- CT Trip

The following actions should be performed in response to a hydraulic system alarm:

1. Verify each single temperature, pressure, or level indication locally, as applicable.

2. When the hydraulic oil filter differential pressure increases to 60 psid or above, shift the on-service filter as follows:

   a. Open the air bleed valve on the off-service filter.

   b. Open the fill valve.

   c. When oil combined with air comes out of the air bleed, shift the transfer valve.

   d. Close the fill valve.

   e. When no air is contained in the oil coming from the air bleed, close the bleed valve.

   f. Verify the differential pressure is less than 60 psid.

   g. Replace and inspect the off-service hydraulic oil filter cartridge.

3. If the pump, regulating valve, or any other component of the hydraulic oil system is suspected of failure, refer to the MS-7001EA Service Manual for troubleshooting guidance.

5. CT STARTUP

This Checklist shall be used to perform and document the specified operation of the Energy Center. All numbered steps shall be performed in the specified sequence. Intervening groups of non-numbered steps may be performed in any convenient order, but all of the steps in any such group must be completed before returning to the numerical sequence. The responsible operator, required action, performance process, and verifying indications are specified. Where appropriate, safety information is provided as a "Warning" to prevent personnel injury or as a "Caution" to prevent equipment damage. MK-VIe control screen actions require an execute command to commence the action requested. Explanatory information is provided as a "Note"

Check	Step	Action	Process
	1	REVIEW precautions, limitations, and setpoints.	Sections 1 and 2 of this procedure.
		VERIFY the Mark VIe Speedtronic control system is properly setup.	Check for maintenance performed since last setup.
		VERIFY the fuel gas system is in service.	Check status per OP-301
		VERIFY demineralized water system is in service.	Check status per OP-806
		VERIFY the CO_2 fire extinguishing system for the CT being started is ready for service.	Pressure vessel and compressor gauges.
		PLACE the associated CEMS unit in operation.	Check status per OP-505
		VERIFY CT Fogging system available	Check for sufficient DI Water
	2	RESET manual CT emergency stop devices.	All emergency stop pushbuttons in normal position.
	3	From the Mark VIe operating station, SELECT the "LOCAL" target.	VERIFY the local message appears on the Mark VIe.
		VERIFY that the "MASTER PROTECTIVE TRIP/ALARM" is not displayed on the Mark VIe CRT.	If displayed, determine the cause and take appropriate corrective action to clear the condition prior to proceeding.
		REVIEW the plant control system Alarm Summary for any alarm or trip condition that might prevent or affect turbine startup.	Perform any corrective actions necessary to clear those alarms or trips.

Automatic CT Startup continued:

Check	Step	Action	Process
	4	SELECT the "Main Display". Verify the following turbine status is indicated on the Main display:	SHUTDOWN STATUS: OFF COOLDOWN OFF
	5	SELECT the "OPERATION SELECTOR AUTO" target and then EXECUTE to select fully automated startup. VERIFY that Main Display status changes to the following:	STARTUP STATUS: READY TO START AUTO
	6	From the fuel display	VERIFY that fuel gas supply pressure is between 350 and 395 psig.
	7	SELECT loading of generator. Pre-select, Base, or Peak.	If Pre-select is chosen, select initial loading setpoint for the machine.
		SELECT the "START" or "FAST START" target and then EXECUTE.	VERIFY that they "SEQ IN PROGRESS" message appears on the Main display.
	8	Once all master protective logic permissives have been satisfied, VERIFY that Main display status changes to:	STARTUP STATUS: STARTING AUTO; START
	9	VERIFY that the following unit auxiliaries start:	Standby lube oil pump. Lube oil bearing supply header pressure should be 25 psig.
			Standby hydraulic supply pump. Hydraulic pressure should be at 1510 psig.
			Lube oil mist eliminator fan.
	10	When lube oil pressure is sufficient, the ratchet will break-away the rotor and turbine speed begins to increase.	VERIFY that the Starting motor is energized.
	11	When turbine speed reaches 0.310% of rated speed (11 rpm), the hydraulic ratchet is de-energized and turbine acceleration is provided by the starting motor. VERIFY that Main display status changes to:	STARTUP STATUS: CRANKING

Automatic CT Startup continued:

Check	Step	Action	Process
	12	When the turbine reaches 10% (360 rpm), the purge timer is energized. The turbine will continue to accelerate to the purge speed at 750-800 rpm.	VERIFY that the PURGING message appears on the Main display.
NOTE The turbine will remain at purge speed (750-800 rpm) for the duration of the purge timer. If firing is not initiated within 30 minutes of purge completion, the INCOMPLETE SEQ message will appear on the MAIN display. The unit must be purged prior to re-ignition.			
	13	When the purge timer times-out, turbine speed will decrease to the minimum firing speed dropout setting at 9.5% rated speed (342 rpm).	VERIFY that the PURGE COMPLETE message appears on the Main display.
	14	When the turbine reaches the minimum firing speed pickup setting at 10% rated speed (360 rpm), the ignition timer is energized. The gas stop/ratio valve opens, gas control valve positions to firing FSR, and the spark plugs are energized VERIFY that the Main display status changes to:	STARTUP STATUS: FIRING
CAUTION If flame is not established or is lost, ignition must be re-attempted within 2 minutes, otherwise an additional purge must be performed in order to prevent excessive fuel accumulation. If an additional purge is required, no more than two attempts to establish flame are permitted. This limitation is intended to prevent overheating the starting motor due to heat buildup from operation during consecutive purge cycles.			
	15	When flame has been verified, the ignition relay de-energizes and the warmup timer starts. The turbine will remain at firing speed for the duration.	STARTUP STATUS: FLAME ON
	16	VERIFY that the Main display status changes to:	STARTUP STATUS: WARMING UP

Automatic CT Startup continued:

<table>
<tr><th>Check</th><th>Step</th><th>Action</th><th>Process</th></tr>
<tr><td colspan="4"><u>NOTE</u>
At least two of the four flame detectors must indicate flame within the 60-second ignition period, otherwise the FAILURE TO FIRE message will appear. The unit will remain at firing speed, and the operator must either shut the unit down or re-attempt ignition. If the flame is lost during the ignition period, the spark plugs remain energized to re-ignite.</td></tr>
<tr><td rowspan="2"></td><td rowspan="2">17</td><td rowspan="2">If required, attempt to re-ignite flame as follows:</td><td>SELECT the "CRANK" target to re-initialize the purge and firing timers.</td></tr>
<tr><td>SELECT the "AUTO" target and then EXECUTE to automatically re-initiate the ignition sequence once the purge is complete.</td></tr>
<tr><td colspan="4"><u>NOTE</u>
When the warm-up timer is complete, firing is increased to assist the starting motor in raising turbine speed to self-sustaining. Firing rate is increased slowly at low speeds (below than 60%), increasing as the turbine approaches the operating speed.</td></tr>
<tr><td></td><td>18</td><td>When the warmup is complete, turbine speed will begin to increase. At 50% rated speed (1800 rpm), the accelerating speed signal 14HA will be displayed on the CRT. VERIFY that Main display status changes to:</td><td>STARTUP STATUS: ACCELERATING</td></tr>
<tr><td colspan="4"><u>NOTE</u>
When the turbine reaches 60% of rated speed (2160 rpm), the starting motor is deenergized and FSR increases to the unloaded maximum limit (15.4%). The torque converter is drained and the starting motor is deenergized. The IGVs begin to modulate open to maintain positive 5th stage pressure in order to prevent compressor stall.</td></tr>
<tr><td></td><td>19</td><td>When the turbine reaches 60% of rated speed, VERIFY that the STARTUP CONTROL message changes to SPEED CONTROL and Main display status is:</td><td>STARTUP STATUS: ACCELERATING</td></tr>
<tr><td></td><td>20</td><td>VERIFY that the starting motor has shutdown and its breaker has returned to the OPEN position.</td><td></td></tr>
</table>

Automatic CT Startup continued:

Check	Step	Action	Process
	21	When the turbine reaches 95% rated speed (3420 rpm), FSR is reduced slightly to minimize temperature overshoot once full speed is reached. Perform the following:	VERIFY that the standby lube oil pump shuts down automatically and proper lube oil pressure is maintained at 25 psig.
			VERIFY that field flashing is initiated to raise generator voltage.
			VERIFY that the startup atomizing air compressor shuts down (if fuel oil is used).
			VERIFY that both exhaust frame blowers automatically start.
	22	When the turbine reaches full speed at 3600 rpm, the 14HS message is displayed on the CRT. Field flashing is terminated and the compressor bleed valves are shut. Generator synchronization will occur as follows:	VERIFY that the SYNCHRONIZING message appears on the Main display while generator speed is being adjusted to match line frequency.
			VERIFY that the CT BREAKER CLOSED message appears on the Main display once the output breaker has closed.
			VERIFY that SPINNING RESERVE (or selected loading) and SEQ COMPLETE messages appear on the Main display once generator loading is complete.
	23	Once turbine exhaust temperature spreads with the generator at Spinning Reserve, proceed to raise generator load.	SELECT the "Pre-select" target and then EXECUTE to increase generator load to the Preselected load setting (40 MW).
			VERIFY that the Preselect message is indicated on the Main display and that generator load is increasing.
	24	SELECT the BASE target and then EXECUTE to increase generator load to the Base Load setting (about 84 MW).	VERIFY that the BASE LOAD message is indicated on the Main display and generator load is increasing.

Automatic CT Startup continued:

Check	Step	Action	Process
	25	When exhaust temperature reaches 950 °F, turbine controls automatically shift from SPEED CONTROL to TEMPERATURE CONTROL.	VERIFY that the TEMP CONTROL message is indicated on the Main display.
	26	If maximum continuous load is desired, SELECT the PEAK target and then EXECUTE to increase generator load to the Peak Load setting (about 89 MW).	VERIFY that the PEAK LOAD message is indicated on the Main display and generator load is increasing.
	27	Monitor the pressure drop across the CT inlet filters to ensure proper operation of pulse air cleaning. Automatic cleaning should initiate prior to filter D/P reaching 3" H_2O.	Monitor the air tower on the air process skid for proper operation.
	28	Monitor all turbine auxiliaries and indicated parameters to ensure proper operation for the first 30 minutes of operation at final load setting.	VERIFY proper cooling water flow control. Lube oil supply temperature must be maintained between 120 °F and 130 °F. VERIFY proper exhaust temperature spreads and wheelspace temperatures. Identify out-of-specification readings and correct abnormalities as soon as possible.

6. CT SHUTDOWN

Check	Step	Action	Process
NOTE Fired shutdown provides gradual reduction in turbine firing to a very low level. This is designed to minimize the temperature differential between fired and unfired air flowing through the turbine once firing is terminated, thereby minimizing thermal stress.			
	1	SELECT the "STOP" target on the Mark VIe Main display to initiate a fired turbine shutdown.	VERIFY the SEQ STOP and SEQ IN PROGRESS messages appear on the Main display indicating the shutdown sequence has been initiated.
	2	OBSERVE that generator load begins to reduce gradually.	When load is at reverse power, VERIFY the output breaker OPENS. FRS will ramp down to minimum value for shutdown and turbine speed will begin to decrease.
	3	VERIFY that the compressor bleed valves open to dampen compressor pulsation. VERIFY that IGV position is modulated toward the fully closed position as turbine speed decreases below 100%.	IGV position should track with corrected speed.
	4	VERIFY that the FIRED SHUTDOWN message appears on the Main display when turbine speed is less than 3600 rpm.	When turbine speed decreases to 95%, VERIFY that the AC Lube Oil Pump starts automatically, indicated by the STANDBY LO PUMP RUNNING message on the Main display.
	5	Upon turbine speed decreasing to 20%, fuel shutoff will occur. If any functional flame detector loses flame prior to this point (indicating blowout), FRS ramps down at the fast rate until fuel is shut off.	VERIFY that the FLAME OFF message is displayed when flameout occurs. VERIFY that the MASTER PROTECT TRIP message is displayed and that FSR is reduced to 0%. VERIFY that the turbine status changes to COASTING DOWN (at about 100 rpm).

CT Shutdown continued:

Check	Step	Action	Process
CAUTION The turbine must be placed on COOLDOWN OPERATION immediately following shutdown. This measure is intended to prevent rotor bowing, thereby precluding possible rubs and/or rotor imbalance on subsequent startup. GE recommends that under normal circumstances, the turbine should remain on cooldown operation for 48 hours following shutdown. However, unless emergency conditions prevail, cooldown operation shall be sustained until the highest wheelspace temperature is less that 200 °F or for 24 hours after shutdown, whichever is longer, in order to provide complete cooldown.			
	6	When turbine speed decreases to ~3% (115 rpm), the torque converter cooldown admission valve is energized to admit oil to the impeller vanes. At about 50 rpm, VERIFY that the COOLDOWN and MINIMUM SPEED messages appear on the Main display.	Lube oil pressure is applied to the vanes to maintain turbine rotation during cooldown at approximately 26 rpm.
COOLDOWN Do not attempt to accelerate cooldown by opening the turbine compartment doors or by removing lagging panels. Uneven cooling of the outer casings will result in excessive thermal stress and possible distortion of the stator.			
	7	If more rapid cooldown is desired, the CRANK target may be selected to initiate turbine cranking.	This will energize the starting motor to provide increased turbine speed and thus greater air flow through the CT to accelerate cooldown.
	8	If turbine restart is required before the cooldown sequence is complete, proceed as follows:	VERIFY that the READY TO START message appears on the Main display.
			Initiate the startup sequence. Only difference will be that the hydraulic ratchet will not be energized.
	9	If necessary to perform maintenance, the cooldown sequence may be aborted once the 24-hour minimum required cooldown period is complete. Terminate cooldown prior to completing the 48 hour timing cycle as follows:	SELECT the COOLDOWN OFF target on the Auxiliary display.
			VERIFY that the AC LO Pump shuts down.
	10	When the 48 hour cooldown timing cycle is complete, the turbine will shutdown automatically.	Isolate support systems as necessary to perform maintenance or repairs.

7. ABNORMAL OPERATIONS

A. EMERGENCY SHUTDOWN

Initiation

- Emergency Stop pushbutton
- Manual emergency trip valve
- Manual trip pushbutton

NOTE

Each of the above listed trips will immediately shut off the fuel and return the compressor bleed valves to their shutdown position. The inlet guide vanes will close as normally scheduled. When the unit reaches zero speed, the cooldown cycle is initiated automatically. The AC Lube Oil Pump will start automatically and continue to operate in order to maintain bearing lubrication and to supply oil to the torque converter for cooldown rotation purposes. On a loss of AC power, these functions will be performed by the DC Lube Oil Pump.

Immediate Actions

a. ACKNOWLEDGE the trip alarm.

b. VERIFY that the turbine is tripped. TRIP the turbine manually if a trip condition is annunciated and an automatic trip has not occurred.

c. VERIFY that the generator output breaker is opened.

d. VERIFY automatic starting of the AC Lube oil pump.

e. VERIFY the fuel supply is isolated properly and inform the main control room.

Supplementary Actions

a. If internal damage is suspected, SELECT the COOLDOWN OFF target on the auxiliary display to terminate cooldown operation.

CAUTION

In the event of an emergency shutdown in which internal damage of any rotating equipment is suspected, DO NOT turn the rotor after shutdown. Maintain lube oil pump operation, since lack of circulating lube oil following a hot shut down will result in rising bearing temperatures which can result in damaged bearing surfaces. If the malfunction that caused the shutdown can be quickly repaired, or if a check reveals no internal damage affecting the rotating parts, reinstate the cooldown cycle.

b. When the cause of the shutdown is identified and no internal damage is suspected, the following factors should be noted prior to turbine restart:

   1.) If the malfunction causing shutdown has been determined and resolved within 15 minutes of the rotor coming to rest and a check reveals no internal damage, the gas turbine can be restarted without cooldown rotation.

   2.) If the malfunction can be quickly repaired or if a check reveals that there has been no internal damage affecting the rotating parts, between 15 minutes and 48 hours, a gas turbine restart can be performed only after 2 hours of cooldown rotation (minimum).

   3.) If the unit has been shut down longer than 15 minutes and has not been rotated at all, it must remain shut down for 48 hours. DO NOT attempt a restart for 48 hours in order to minimize the danger of shaft bow.

c. When the cause of the shutdown has been identified and corrected, proceed as follows

d. ENSURE all alarm conditions have been corrected and accounted for and do not affect the Master Reset Lockout function.

e. RESET all alarms.

f. If internal damage was not suspected and turning operation has been continuous, or if the cooldown cycle was interrupted and all precautions for pre-start rotation have been met, perform a FAST START.

CAUTION

If the turbine has not been rotated continuously prior to restart, vibration velocity shall be carefully observed as the unit is brought up to its rated speed. If vibration velocity exceeds 1 ips at any speed, shut down the turbine and rotate for at least one hour before attempting restart. If seizure occurs during turning operation, the turbine shall be shut down and remain idle for at least 30 hours, or until the rotor is free. The turbine may be rotated at any time during the 30 hour period if it is free; however, audible checks should be made for rubs.

g. If a restart will not be performed, shutdown the turbine.

B. FIRE PROTECTION SYSTEM ACTIVATION

Activation of the fire protection system, when actuated, will cause several functions to occur in addition to actuating the media discharge system. The turbine will trip, an audible alarm will sound, and the alarm message will be displayed on the Mark VIe CRT. Ventilation fans are stopped and counter-weighted vent louvers will automatically close. The damper in the turbine shell cooling discharge will be actuated shut by a pressure-actuated latch mechanism.

The fire protection system must be replenished and reset before it can automatically react to another fire. Reset must be made after each activation of the fire protection system which includes an initial discharge followed by an extended discharge period of the fire protection media. Fire protection system reset is accomplished by resetting the pressure switch located on the fire protection system. Ventilation dampers, automatically closed by a signal received from the fire protection system, must be reopened manually in all compartments before restarting the turbine.

CAUTION

Failure to reopen compartment ventilation dampers prior to turbine operation will severely shorten the service life of major accessory equipment. Failure to reopen the load coupling compartment dampers will materially reduce the performance of the generator.

C. INLET GUIDE VANE CONTROL

Under part-load conditions, reduced firing will result in lower turbine exhaust temperatures. In order to maintain higher exhaust temperature, the inlet guide vanes can be adjusted to restrict air flow into the turbine. IGV temperature control may be initiated from the INLET GUIDE VANE CONTROL display by selecting IGV TEMP CNTL ON and then IGV AUTO for normal operation. To terminate, simply select IGV TEMP CNTL OFF. IGV position (angle) is indicated on the display. The IGV MANUAL target can be selected to manually set the maximum IGV angle; however, this feature is not intended for use when the turbine is on-line.

D. HIGH WHEELSPACE TEMPERATURE

Wheelspace temperatures in excess of the maximum permissible values are potentially harmful to hot gas path parts over prolonged periods. Excessive wheelspace temperatures will cause an alarm; however, the turbine will not trip. The alarm should be acknowledged and the condition logged and reported. Consult the GE technical representative for guidance regarding continued operation and corrective action as soon as possible. The following are some of the most common causes of high wheelspace temperatures:

- Cooling air line restrictions or leakage
- Excessive wear of turbine seals
- Distortion of the turbine stator
- Improper thermocouple positioning (usually following maintenance)
- Combustion system malfunction

E. LOSS OF LUBE OIL

Symptoms and Indications

- Low Lube Oil Pressure alarm
- Low Lube Oil Level alarm
- High Lube Oil Temperature alarm
- High Lube Oil Filter Differential Pressure alarm
- Automatic start of either AC or DC lube oil pumps
- CT trip occurs with associated low lube oil pressure indication

Immediate Actions

a. VERIFY if the CT has tripped. MANUALLY TRIP the turbine if lube oil pressure falls below 8 psig.

b. MANUALLY START the AC or DC lube oil pump to restore lube oil pressure and flow.

c. If filter differential pressure is high, SHIFT filters and clean the off-line filter as necessary.

d. Determine the cause of the malfunction or abnormality. Once corrected, a restart can be initiated by selecting the START target and then EXECUTE on the Main display of the Mark V CRT.

F. LOSS OF HYDRAULIC PRESSURE

Symptoms and Indications

- Hydraulic Trouble alarm
- Low Hydraulic Supply Pressure alarm
- Low Liquid/Gas Fuel Hydraulic Trip Pressure alarm
- High Hydraulic Filter Differential Pressure alarm
- Automatic start of the Auxiliary Hydraulic Supply Pump
- CT trip occurs with associated low hydraulic supply pressure

Immediate Actions

a. VERIFY if the CT has tripped. MANUALLY TRIP the turbine if hydraulic supply pressure falls below 1200 psig.

b. MANUALLY START the Auxiliary Hydraulic Supply Pump to restore hydraulic supply header pressure.

c. If filter differential pressure is high, SHIFT filters and clean the off-line filter as necessary.

d. Determine the cause of the malfunction or abnormality. Once corrected, a restart can be initiated by selecting the START target and then EXECUTE on the Main display of the Mark VIe CRT.

G. FUEL SYSTEM TROUBLE

1. Symptoms and Indications

- Fuel Valve Trouble or Operability alarm
- Low Gas Fuel Pressure alarm
- High Fuel Filter Differential Pressure alarm

- CT trip occurs with associated abnormal fuel system indication

2. Actions should be taken to correct abnormalities in accordance with the applicable sections of OP-301 (Fuel Gas System).

3. Verify fuel supply quality to determine if problem is due to poor quality fuel (high level in fuel gas separator, etc.).

4. Perform the necessary corrective actions and restore fuel systems to normal operating condition as soon as possible.

H. HIGH BEARING METAL OP DRAIN TEMPERATURES

Symptoms and Indications

- Bearing Metal Temperature High alarm
- Bearing Oil Drain Temperature High alarm
- Indication of rising bearing metal or oil drain temperatures approaching alarm settings
- Excessive vibration associated with abnormal bearing temperatures

Possible Causes

- Loss of lube oil pressure/flow
- Lube oil system leak/rupture
- Failure of Standby Lube Oil Pump auto start feature

Immediate Actions

a. If bearing metal or oil drain temperatures exceed 275 °F or 225 °F, respectively, immediately TRIP the turbine.

b. VERIFY bearing lube oil supply header pressure greater than 18 psig. START the AC Lube Oil Pump if necessary to restore system pressure.

c. If pressure cannot be immediately restored, TRIP the turbine. VERIFY that the lube oil system is not ruptured and START the AC or DC lube oil pump if necessary to maintain system pressure/flow.