If you are using a printed copy of this procedure, and not the on-screen version, then you MUST make sure the dates at the bottom of the printed copy and the on-screen version match. The on-screen version of the Collider-Accelerator Department Procedure is the Official Version. Hard copies of all signed, official, C-A Operating Procedures are available by contacting the ESSHQ Procedures Coordinator, Bldg. 911A

C-A OPERATIONS PROCEDURES MANUAL

7.1.37 System Restart Following a Momentary Loss of Power

Text Pages 2 through 5

Hand Processed Changes

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Approved: _____***Signature on File***_____ _____
Collider-Accelerator Department Chairman Date

C. Salat

7.1.37 System Restart Following a Momentary Loss of Power

1. Purpose

1.1 To provide guidance on restarting the RHIC cryogenic system following an electrical power dip.

1.2 It is assumed all rotating equipment has stopped. If that is not the case, the procedure will have to be adjusted accordingly.

1.3 This procedure provides general guidance. The order of the steps and the details will need to be adjusted as conditions warrant.

2. Responsibilities

2.1 The Shift Supervisor or an operator designated by the Shift Supervisor is responsible for conducting the procedure and providing documentation in the Cryogenic Control Room Log.

2.2 Should a problem arise during this procedure, the Shift Supervisor shall report to the Technical Supervisor for instructions before continuing.

2.3 In the event of a power dip, the Shift Supervisor or designee shall notify MCR Operations Coordinator (x4662) of current cryogenic system status.

3. Prerequisites

Actions to be taken prior to an anticipated power dip i.e. – impending thunderstorms or high winds:

3.1 Prepare to secure, or secure any non-steady state operations such as regens and purges, etc.

3.2 Note the online and offline compressors and cooling water pumps.

3.3 Make printouts of current system status & plan ahead who will be performing the various tasks associated with recovery.

3.4 All personnel working on any electrical system or equipment in the C-AD shall be familiar with BNL SBMS Electrical Safety, BNL SBMS Lockout/Tagout (LO/TO), C-A-OPM 1.5, "Electrical Safety Implementation Plan", C-A-OPM 1.5.3 "Procedure to Open or Close Breakers and Switches and Connecting/Disconnecting Plugs", C-A-OPM 2.36, "Lockout/Tagout for Control of Hazardous Energy". C-AD will provide on-site/work specific training to individuals in the electrical safety aspects of their job functions and assignments.

4. Precautions

4.1 If the refrigerator pots contain liquid, all personnel entering the refrigeration wing of Building 1005R must be ODH Class 1 qualified, have a Personal Oxygen Monitor (POM), and carry and emergency escape pack.

4.2 Approved eye protection and safety shoes shall be worn at all times.

4.3 Double hearing protection is required in bldg. 1005H when compressors are in operation.

5. Procedure

5.1 General Information

If all compressors are off, the most immediate concern is to minimize the pressure build up in the low pressure side of the system. This can be accomplished by isolating the high pressure side of the system from the low pressure side. Keep in mind the following approximate setpoints for the low pressure side of the system:

1.2 atm- H131A and/or H33A begin to close, isolating the ring return from the refrigerator.
1.25 atm- Low pressure make-up valve H3031A will automatically close.

3.2 atm – vent valves H1102A, H1109A by cold box 1 & 2 begin to open and vent to atmosphere. This parameter is variable and can be adjusted. See screen [D275]

4 atm – various relief valves throughout the low pressure side of the system begin to open and vent into the relief valve header which returns to the 36” header. When the relief valve header pressures to 7 psig, it begins venting to atmosphere outside the northwest corner of the refrigerator building.

5 atm – The large relief valve on the west side of cold box 4 (H21R) will open and vent to atmosphere.

6 atm – Approximate set point for various burst disks throughout the low pressure side of the system including the high, intermediate, and low pots as well as the 36” return header.

Other automatic actions that may occur:

Valve H9A closes when the warm turbines stop.
Valve H204A closes. Turbine 7 shuts down. H206A will be in control.
Valves H100A & H74A will close to maintain ring pressure.

5.2 **If <u>all</u> first and second stage compressors are offline, perform the following:**
Shutdown the warm turbines.
Shutdown the cold turbines.
Verify shutdown Turbine 7.
Shut/verify shut H100A.
Shut/verify shut H9A.
Shut/ verify shut H74A supply to ring.
Change open limit of pump back valve H3025A to 100%
Switch to 2 low pressure gas tanks & ensure H3025A operational

5.3 Check status of the high pressure N2 dewars and thermax heaters and check status of ring air crossconnect valves**.** Restart the ring air compressors if tripped**.**

5.4 The Gas Management system now has a UPS back up. In the unlikely event red "Gas Management Shutdown" bar appears on the compressor page [D3], the gas management panel will have to be reset locally in order to start any compressor.

5.5 Check status of cooling water pumps. **a**
If a pump or all pumps should shut down, they should come back on automatically. There is a reset button on east wall control panel. It is named Tower Pump reset. Pressing this will reset auto on logic.

If water pumps must be manually restarted, inform MCR OC that Tower Group personnel are needed @ 1005P to restart pumps.

> **<u>Note</u>**:
> The pumps are located in the bldg 1005P. Key #11 opens the door

5.6 Start a first and second stage compressor that was offline prior to the power dip.

5.7 On the alarm page look for **"**valve position feedback error". Check line printer messages and/or [D263]. Go to specified valve on Indosoft screen. If the command circle in the center of the valve does not match feedback color of valve, the valve is out of "sync". Clicking the command circle twice should put valve back in "sync.

5.8 Check pot return valves H90A, H54A, H89A, and ensure that they are operational to control pot pressures.

5.9 If not already loaded, load the running compressors.

5.10 If offline, reset and start the seal gas compressor.

5.11 Bleed down mid pressure and reset the warm turbine skid. "A" – H346M. "B" – H746M. Ensure CDR open to LP.

5.12 Start and establish the warm turbines.

5.13 Check status of compressor control system: make-up, pump-back, bypass, tanks.

5.14 Reset and start remainder of first and second stage compressors that will be needed.

5.15 Bleed down and reset the cold turbine skid. "A"- H399M "B" H799M.

5.16 Start & establish cold turbines.

5.17 Re-establish heat shield flow**.** Put H9A set point @ 25 g/s in auto and slowly

increase set point in increments until 120 g/s has been reached.

5.18 Start & establish turbine 7.

5.19 Once cold turbine outlet temperature is appropriate, ensure CB5 pot level is over 20%. Utilize H100A if necessary. If level is under 20%, H74A will not open in auto.

5.20 When cold end of refrigerator is stable & temperature is appropriate, re-establish ring flow. Ensure H100A & H74A are in auto.

5.21 Ensure refrigerator insulating vacuum systems are operational.

5.22 Check ring status and address accordingly. i.e. recooler level, lead flows, valve box insulating vacuum, etc.

5.23 Satisfy cryo permissive interlock. Inform MCR OC of system status.

5.24 Ensure 1005H ventilation fans are operational.

5.25 Re-establish any normal operating control parameters that may have been changed during recovery process.

5.26 Check remainder of alarms on display page and address.

6. Documentation

The Shift Supervisor, or designee, shall document the completion of this procedure is the Cryogenic Control Room Log.

7. References

None

8. Attachments

None