

PPPL	Princeton Plasma Physics Laboratory	PROCEDURE	ENG-040, R0 page 1 of 4
Subject: AC Power Switching Orders	Effective Date: December 10, 2008	Initiated by: Associate Director, Engineering & Infrastructure	
	Supersedes: NEW	Approved: Director	

Applicability

This procedure describes the preparation, content, review, approval, use, closeout and archiving of AC Power Switching Orders. Switching Orders are used by AC Power as controlling procedures for maintenance and repair of AC Power equipment. This procedure also describes the safety related work practices for switching operations of AC Power equipment. Equipment owned and operated by projects, experiments or other Laboratory divisions are not covered by this procedure.

Introduction

This procedure covers the necessary content, development, review and approval of AC Power Switching Orders. Content requirements include Lockout/Tagout and safety related work practices for personnel safety and equipment protection.

Reference Documents

PPPL Environmental Safety and Health (ES&H) Manual, ES&HD-5008 including Section 2, "Electrical Safety"

ENG-30, "PPPL Technical Procedures for Experimental Facilities"

NFPA 70E, "Standard for Electrical Safety Requirements for Employee Workplaces"

ESH-016, "Control of Hazardous Energy (Lockout/Tagout)"

Definitions

Switching Orders AC Power Switching Orders are used for switching and Lockout/Tagout during maintenance, repair and modification of AC Power equipment.

Switching Operations Normal operation of AC Power Equipment to provide alternate power feeds, equipment shutdown (e.g. for energy savings) or other operations objective.

Responsibilities

AC Power switching orders are prepared by an AC Power section member, reviewed by another member, and reviewed and approved by the Power Engineering Branch Head (PEBH). The originating AC Power member then performs the procedure as written unless verbal concurrence for changes is obtained from the Branch head.

Switching operations are authorized by the Power Engineering Branch head.

Procedural Requirement Details

This procedure is divided into four sections:

- A. Use of Switching Orders
- B. Content Requirements of Switching Orders
- C. Tracking and Closing of Switching Orders
- D. Switching Operations Work Practices

A. Required Use of Switching Orders

All switching operations of medium or high voltage equipment for maintenance, repair or modification (i.e., requiring Lockout/Tagout - LOTO), must be performed in accordance with approved Switching Orders.

Low voltage operations for complex personal or group LOTO, also require performance in accordance with approved switching orders or other procedure (see ESH-016 for details).

Section D describes the safety related work practices to be used for AC Power switching operations not involving LOTO.

This procedure does not replace or alter any of the requirements of the PPPL Safety Lockout/Tagout Procedures or the PPPL Environmental Safety and Health (ES&H) Manual, ES&HD-5008.

B. Content Requirements of Switching Orders

All switching orders shall be prepared, reviewed and approved prior to use and include the following:

1. Cover Sheet (see Attachment 1)

The AC Power Switching Order cover sheet shall include: the purpose of the order; the date of implementation; signatures of the preparer, reviewer and approver (usually the Power Branch head); and provision for closeout date and initials of person closing the order.

2. LOTO Page (see Attachment 2)

A Lockout/Tagout page shall be included in the Order. The standard page, Attachment 2, with appropriate information filled in, shall be used.

3. Body of Switching Orders shall incorporate (as necessary) the following safety practices and items:

- Pre-job Brief with all personnel involved with switching or covered under the LOTO. The brief should include a walkdown of the affected system.
- Hazards analyses for switching activities (including zero voltage checks) as well other work activities as applicable.

- The switching steps of the Order shall include LOTO tag numbers for each applicable step, including tagging of safety grounds. Critical Steps should have provision for the coordinator to initial completion.
- Zero voltage checks should be related to the included hazards analyses by step number in the hazards analysis.
- For Group LOTO situations, a specific step establishing the Lockbox should be listed.

C. Tracking and Closure of Switching Orders

Active Switching Order Tracking

The Power Branch head shall maintain a folder of active Switching Orders on the Laboratory's routinely backed-up P-Drive. Field personnel shall use approved signed-off Switching Orders for their work.

Closing and Filing of Completed Switching Orders

When the Switching Order has been completed, the procedure used shall be scanned and stored by the Head, Power Branch onto the P-Drive.

D. Switching Operations Work Practices

AC Power switching operations shall implement the following safety related work practices as routine:

Pre-job Brief with all personnel involved with switching. The brief should include a walkdown of the affected system(s).

NFPA 70E arc flash hazards and shock hazards categories shall be reviewed to select the appropriate PPE.

Procedure

<u>Responsibility</u>	<u>Action</u>
AC Power Member	<ol style="list-style-type: none"> 1. Prepares switching orders in accordance with content requirements of this procedure (Attachment 3). 2. Circulates draft copy of switching orders to alternate AC Power Member and Power Engineering Branch Head (PEBH) for review and comment.
Alternate AC Power Member	<ol style="list-style-type: none"> 3. Provides review and comment of draft procedure to originating AC Power Member.
Power Engineering Branch Head	<ol style="list-style-type: none"> 4. Provides review and comment of draft procedure to originating AC Power Member.
AC Power Member	<ol style="list-style-type: none"> 5. Resolves and incorporates comments from reviewers into switching orders. 6. Obtains signatures from alternate AC Power member and PEBH (for approval). Provides copy of approved switching order to PEBH for archiving. 7. Performs operations in accordance with switching orders, recording lockout/tagout numbers and any changes made during performance. PEBH verbal concurrence required for change authorization. 8. Submits copy of completed switching order to PEBH for review and archiving.
Power Engineering Branch Head	<ol style="list-style-type: none"> 9. Reviews completed switching orders, scans and archives on the P-Drive.

Attachments

1. Switching Orders Cover Page (example)
2. LOTO Information Page (example)
3. Switching Orders Content Page (example)

**SWITCHING ORDERS FOR
MAINTENANCE ON
QPT-3, QD-18, 19, 20, 21, 22, 23, & 24
SATURDAY, 7 OCTOBER 2006
0600 TO 2000 HRS.**

REQUIREMENTS FOR GROUP LOCKOUT/TAGOUT

(Page 1)

SWITCHING ORDER I

(Page 2 to 4)

DE-ENERGIZING QPT-3, QD-18, 19, 20, 21, 22, 23, & 24
FOR MAINTENANCE

SWITCHING ORDER II

(Page 5 to 6)

RE-ENERGIZING QPT-3, QD-18, 19, 20, 21, 22, 23, & 24
AFTER MAINTENANCE

**PROCEDURES FOR RACKING IN OR OUT GE MAGNA
BLAST BREAKERS**

(Page 7 to 8)

SCHEDULED POWER OUTAGE NOTIFICATION SIGNOFF

Prepared by: _____
A. Wise

Reviewed by: _____
R. Camp

Approved by: _____
J. Lacenere

Completed: _____ initials _____

PROCEDURE REQUIREMENTS FOR GROUP LOCKOUT / TAGOUT**1. A description or diagram of the system.**

- PPPL AC Power Flow Diagram, Drawing Number 6800-E-310-0L, Sheet 1 to 2.
MCC-P3-8E, 6840-D-217-OL
MCC-P3-9E, 6840-D-218-OL
MCC-P3-9E-1, 6840-D-219-OL

2. The sequence (these switching orders are not sequentially carried out, some are done in parallel) of activities necessary to place equipment/system in a safe state.

- Attached Switching Orders I through II

3. The name of the authorized employee(s) who will perform the isolation of the energy sources. NOTE: When there are multiple authorized employees, one must function as a coordinator and all must lock and tag lock box.

- D. DeBonis A. Wise (Coordinator) R.Camp

4. The methods to be used to verify that equipment/systems are in a safe state.

- Hot Stick, VOM and non-contact voltage detector
Working Grounds

5. When the process includes the transfer of responsibility to other authorized employees, the procedure must include the following information:

- N/A

6. The sequence (these switching orders are not sequentially carried out, some are done in parallel) of activities necessary to restore a system/equipment to an unsafe state.

- Attached Switching Orders II

SWITCHING ORDER I**DE-ENERGIZING****QPT-3, QD-18, 19, 20, 21, 22, 23, & 24****FOR MAINTENANCE****0600 Hrs. SATURDAY, 7 OCTOBER 2006****PREREQUISITES**

1. Make C & D -Site "PA" system announcement that the scheduled power outage will occur shortly.
2. Verify that PM&O (Plant Maintenance and Operations) boiler operator is ready for power outage.
3. All test equipment, used to verify whether equipment is energized or de-energized, will be verification tested before and after use.
4. The steps in these switching orders need not be carried out in sequence and maybe varied as directed by the coordinator.
5. Mobile generator will be set up at Well Pump #5 before outage to carry loads fed by MCC-P3-8E during outage.
6. Walkdown affected systems for unexpected conditions and perform pre-job brief with switching personnel.

C-SITE

1. Open, lock and tag circuit breaker in MCC-P3-8E Compartment BB6. (Mobile generator output at Well Pump #5 back feeds to load side of breaker in compartment BB6 during outage.) TAG # 34452
2. Start mobile generator at Well Pump #5 and close disconnect switch PD-359 and close mobile generator circuit breaker to pick up loads supplied by Well Pump #5.
3. Open, remote rack out and tag circuit breaker Q3-B7. TAG # 34453
(See Job Hazard Analysis Below)
4. Open, remote rack out and tag circuit breaker Q4-B7. TAG # 34454
(See Job Hazard Analysis Below)

D-SITE

- 5. Open, remote rack out and tag circuit breaker Q11-B4. TAG # 34455
(See Job Hazard Analysis Below)

C-SITE

- 6. Verify that auto transfer switch in MCC-P3-9E-1 has transferred to emergency source in D-Site Cooling Tower Pump House.

- 7. Open, lock and tag circuit breaker in MCC-P3-9E compartment TD5. TAG# 34456

Use Hot Stick to verify that each disconnect and transfer switch is de-energized.

- 8. Perform “0” voltage check on the following disconnect and transfer switches:
(See Job Hazard Analysis Below)

QD-18	QD-20	QD-22
QD-19	QD-21	QD-23
		QD-24

Use VOM or non-contact voltage detector to verify that the secondary of QPT-3 is de-energized

- 9. Perform “0” voltage check on the QPT-3 secondary.
(See Job Hazard Analysis Below)

- 10. Before applying the following working grounds (these grounds are optional), a tag shall be filled out and the tag stub given to the outage coordinator.**
(See Job Hazard Analysis Below)

QD-18 (both sides)	QD-20 (line side)	QD-22 (line side)
QD-19 (line side)	QD-21 (line side)	QD-23 (line side)
		QD-24 (line side)

- 11. Before applying the working grounds (these grounds are optional) on the secondary of QPT-3, a tag shall be filled out and the tag stub given to the outage coordinator.**
(See Job Hazard Analyses Below)

- 12. Perform “0” voltage check in compartment BA1 on MCC-P3-8E and apply grounds in compartment BA1 and tag.** TAG# 34457
(See Job Hazard Analyses Below)

- 13. Outage Coordinator establishes group lockbox.

- 14. Perform pre-job brief with maintenance personnel.

JOB HAZARD ANALYSIS

Sw. Order Step #	Task	Hazard Cat.	Identify limit of approach and precautionary steps	Protective apparel/Protective equipment
3 4 5	Remote racking out operation of 5 kV class circuit breakers	2	SEE ATTACHED PROCEDURE FOR RACKING IN OR OUT GE MEGNA BLAST BREAKERS	
8 10	“0” voltage check	4	Prohibitive zone V rated gloves V rated tools	1. FR clothing. 2. Flash suit with double layer hood 3. Safety glasses. 4. Hearing protection 5. Leather shoes 6. Electrical rated rubber over shoes.
9 11 12	“0” voltage check and applying grounds	2*	Prohibitive zone V rated gloves V rated tools	1. FR clothing. 2. Double layer hood 3. Safety glasses. 4. Hearing protection 5. Leather shoes 6. Electrical rated rubber over shoes.

NOTE: Maintenance work may now proceed on Unit Substation, QPT-3 and its secondary, disconnect and transfer switches QD-18, 19, 20, 21, 22, 23 & 24