BP OIL -- TOLEDO REFINERY

Document Type: Procedure	**Refinery Wide**	**Reference No.:** SAF 098
Effective Date: October 5, 2015	Electrical Distribution System Switching and Isolation	**Rev. No.:** 5
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SCOPE	This procedure is designed to minimize the risks of electrical distribution switching and isolation by providing instructions and minimum requirements.
HEALTH **Special PPE & Special Hazards**	Electrical PPE shall be used as specified in SAF 095, “Working on or near Energized Electrical Equipment”
SAFETY	Protection from electrical hazards including Shock, Arc Flash and Blast.
REFERENCE DOCUMENTS	NFPA 70E SAF 037 Control of Hazardous Energy (Lockout/tagout) SAF 095 Working on or near Energized Electrical Equipment RDP 4.5-0002 BP refining Defined practice for Isolations
SPECIAL MATERIALS & EQUIPMENT	N/A
QUALITY	N/A
ENVIRONMENTAL	N/A

OVERVIEW

This procedure will provide minimum requirements on executing electrical switching and isolation. Electrical Switching errors can create a major upset or shutdown of the refinery. Switching and Isolation Plans shall be used to minimize the risks associated with electrical work. Switching and Isolation Plans contain step by step instructions and other requirements to safely either energize or de-energize a portion of the Refinery Electrical Distribution System. This procedure applies to all systems that operate nominally at more than 50 volts, AC or DC, phase to phase or phase to ground.

1.0 Definitions

- **Arc Flash Boundary** – An approach limit at a distance from exposed live parts within a person could receive a second degree burn if an electrical arc flash were to occur. The distances are 7 ft for 480 volts, 20 feet for 4160 volts and 50 feet for 69 KV.
- **De-Energized** – Isolated from electrical energy. Free from any electrical voltage or charge.
- **Electrically Qualified Person** – An experienced person properly trained and familiar with the construction and operation of the equipment and the hazards involved. Qualified persons must be at least able to distinguish exposed live parts and their nominal voltages, as well as the clearance distances and the corresponding voltages to which they will be exposed. Whether an employee is considered to be a qualified person will depend upon various circumstances in the workplace. It is possible and, in fact, likely for an individual to be considered qualified with regard to certain equipment in the workplace, but unqualified as to other equipment.
- **Electrical Hazard** – A potential source of personal injury, either directly or indirectly caused by an electrical energy source. The hazards include shock, blast, burns, arc flash or fire.
- **Electrical Intrusive Work** – Work that involves contact with open and exposed electrical components, in a de-energized state, after isolation and testing.
- **Electrical Safe Work Condition** – A state in which the conductor or circuit part to be worked on or near has been disconnected from energized parts, tested to ensure the absence of voltage, grounded if determined necessary and locked/tagged in accordance with refinery standards.
- **Energized** – Electrically connected to or having a source of voltage.
- **ICC** – Isolation Confirmation Certificate incorporates the management process for all isolations (process, instrument, electrical) from execution to removal and the plant or equipment being returned to service.
- **Incident Energy** – The amount of energy impressed on a surface, a certain distance from the source, generated during an electrical arc event. Incident energy is usually measured in cal/cm^2.
- **Low Voltage** – A voltage equal to or less than 1000 VAC or 1500 VDC.

- **Personal Protective Equipment -** Includes such items as voltage rated rubber gloves, flash hoods, hearing protection, rubber insulating mats, blankets and voltage rated insulated tools, flash suits and equipment.

- **Switching –** Operating (opening or closing) or isolating electrical distribution equipment by a qualified person.

- **Switching Coordinator –** The individual in charge of the electrical switching process. The switching coordinator will direct the execution of the switching procedure steps.

2.0 Procedure

- An Electrical Switching and Isolation Plan is required in the following circumstances.

    1. Commissioning New Electrical Equipment.
    2. Planned Power Distribution System Outages and Return.
    3. Re-energization after an equipment failure.
    4. Isolation of electrical equipment or systems for maintenance that is not documented on a normal ICC.
    5. Transfer of electrical power from normal to an alternate configuration and return.

- It is preferred to use a switching and isolation plan during an emergency. It is understood the timeliness of recovery may not permit it. Switching may only occur during an emergency that requires immediate action when:

    1. The cause of the emergency or failure is known.
    2. The switching will not re-energize a failed piece of electrical equipment.
    3. Energy Isolation for the failed equipment has been achieved.
    4. An Electrical Engineer has reviewed and approved the switching procedure. It may be verbal directions only during an emergency.

- A single Electrical Engineer may approve the switching steps during an emergency.

- After an emergency event, a Switching and Isolation Plan shall be required before any intrusive electrical work occurs.

- A switching and isolation plan will be used when energizing or de-energizing the following equipment.

    1. All 69 or 138 KV Equipment
    2. 4160 Volt Switchgear
    3. 4160 Volt Motor Control Centers
    4. 4160 Volt Feeder Cable
    5. 4160 Volt primary rated transformers
    6. 480 Volt Switchgear
    7. 480 Volt Motor Control Centers
    8. 480 Volt Switchracks
    9. 480 volt Panelboards
    10. UPS or Instrument Power Systems. (The plan may refer to the

detailed instructions contained on the UPS)

- A Switching and Isolation Plan is not required with the following types of equipment. These shall be documented on the normal ICC.

    1. 4160 volt or 480 volt individual motors
    2. 120/240 volt or 120/208 volt lighting or power panels.
    3. Personal Isolation is permitted.

- Personal Isolation may be used when low voltage equipment with exposed conductors or circuit parts is de-energized for minor maintenance, servicing, adjusting, cleaning, inspection or the like. This type of isolation does not need to be recorded on an Electrical Switching and Isolation Plan or ICC unless the Area Authority or Unit/Area Shift Supervisor requests this. Personal isolation shall only be used when all of the following are in place:

    1. The isolation shall be in place for a maximum of one shift and shall not be handed over to another person.
    2. The requirements of SAF 037 apply except that an ICC is not required.
    3. The isolation requires only one isolation location.
    4. The person isolating, verifying and working on the exposed conductors, parts and equipment is an Electrically Qualified person.

- First Energy is typically the operator of the BP-Husky substation 138 KV Electrical Distribution System. The First Energy Switching Order meets the intentions of this procedure when they are operating the 138 KV electrical equipment. However, appropriate notification and review of the switching order should be given to the BP Electrical Engineer for their approval in advance of First Energy performing the switching on the 138 KV system.
- A BP Husky Switching and Isolation Plan is required when BP Husky is operating the 138 KV electrical equipment.

3.0 Required Information

- An Electrical Switching and Isolation Plan will contain the following information:

    1. Equipment to be Switched
    2. Purpose of Switching
    3. Units affected by Switching
    4. List of one line drawings associated with switching
    5. Incident energy at switching locations.
    6. Standby Locations
    7. Required PPE for Switching.
    8. Switching Instructions or steps.
    9. Isolation or Lockout locations.
    10. Switching procedure written by & date.
    11. Switching procedure checked by & date.
    12. Switching Coordinator

13. Date of Switching

4.0 Required Actions

1. The Switching and Isolation Plan shall be written and approved in advance except for emergencies requiring immediate actions.
2. Operations shall be made aware of all planned switching that may result in a unit shutdown or upset.
3. During Turnarounds, Formal notification is not required to operations.
4. The Refinery Coordinator shall be notified immediately prior to switching and after completion.
5. A pre job meeting should occur prior to switching so that all people involved are knowledgeable of the required tasks. The meeting can take place at the job site.
6. What ifs should be discussed at the meeting. Device fails to open, device fails to close, wrong device opens unexpected trip, etc.
7. Standby locations will be identified that a person should be present.
8. PPE will be used per the Refinery Safety Procedure SAF 095, “Working on or near Energized Electrical Equipment”
9. People without proper PPE shall be located outside the Arc Flash Boundary. This is 7ft for 480 volts, 20 feet for 4160 or 13,800 volts and 50 feet for 69 KV.
10. Switching shall only be completed by a qualified person familiar with the specific equipment in the procedure.
11. When working on electrically isolated equipment, appropriate notification such as blue tape or “Energized Equipment “ signs shall be located on adjacent similar equipment that is still energized.

5.0 Energy Isolation

1. The Electrical Switching and Isolation Plan will be used as the ICC.
2. Switching required establishing an Electrically Safe Work Condition to perform work on the Electrical Distribution System shall identify all isolation points. They shall be listed in the Switching and Isolation Plan.
3. All potential sources of energy shall be included. Instrument or Voltage Transformers shall be identified.
4. Lockout/Tagout shall be performed per the Refinery Procedure SAF 037, “Control of Hazardous Energy (Lockout/Tagout)”
5. De-energized electrical equipment shall be verified de-energized per requirements of SAF 095 prior to any electrical intrusive work.

6.0 Grounding

- Protective Grounds shall be used anytime there is potential to induce voltage in the de-energized circuit or switchgear that is being worked upon.
- The installation and removal of grounds shall be listed in the Switching and Isolation Plan.
- Witnessing of the installation and removal of grounds by an Electrically Quallified Person shall be conducted and recorded in the Switching and Isolation Plan.
- Only approved grounding cables or switchgear devices should be used as protective grounds.
- When grounding location is located behind a closed door or apparatus, the door concealing the grounds shall be labelled visibly to show the presence of grounds. If the grounds are in a remote location, the de-energized

feeder breaker to the grounding point should be labelled indicating that a remote location has been grounded.

- Minimum size of Protective Ground conductors should be 4/0.
- When installing or removing grounds always ensure:
  - Proper isolation and lockout tagout of all electrical sources.
  - De-energization of the electrical equipment to be grounded has been proven including verification of the tester immediately before and after use.
  - That all protective grounds are removed prior to energization.

Revision History

Revision history

The following information documents at least the last 3 changes to this document, with all the changes listed for the last 6 months.

Date	Revised By	Changes
9/27/11	**R. Chmelovski**	Update SAF 098 to incorporate all requirements of the Isolations RDP. Update the switching and Isolation Plan document to include additional information. MOC# M20112913-001
9/15/2015	**D. Clark**	Update SAF 098 to include electrical safety ground installation and removal. Also include signage to indicate location of grounds when used. MOC#: M20152338-001

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