Switching and Clearance Procedures

March 2024

SNOHOMISH PUD

Energizing Life In Our Communities

This Switching and Clearance Procedures Manual establishes the authority, responsibilities, and procedures for system operation; obtaining and releasing clearances on lines, cables, stations, and equipment of the Public Utility District No.1 of Snohomish County, hereafter referred to as the "District". In addition, all applicable safety procedures in the District's Accident Prevention Manual shall be known and followed by all employees working on the District's electric system.

These procedures were developed to make the workplace for electrical employees as free from recognized hazards as reasonably possible and to insure District compliance with the State's Electrical Workers Safety Rules, Chapter 296-45 of the Washington Administrative Code (WAC), while working on the District's electric system. These procedures exist to provide employee safety; therefore, employees are required, in good faith, to follow the procedures of this manual. Following these procedures shall require that employee safety receive a higher priority than speed and work performance.

These procedures can not cover every hazard that an employee may encounter. When a hazard exists that is not covered by these procedures, the employee and supervisor are expected, in good faith, to mutually discuss the hazard and agree how to perform the work safely. If a question exists as to the meaning of the provision in WAC 296-45, the question should be referred to the Safety Department, the Switching and Clearance Committee or the State Department of Labor and Industries.

Only qualified personnel authorized by the District shall perform the duties as outlined in these Procedures.

Switching and Clearance Committee Members

Name	Position	Department
Kevin Davis	Safety Specialist	Security and Emergency Services
Paige Olson	Superintendent	Energy Control Center
Forest Bigenho	Manager	Substation Construction Operations and Apparatus
Bill Rife	Crew Coordinator	Substation Construction
Aaron Janisko	Senior Manager	Transmission and Distribution System Operations
Jeff Rife	General Foreman	Energy Control Center
Paul Kiss	Operations Superintendent	Everett Line
Gary Stutheit	Electrical Constructor	Jackson Project
Mark Oens	Senior Manager	Substation, Metering Services and Telecom
Carlos Tostado Jr.	Linemen Training Coordinator	Safety and Line Training
Scott Packebush	Line Forman	Monroe Line

Revision Summary

Section	Section title	Description
Section F	Field Clearances	Field Clearance subheading updated
COVER	COVER	Publication Date
Section A	Patrolling Requirements	New section
Section B	Communications	No Changes
Section C	Safety Tags	No Changes
Section D	Tagging Procedures	Added language for breaker lockout, Steps 1&2
Section E	Clearance Procedures for District Employees	Added “Recloser bypass switches are not preferred devices for clearance points but may be used as a clearance point if agreed to by the clearance holder.”
	Clearance Procedures for Tree Trimmers	Tree Trimers shall always treat the conductor(s) or equipment as ENERGIZED and maintain minimum approach distances noted in WAC 296-45-325 table 2 unless working under a clearance with equal potential grounding in place.
Section F	Field Clearance Procedures	Step 1: Lead Employee/ Worker, submits a completed Switching Request to ECC (See Section A) Step 2: Lead Employee/ Worker, Verifies the location of the worksite and clearance point Step 3 (previous step 2) Step 4 (previous step 3) Step 5 (previous step 4)
Section G	General Operating Procedures	No Changes
Section H	Substation Switching Procedures	No Changes
Section I	Substation Voltage Regulators, LTC’s and Controls	No Changes
Section J	Distribution Switching Devices and Equipment	No Changes
Section K	Transmission Switching Procedures	No Changes
Section L	District Generating Facilities	Added Arlington Microgrid
Section M	Appendix I	No Changes
Section N	Appendix II	Defining Hot Line Hold
Note		Energy Control Center has been abbreviated in several areas. Several typos have been corrected throughout that have no impact on operations.

Operating Authority

System Operator

The System Operator has authority and responsibility for switching and clearances on lines, cables, stations, and equipment for the District's electric system. The System Operator issues orders to open and close switches (including underground elbows), to place and remove cards, and to de-energize or clear lines, cables, stations, and equipment on which employee/workers shall work.

The System Operator has the authority to de-energize, or order deenergized any District lines, cables, equipment or stations in an emergency situation according to their best judgment when life or property is endangered or when requested by an emergency agency official. Once the electric system is restored to its normal status, the System Operator shall notify the Energy Control Center (ECC) Superintendent or Duty Supervisor.

If no System Operator/Generation Operator/Constructor is in charge of the lines or equipment and their means of disconnection, one employee/worker in the crew shall be designated as being in charge of the clearance. See WAC 296-45-335. See Field Clearance Section.

Generation Operator/Constructor

The term "Generation Operator/Constructor", as used in this manual, shall apply to the employee/worker having immediate jurisdiction over the operation of the District's Hydro Generating Facility not under ECC control.

Note:

No device(s) or equipment shall be operated without an order from the System Operator/Generation Operator/Constructor.

Exception:

- Lines and equipment operating 600 volts and below are operated according to the Accident Prevention Manual
- Overhead cut-out(s) on the same pole directly feeding an overhead transformer(s)
- Underground padmount transformer Bayonet fuse(s)
- Control power (CPT) or potential transformer (PT) fuse in a substation
- All overhead laterals with only one source of feed
- Battery Energy Storage Systems

Switching, Clearance & Work Requests

Applications for switching shall be made using the following minimum notifications:

- All Design Drawings must have the appropriate approvals before submitting the Switch Request
- All Switch Requests received after 1400 (2:00 pm) will not be reviewed until the next business day
- Transmission work not affecting the Bulk Electric System (BES) at least five (5) business days in advance
- Transmission work affecting the BES at least fifteen (15) business days in advance
-

Request Type	Hours
Hot Line Hold	24
Field Clearance	24
DNO	24
Fiber	24
Notification	24-72
New Construction (primary)	72
Clearance	48
Load Transfer	24
Breaker Tie	24
Relay Work	24
OT, IT, ICCP	48

These applications shall be filled out completely on the Switching Request Form. The System Operator shall notify the requestor as soon as possible in the event the switching is canceled. The Energy Control Center will make an attempt to accommodate all same day requests, based on the scope of the Switching Request for distribution switching and clearances only.

To energize new construction work that is assigned and shall be completed in the same work shift, a Switching Request shall be provided to the Energy Control Center before the work begins and the Lead employee/worker shall receive authorization from a System Operator before energizing lines, cables, and stations.

The System Operator is authorized to order switching and/or issue a clearance without prior notification only with the approval of the Energy Control Center Superintendent, General Foreman or System Operator. Notification time does not include weekends and holidays.

All potential OT/IT changes that affect infrastructure or software that can possibly cause an outage or affect equipment associated with ICCP data transmission, SCADA functionality or potential loss of tele-communication with the Reliability Coordinator or Neighboring Utilities such as Seattle City Light, Puget Sound Energy and Bonneville Power Administration shall require a 10 day notice with the implementer of the change submitting a switching request outlining the scope of work and potential systems that will be affected.

Notification

The System Operator/Generation Operator/Constructor shall attempt to contact employee/workers known to be in or around the substation equipment or devices to be operated remotely. There may be no notification to these people when these devices are operated in emergency conditions.

All employees entering an energized District substation and performing work that could affect the operation of substation devices shall notify the System Operator/Generation Operator/Constructor before proceeding with their work.

Additionally, if there are other employees working in the substation at the same time, a careful review of the work each is completing shall be conducted by the employees. If the substation is under a clearance, the clearance holder will determine what work can be done while the clearance is in place.

Upon receiving notification from an employee entering a substation to perform work, the System Operator /Generation Operator/Constructor will determine if there are existing clearance(s) in place. If a clearance is in place, and the employee will be performing work that could affect a point of clearance, the employee will be directed to contact the clearance holder to review the scope of the work to be performed. The clearance holder has full responsibility of the lines, cables and equipment within the clearance boundaries and will make the final decision whether the work can be completed in a safe manner or if the work should be postponed and/or rescheduled.

Qualification of Mutual Aid/Contract Personnel

Prior to the ECC issuing any clearances, they shall receive the names of Mutual Aid/Contract Personnel qualified to receive a District clearance.
See Clearance Procedures for District Employees Section.

Interconnections with Foreign Utilities

The System Operator has jurisdiction over interconnections with foreign utilities and systems. Where lines of foreign utilities are involved in the operation of the District's electric system, the System Operator shall cooperate with Dispatchers of foreign utilities. Terminal Clearances for the foreign utility or generation facility shall be tagged with a Master Safety Card. See WAC 296-45-335 (14).

Interconnections with Customer Primary Systems

Where the customer primary system is mapped and under the control of the Energy Control Center, the System Operator shall issue orders for switching and clearances on the customer's lines, cables, stations, and equipment and shall be tagged with a Master Safety Card.

Where the customer primary system is not identified, the System Operator shall not issue orders for switching and clearances. Employees working on customer owned primary systems shall be provided with a means of identifying the lines and equipment to be worked on, and shall ensure the lines, cables, stations, and equipment are de-energized, identified, isolated, and tagged with a Master Safety Card, tested and grounded before any work begins. The employee/worker(s) shall establish their field clearance under these conditions. See Field Clearance Section.

Customers may also have Lock-Out and Tag-Out Procedures that shall be observed. See WAC 296-45-335 (2b & c).

Communications

Communications in connection with switching and clearances shall be given by the System Operator directly to the employee/worker in charge of operating the switch or receiving the clearance. Personnel shall identify themselves to each other and assure that they know with whom they are communicating when giving or taking Hot Line Hold, switching orders, and clearances.

Switching orders and clearances shall be repeated word for word back to the speaker, using the correct designation of lines, cables, stations, and equipment. Speakers shall identify themselves by name. See WAC 296-45-335.

The radio is the primary communication source for the Energy Control Center: The radio shall serve as the principal communication media for all clearances and switching. The telephone shall be used only as a backup system when the radio is not working at the job site.

Both the radio and telephone used for this purpose shall be recorded.

Operating Instructions

“A command by operating personnel responsible for the real-time operation of the interconnected Bulk Electric System to change or preserve the state, status, output, or input of an Element of the Bulk Electric System or Facility of the Bulk Electric System. (A discussion of general information and of potential options or alternatives to resolve Bulk Electric System operating concerns is not a command and is not considered an Operating Instruction.)” (Ref. NERC Glossary)

- Use 3-part communications for Operating Instructions (normal and emergency conditions)
- Use English
- Use 24 hour time
- Use standard nomenclature
- Use Phonetic Alphabet when needed for clarity
- Speakers shall identify themselves by name.
- If we use an oral or written single-party to multiple-party burst Operating Instructions we will confirm or verify that the Operating Instruction was received by at least one receiver of the Operating Instruction.

A-Alpha	N-November	One (wun)	0100-1am	1300-1pm
B-Bravo	O-Oscar	Two (too)	0200-2am	1400-2pm
C-Charlie	P-Papa	Three (tree)	0300-3am	1500-3pm
D-Delta	Q-Quebec	Four (fow-er)	0400-4am	1600-4pm
E-Echo	R-Romeo	Five (fife)	0500-5am	1700-5pm
F-Foxtrot	S-Sierra	Six (six)	0600-6am	1800-6pm
G-Golf	T-Tango	Seven (sev-en)	0700-7am	1900-7pm
H-Hotel	U-Uniform	Eight (ait)	0800-8am	2000-8pm
I-India	V-Victor	Nine (nin-er)	0900-9am	2100-9pm
J-Juliet	W-Whiskey	Zero (zee-row)	1000-10am	2200-10pm
K-Kilo	X-Xray		1100-11am	2300-11pm
L-Lima	Y-Yankee		1200-12pm	2400-midnight
M-Mike	Z-Zulu			

Safety Cards

The following cards shall not be placed or removed without authorization from the System Operator or Generation Operator/Constructor having jurisdiction.

Exception: See Field Clearance Section.

MASTER SAFETY CARD

These cards are red and white and are only used in association with clearances. These cards shall be filled out and securely attached on or near the point of control for the device or operating mechanisms of each switch, breaker, or source that could energize the line, cable, station, and equipment to be worked on. This card shall also be used at the Jackson Hydro Facility on devices to indicate clearance points. The Master Safety Card, as shown in this section, shall also be used for terminal and field clearances.

Supervisory Control and Data Acquisition (SCADA) will be tagged electronically.

When a clearance is released, the Master Safety Card may be discarded.

DANGER - DO NOT OPERATE CARD

These cards are white and red and are used on the District's lines or equipment, or customer equipment to indicate an isolation point for the customer from the District's electric system. The card may be used at an isolation point for District employee/workers from the customer's electric system. The card can also be used at our Generation Facilities for LO/TO requirements. They are attached on or near the point of control for the device or operating mechanisms.

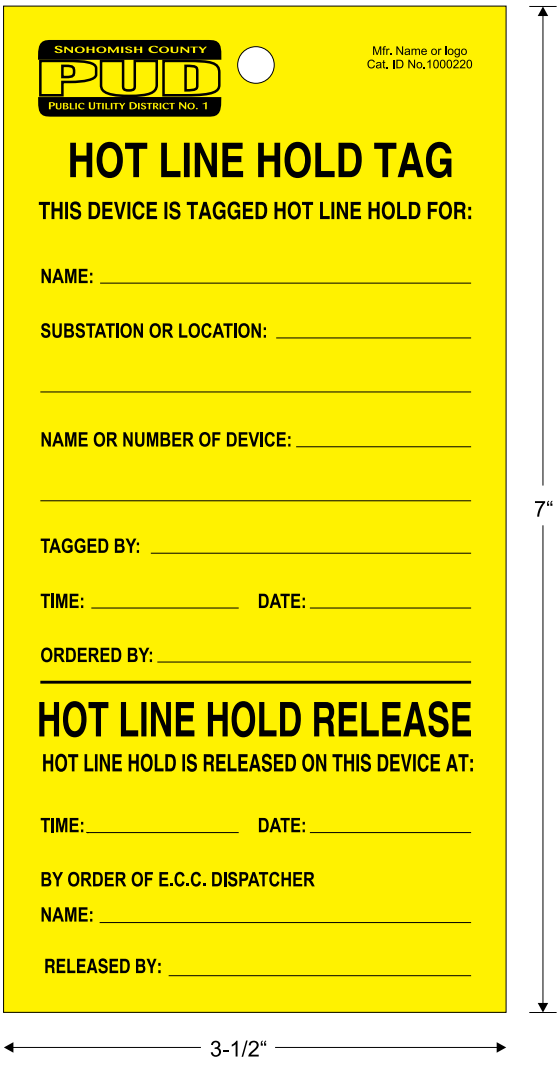
Exception: The card may also be used at an isolation point for District employee/workers working on any electric system under 601 volts without ECC approval.

SCADA will be tagged electronically.

HOT LINE HOLD SAFETY CARD

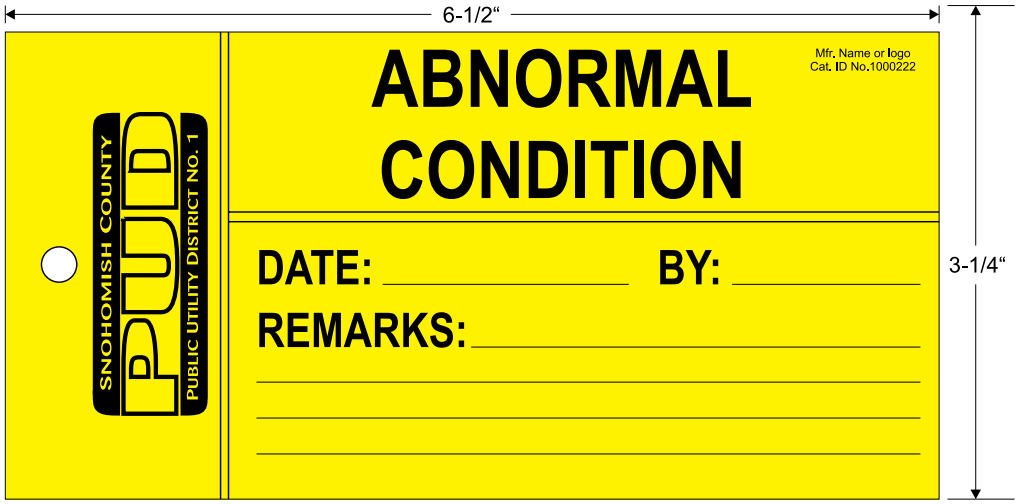
These cards are safety yellow and indicate that the auto reclosing is disabled and instantaneous trip is enabled on circuit breakers or line reclosers. They are attached on or near the point of control for the device or operating mechanisms.

SCADA will be tagged electronically.



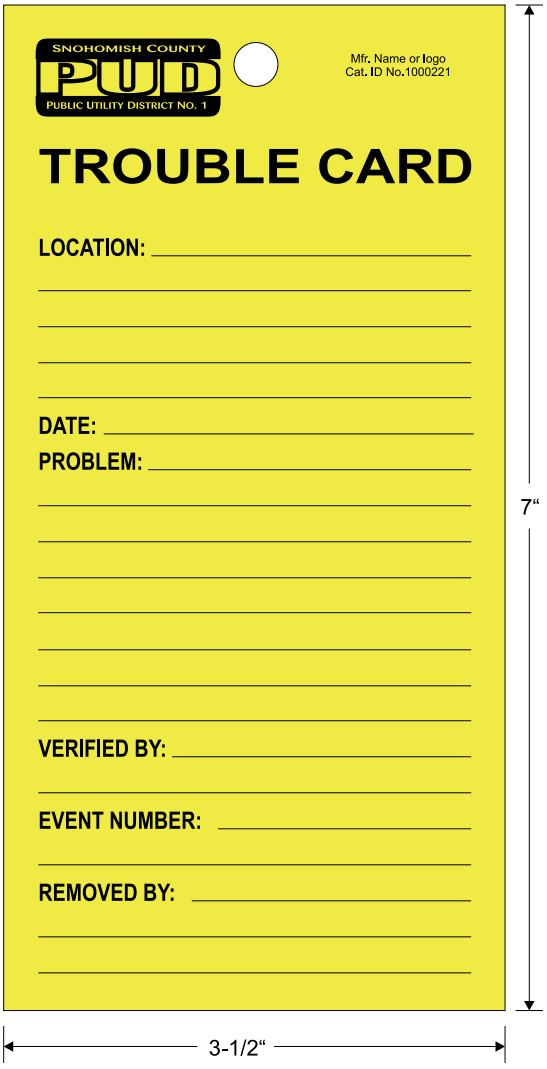
ABNORMAL CONDITION CARD

These cards are yellow and shall be used as a warning to identify equipment or a part of the system that may be defective, operating in an unusual manner, or subject to special operating conditions.



TROUBLE CARD

These cards are used during localized/major emergencies in the field to identify system damage

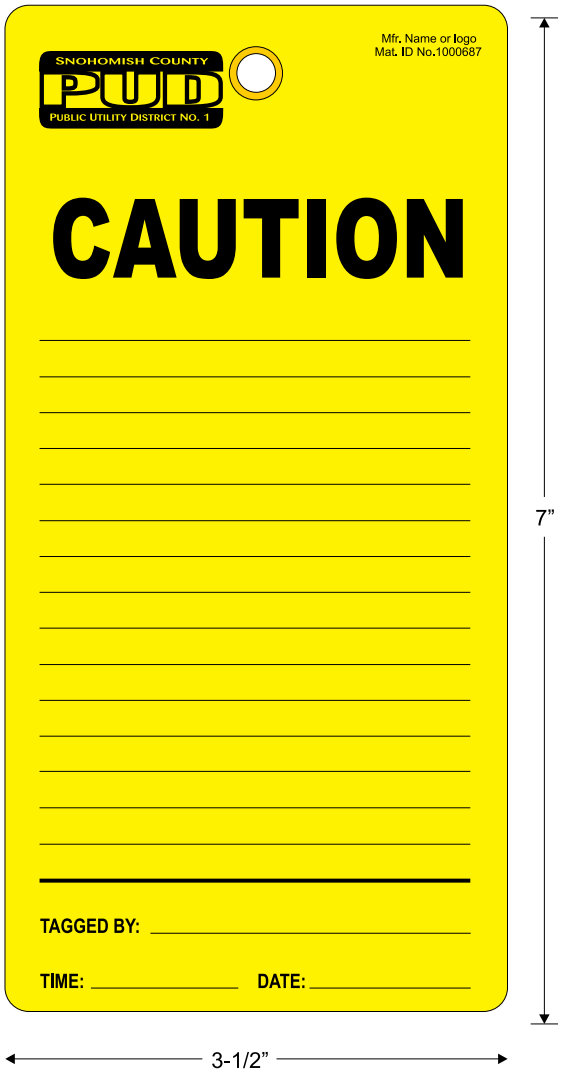


Informational Cards

These may be placed or removed in the field for conditions not relating to system operating issues and are not under the control of the System Operator or Generation Operator/Constructor.

CAUTION CARD

These cards are yellow and may be placed by the employee/worker in the field to provide information to other field employees.



Where to Attach Cards

Attach the appropriate safety card to equipment during switching and clearance operations. Never place in front of or cover a Master Safety Card with any other type of card.

Circuit Breakers and Switches - Attach to the control devices. SCADA is also electronically tagged when it is a control device.

Switch Operating Mechanisms - Place in card holder(s) or securely attach on or near the mechanism so it is out of reach from the ground on pole mounted facilities.

Single/Multi-Pole Disconnect Switches - Place in card holder(s) or attach securely to the pole out of reach from the ground.

Substations- Place in card holders or other device(s) and attach to switch(s), circuit breaker(s), disconnect switch(s), or transfer bus switch(s) which could energize the line or equipment to be worked on. All threephase, single-pole disconnect switch(s) shall be tagged; however, only the center disconnect is required to have clearance information. For stations with a local computer that can operate device(s), a card shall be placed on the computer's enable/disable switch.

Underground Conductors - Attach the card on, or if not possible, near each switchable device or elbow. At least one of the cards for a threephase circuit shall contain the clearance information. If more than one multiphase circuit is under clearance in a vault, all cards shall be filled out completely.

Tagging Procedures

Master Safety Card

Follow these steps to use a MASTER SAFETY CARD when obtaining a clearance.

Step 1: Employee/Worker

- Submits a completed Switching Request to ECC (see Section A)

Step 2: Operator

- Prepares Switching Order
  Performs final check and executes the Switching Order. Orders Master Safety Card(s) installed at clearance point(s)

Step 3: Employee/Worker

- Completes switching step as directed by the Operator
  Completes and installs a Master Safety Card for each employee/worker who is to be given a clearance as directed by the Operator

Hot Line Hold Card

- A Hot Line Hold is required when performing hot line work on energized conductor(s) that are not fuse protected.
- An employee/worker may request a Hot Line Hold at their discretion when performing hot line work on energized conductors that are fuse protected or when working in close proximity to energized conductors. Weather and other external conditions may influence the ability to issue a Hot Line Hold.

Fuses do not provide Hot Line Hold protection.

Hot Line Hold

Follow these steps to use a HOT LINE HOLD card.

Step 1: Employee/Worker

- Submits a completed Switching Request to ECC (see Section A)

Step 2: Operator

- Reviews the request and verifies the exact location of the work.
- Orders the necessary field device placed on Hot Line Hold & tagged.
- If no field device available, remotely places the substation breaker on Hot Line Hold and tags via SCADA, or dispatches a qualified employee/worker to the site to place the breaker on Hot Line Hold andtag.
- Notifies the employee/worker that the necessary device is tagged and on Hot Line Hold.

Step 3: Employee/Worker

- Notifies the Operator when the Hot Line Hold is no longer needed.

Step 4: Operator

- Orders the tag removed in the field and the Hot Line Hold released, restoring the device to previous settings.
  or
  Removes Hot Line Hold and restored substation breaker to previous settings via SCADA (if applicable.)
- Logs the information.

Outage Procedure While Holding a Hot Line Hold

This process describes how to report and respond to a station breaker or line recloser which has opened while on Hot Line Work.

Step 1: Employee/Worker

- Immediately notifies the Operator of loss of power while holding a Hot Line Hold.
- Reports to the Operator if assistance is needed and reports the events which caused the circuit to open, if known.
  Note: It is required that the holder of the Hot Line Hold monitor the radio.
- States if the line is clear to be reenergized. If clear, the employee/worker shall release the Hot Line Hold.

Step 2: Operator

- Verifies with the employee/worker that the line has opened. Responds to any assistance needed. Logs information.
- Confirms if the circuit is ready to be energized. Orders tag to be removed, recloser back to reclose and energizes circuit.
  Note: If the station breaker relayed open, the Operator should place the breaker back to reclose operation immediately prior to closing to ensure that the fuse(s) in the field will operate. If the breaker is closed while on Hot Line Hold, (instantaneous relay operation), the breaker may relay open for a fault behind the fuse(s) or for cold load.
- If required, re-tag the affected device and re-issue the Hot Line Hold, to the employee/worker.
- Logs the information

Process when a Hot Line Hold is “not released”

System Hot Line Hold(s) shall be released as soon as the equipment protection is no longer required by the Foreman/Lead Worker, but no later than the end of each work day. System Operating Procedures do not allow for a Hot Line Hold to be left in place overnight unless approved by the ECC Duty Supervisor.

In the event that a Hot Line Hold is “not released” at the end of the work day, the System Operator shall:

- Attempt to contact the employee (holding the Hot Line Hold) at home to have the Hot Line Hold released by telephone. If unable to make contact with the employee proceed with the following
- Contact the ECC Duty Supervisor to report the situation.
- Have a Serviceman patrol the circuit and report the status of the electric system, back to the ECC over the District radio or a recorded telephone line.
- If the circuit is in an abnormal configuration and the ECC needs the circuit returned to its’ normal configuration for emergency restoration, a District crew will be called out to make the necessary repairs.
- Have Serviceman/Foreman release the Hot Line Hold over the District radio or recorded telephone line.
- Provide the ECC Duty Supervisor with all pertinent information so he/she can make contact with the DSM/Superintendent /General Foreman on the next business/work day to report the event. DSM/Superintendent/General Foreman shall make contact with the Foreman/Lead Worker and advise them of the status of the electric system before any further work can proceed.

Clearance Procedures for District Employees

(Includes all Mutual Aid Crews, Line Contract Crews & Tree Contract Crews Working for the District)

Clearance Procedures

These are the methods to obtain a clearance at the District:

- Issued through a System Operator (above 601 volts A/C). See Exceptions
- See Generation Facilities Section
- Field Clearance (See Field Clearance Section)

The System Operator shall issue a clearance before work can begin on a de-energized line, cable, station, or piece of equipment that is under their control. This shall include clearance points needed on District lines, cables, or pieces of equipment under ECC authority to allow a District employee/worker to establish a clearance.

Clearance points must provide a visual open and be rendered inoperable if applicable. Examples of acceptable clearance points are manually operated switches, racked-out circuit breakers and elbows on stand-offs, etc.

All clearance holders shall successfully complete an annual switching and clearance review prior to switching or being issued a clearance.

No device(s) or equipment shall be operated without an order from the System Operator/Generation Operator/Constructor.

Exceptions:

- Lines and equipment operating 600 volts and below are operated according to the Accident Prevention Manual
- Overhead cut-out(s) on the same pole directly feeding an overhead transformer(s)
- Underground padmount transformer Bayonet fuse(s)
- Control power (CPT) or potential transformer (PT) fuse in a substation
- Battery Storage Systems
- All overhead laterals with only one source of feed

Emergency or Major Outage Events

When Mutual Aid/Contract crews work on a line, cable, station, or equipment on the District's electric system during emergencies (such as storms or other disaster damage restoration), they shall be assigned a District Crew Guide who shall remain at the job site throughout the entire period of the work. The Crew Guide or other District employee/worker shall provide radio contact with the Energy Control Center so clearances can be issued directly to the employee/worker performing the work. This clearance shall be issued in accordance with District Procedure.

When District crews work on a line, cable, station, or equipment of a foreign utility they shall receive a clearance in accordance with the foreign utility's procedure.

Clearance and Hot Line Hold Requests with Foreign Utilities (i.e. PSE, BPA, SCL, etc.)

Requirements

- 48 hour notice is required for Hot Line Hold requests
- For all transmission and distribution requests see Section A

Interconnections cleared for work performed by an employee/worker of foreign utility or District Generation Facility shall be tagged with a Master Safety Card at the District's clearance terminal point(s) for the foreign utility's System Operator or District Generation LO/TO Coordinator.

Similarly, when an interconnection is cleared for work to be done by a District employee/worker other than District Generation employee/workers, the foreign terminal shall be tagged for the District's System Operator and the District's clearance point(s) shall be tagged for the District employee/worker requesting the clearance.

Process for requesting a clearance of a section of the District's electrical system for an employee/worker from a foreign utility to perform work in close proximity

ECC will arrange with line construction for a District clearance holder. Clearance points will be tagged with a Master Safety Card for the District's clearance holder requesting the clearance.

Any work required on the District system will be done by the District. The District's clearance holder will offer to meet on site with the foreign utility's employee worker to review the limits of the clearance. The District's clearance holder will be on site while work is being performed that could impact the section under clearance.

Process for requesting a Hot Line Hold on the District's electric system from a foreign utility dispatcher for their electrically qualified employee/worker performing work near our system

ECC will arrange to have the necessary device(s) tagged with a Hot Line Hold card for the foreign utility dispatcher making the request. The ECD would then issue the Hot Line Hold to the foreign utility dispatcher.

Their dispatcher would then issue Hot Line Hold to their employee/worker. Weather and other external conditions may influence the ability to issue clearance and/or Hot Line Hold on the District's electric system.

Disclaimer: This does not include crews from other utilities working for the District.

For Clearances on District Owned Equipment or District lines, cables, or stations under the control of the Energy Control Center – See Section A, Operating Authority for notification time requirements.

For Clearances on Customer Owned Equipment or District lines, cables, or stations not under the control of the Energy Control Center – See Section G, General Operating Procedures.

Conditions and Requirements for Working Under a Clearance

The System Operator shall record all switching steps pertaining to the clearance before issuing the clearance to the employee/worker.

The System Operator shall not issue clearances on lines, cables, stations, and equipment until satisfactory communications have been established. The employee/worker who shall do the switching and receive the clearance shall establish communications with the System Operator either by radio or designated telephone lines. **The radio shall serve as the principal communication media for all clearances and switching. The telephone shall be used only as a backup system when the radio is not working at the job site. Both the radio and telephone used for this purpose shall be recorded.**

At the beginning of the work, the System Operator shall order all appropriate devices opened and tagged with a Master Safety Card. Group or gang operated switch(es) shall also be locked open if lockable or rendered inoperative unless it doesn't so permit.

Whenever a line or equipment is de-energized for safety, no employee/worker shall proceed to work until the employee/worker in charge of the work has **identified, isolated, and obtained a clearance from** the System Operator having jurisdiction (Exception: See Field Clearance Section). All lines and equipment shall be considered energized unless **tested and grounded**. **See WAC 296-45-345** and 355. At the clearance points, all switching devices shall be rendered inoperative unless its design does not permit.

If, while executing a Switching Order to obtain a clearance, the System Operator or Employee/Worker has reason to believe that any further switching would be improper, the System Operator shall, at that point, stop the switching, resolve the issue and/or report the event(s) to the immediate supervisor/lead, if necessary.

When executing a Switching Order to obtain a clearance, if a switch is found to be in a position other than that specified in the order, the switching shall stop and no further switching shall be done until the System Operator approves the continuation of the Switching Order.

Conditions and Requirements for Releasing a Clearance

The System Operator shall not accept the release of a clearance from anyone but the employee/worker who received the clearance, except as stated below.

When the work is completed, the grounds shall be removed and the line(s), cable(s), station(s), and equipment should be returned to the original status, prior to releasing the clearance. This does not include clearance point(s). The employee/worker holding the clearance shall notify the System Operator that all the workers are clear of line(s), cable(s), station(s), or equipment; all ground connections have been removed, and shall report the status of any additions or changes that would affect the operation of the system. This act shall be known as “releasing the clearance” to the System Operator.

If the employee/worker who received the clearance must leave the job for another employee/worker to complete, the employee/worker leaving shall explain the circumstances and current job status in detail to the System Operator and release their clearance. The employee/worker who continues the work shall secure a clearance from the System Operator in their own name before work is resumed. See WAC 296-45-335 (9).

Exception: When it is determined by the ECD that a clearance needs to be released and the employee/worker holding the clearance is not at work, that clearance may be released under the following conditions:

The System Operator or the employee’s supervisor shall attempt to contact the clearance holder. If contact is made and the clearance holder is able, they shall be requested to report to work and take the necessary steps to release the clearance.

If the clearance holder is contacted, but is unable to report to work, the System Operator shall be able to issue a new clearance to another employee/worker, if grounds are still in place or if additional work would be required to release the clearance.

If the grounds are removed and no additional work is required to release the clearance, the clearance holder shall inform the System Operator of the required information to release their clearance and then release their clearance over the recorded ECC phone line from home.

If the clearance holder cannot be contacted, the next available qualified supervisor who is familiar with the work can release the clearance over the District radio after going on site to visually verify that all work is completed, all personnel are in the clear, all grounds have been removed and is ready to be energized. The supervisor would also need to know if any changes have been made that would impact the system and report any changes to the System Operator when releasing the clearance. If the supervisor is not electrically qualified, they will be required to attain an electrically qualified worker to do an assessment of the site to visually verify that all work is completed, all personnel are in the clear, all grounds have been removed and is ready to be energized.

If the qualified supervisor determines that grounds are in place or work must be done before the clearance can be released, the qualified supervisor shall work with the System Operator to get the necessary personnel

to conduct the work. The System Operator shall issue a new clearance to the new clearance holder who shall perform the work. The supervisor can then release the original clearance to the System Operator over the District radio.

The supervisor is also required to ensure that the original clearance holder is informed, upon return, that their clearance was released.

Multiple Clearances

If it becomes necessary for two or more crews to work independently on the same line section or equipment, the lead employee/worker on each crew needing to work under a clearance shall take their own clearance. In all cases where multiple clearance holders hold the same clearance points, the System Operator shall attempt to notify each known clearance holder, if conditions permit.

If two or more crews are working together on the same line section or equipment, one of the lead employee/workers can hold the clearance for all crews. The clearance holder shall conduct a single job briefing with all employee/workers involved before starting work. The lead employee/worker holding the clearance shall be on site where and while the work is being performed on the line section or equipment under the clearance.

In the case of multiple clearance holders sharing grounds, if it becomes necessary to release one of the clearances with the common grounds still in place, then the employee/worker releasing their clearance shall report that the common grounds are still in place and being used by other clearance holders. The last employee/worker releasing their clearance shall be on site and verify that all personnel and equipment are in the clear and that the grounds have been removed. See WAC 296-45-335 (10).

Clearances can be issued with a common clearance point, provided that point is not being worked on. A clearance can be issued within a clearance; however, overlapping clearances shall not be permitted at any time.

For the purpose of extending, reducing, or transferring a clearance with grounds in place, the existing clearance shall stay in place until the new clearance is issued. The grounds shall be inside the new clearance. After the new clearance is issued, the old clearance shall then be released. Employee/Workers and equipment shall be in the clear during this process.

Exception:

Multiple clearances shall not be issued on a Snohomish PUD 115kV line when the section of line between personal protective grounds is running parallel (in a transmission corridor) to another utility's line that is energized at 115kV or above for more than 2,640 feet (1/2 mile).

Multiple clearances shall not be issued on a Snohomish PUD 115kV line when the section of line between personal protective grounds is running parallel (in a transmission corridor) to another Snohomish PUD energized 115kV line for more than 15,840 feet (3 miles).

See Appendix I for detailed information.

Clearance Process

This process describes how to obtain and release a clearance from the Energy Control Center. See WAC 296-45-335 for reference.

For Generation Facilities, see “Clearance Procedures in Generation Facilities” section.

Step 1: Employee/Worker

- Submits a completed Switching Request to ECC (see Section A)

Step 2: System Operator

- Prepares Switching Order
- Orders the clearance points opened and tagged for the employee/worker who requested the clearance

Step 3: Employee/Worker

Note: The employee/worker shall check the device(s) having SF6 gas for gas targets before operating the device(s).

- Opens or checks open switch(es), visually inspects all three blades to be open, lock open if applicable, and tag
- Opens motor-operated switch(es) (unless SCADA controlled), visually inspects all three blades to be open, de-couples the linkage, locks the switch/disconnects open, and tags
  Note: The employee/worker shall have the option of opening the power to the motor operator. If the employee/worker opens the power to the motor operator, they shall notify the System Operator. (This may send a DC alarm to the Energy Control Center. Power shall be restored after de/re-coupling and the alarm shall be cleared.)
- Report to the System Operator that the open point, jumpers, etc., have been verified by switch number, pole number, or address and tagged

Step 4: System Operator

- Issues the Clearance by notifying the employee/worker that the isolating points associated with the lines, cables, stations, or equipment are opened and tagged for the employee/worker

Step 5: Employee/Worker

- Receives clearance and proceeds to Verify, Test and Ground, as applicable
- Proceeds with and completes the work
- Restores the equipment within the clearance to the original status or informs the System Operator of the status of any addition or changes to the system or its operation. (This does not include the clearance points.)
- Releases the clearance and notifies the System Operator that they removed the personal grounds and all personnel and equipment are in the clear

Step 6: System Operator

- Orders card(s) removed (by name and number) and line(s), cable(s), station(s), and equipment energized as necessary

New Construction

New construction shall become part of the electric system and a clearance shall be required when work is completed to a point where cables or lines could become intentionally energized; for example, connected primary neutrals, rolled back jumpers, cutouts, switches, elbows with connected primary neutrals, etc. Elbows without connected primary neutrals are not considered switchable devices.

Grounds may be installed on new construction without a clearance, provided it does not meet any of the above conditions.

Islanding Substations

A substation is considered “islanded” when all lines and cables have been completely removed from the termination point on poles, structures or vaults and no source of energization is present from the electric system (including neutral conductors). When a substation is islanded, it is no longer considered part of the electric system, no clearances are required and grounds may be applied. If energized conductors on poles run above the substation, the substation can still be “islanded” as long as the minimum approach distances from WAC 296-155-428 are maintained for non-electrically qualified workers performing tasks inside the substation fence.

Special Condition Clearance

To be used for unique situations and not during storm restoration. A Special Condition Clearance shall be defined as one that involves a clearance on less than all phases of any line.

1. The employee/worker in charge shall be fully aware of the circuit configuration in the area to be worked and request a clearance from the Energy Control Center.
2. All load shall be transferred from the phases to be worked on; and the employee/worker in charge shall ensure that there are no other possible sources of energization.
3. All employee/workers shall be made fully aware of which line(s) will be worked on and which line(s) will remain energized.
4. The System Operator shall issue the Special Condition Clearance. Tagging of the device(s) shall include the Master Safety Card(s) and an Abnormal Condition Card(s) that clearly details the specific clearance being issued.
5. Both the Master Safety Card(s) and the Abnormal Condition Card(s) shall be placed in such a manner that both are visible at all times.

Clearances for One or Two Underground Cables in a Multi-Phase Circuit Including Testing

A clearance can be issued on one or two phases of a multi-phase underground circuit as long as the section being cleared has fuses or elbows and is not affected by three phase load. The lead worker can always request that all phases be de-energized based on safe work conditions.

When taking a clearance as defined above, the normal source(s) of feed will be tagged with a Master Safety Card(s). Exception: If alternate sources of feed are in the same vault, and the cable(s) are isolated on separate J Box(es) they do not need to be tagged.

Clearance Procedures for Line Clearance Tree Trimmers

Tree Trimmers requiring clearances on District lines and equipment shall follow these procedures for work performed in accordance with WAC 296-45-335 and 455.

NOTE: Tree Trimmers shall always treat the conductor or equipment as ENERGIZED unless equal potential grounding is in place or protective equipment is used to insulate the employee/worker. Safe working distances shall be observed in accordance with tables 1, 4,and 5. See WAC 296-45-455.

Clearance Process for Line Clearance Tree Trimmers

This process describes how to obtain and release a clearance for Tree Trimmers.

Step 1: Lead Tree Trimmer

- Starts the request by establishing the work location and sends the signed Switching Request to Vegetation Management. Vegetation Management shall send the Switching Request to the appropriate Line Manager/Superintendent to determine which Line Foreman shall assist in the clearance. The Line Foreman makes the switching and clearance request to the ECC
  Note: It is recommended that the Lead Tree Trimmer and Line Foreman shall review the work location together.

Step 2: Line Foreman working with the Lead Tree Trimmer

- Submits a completed Switching Request to ECC (see Section A)

Step 3: System Operator

- Prepares Switching Order
- Orders the clearance point(s) opened and tagged for the employee/worker who requested the clearance

Step 4: Employee/Worker (performing the switching)

Note: The employee/worker shall check those devices having SF6 gas for gas targets before operating the devices.

- Opens or checks open switch(es), visually inspects all three blades to be open, lock open if applicable, and tag
- Opens motor-operated switch(es) (unless SCADA controlled), visually inspects all three blades to be open, de-couples the linkage, locks the switch/disconnects open, and tags

Note: The employee/worker shall have the option of opening the power to the motor operator. If the employee/worker opens the power to the motor operator, they shall notify the System Operator. (This may send a DC alarm to the Energy Control Center. Power shall be restored after de/re-couplingand the alarm shall be cleared.)

- Report to the System Operator that the open point, jumpers, etc., have been verified by switch number, pole number, or address and tagged

Step 5: System Operator

- Issues the Clearance by notifying the Line Foreman that the isolating point(s) associated with the line (s), cable(s), station(s), or equipment are opened and tagged for the Line Foreman

Step 6: Line Foreman

- Receives the clearance
- Proceeds to Verify, Test and Ground, as applicable. Reports to the System Operator that these steps have been completed
- Reviews the bounds of the clearance with the Lead Tree Trimmer

Step 7: System Operator

- Notifies the Line Foreman that the clearance shall be issued to the Lead Tree Trimmer. Issues a clearance to the Lead Tree Trimmer with the Line Foreman's clearance still in place

Step 8: Lead Tree Trimmer

- Receives the clearance

Step 9: Line Foreman

- Releases their clearance identifying and notifies the System Operator that the line crew employee/workers are no longer working on the line, the grounds have been left in place within the Lead Tree Trimmer's clearance, and that the line is not ready for service

Step 10: System Operator

- Releases Line Foreman's clearance

Step 11: Lead Tree Trimmer

- Indicates to the System Operator that they have completed their work

Note: The Lead Tree Trimmer shall give the System Operator as much notice as possible. The System Operator shall contact a Line Foreman to report to the site. The Lead Tree Trimmer cannot release the clearance until a Line Foreman has received the clearance.

Step 12: System Operator

- Issues the clearance to the Line Foreman

Step 13: Lead Tree Trimmer

- Releases the clearance to the System Operator stating that the Tree Trimming crew is clear of the line or equipment, that the grounds have been left in place and are within the Line Foreman's clearance, and that the line is not ready for service until the Line Foreman releases their clearance to the System Operator

Step 14: Line Foreman

- Reviews the work site, ensures all employee/workers and equipment are clear of the line and that all grounds have been removed. The Line Foreman shall then release their clearance to the System Operator

Step 15: System Operator

- Orders Card(s) removed (by name and number) and line(s), cable(s), station(s) and equipment are energized as necessary. See WAC 296-45-335 (13)

Field Clearances

Procedures for Field Clearances

A Field Clearance is part of the District's normal clearance process. A Field Clearance is used only to provide protection for employee/workers in the field working on lines, cables or stations not under control of the Energy Control Center (ECC). This section will provide instruction on when this type of clearance shall be used.

Employees working on the District's high voltage system not under the control of the ECC shall establish their own Field Clearance per WAC 296-45-335 (2b, c&d). The Master Safety Card(s) shall be used along with District lock(s) where appropriate. The employee/worker in charge of establishing the Field Clearance shall visibly ensure that the lines, are open and isolated from all potential sources of energy, and then place the Master Safety Card(s). They can then have the line(s) tested, grounded, and proceed with their work.

This section will provide instruction on this type of clearance including:

Field Clearance

This procedure authorizes qualified electrical workers(s) to establish their own Field Clearance(s) restricted to the following:

- All overhead laterals with one source of energization. A lateral is further defined as any line section with a single source that is hot-tapped. Line sections that are end of line fed by wedge or bolted type connected jumpers do not qualify as Field Clearances.
- If a hot tapped single sourced overhead lateral contains a section or sections of underground line, the underground sections will be considered a part of the Field Clearance.
- Laterals with single phase reclosers with hot tap connected jumpers are not under ECC control and will use the Field Clearance process.
- Following the completion of the established Field Clearance, all operational system status changes, (anything other than the normal system configuration), shall be communicated by telephone or radio to the ECC System Operator.

Foremen may contact ECC to request clarification or assistance.

The qualified electrical employee(s) in charge of the work, shall ensure that all of the overhead lines and equipment, being worked under this procedure, are patrolled, tagged, tested, grounded.

The qualified electrical employee(s) in charge of the work shall report the time that the Field Clearance was established, the time restoration was completed, and the cause for each event.

Field Clearance Process

Step 1: Lead Employee / Worker

- Verifies the location of the worksite and clearance point.

Step 2: Lead Employee / Worker

- Patrols lines to verify source of feed and identifies visible open.
- Opens or verifies switching device(s) are open and for non-storm work notifies ECC by phone or radio that the device is open.
- Fills out Master Safety Card(s) and places it on the opening.

Step 3: Lead Employee / Worker

- Communicates clearance point(s) with crew members.
- Gives orders to test, ground, and proceed with work.

Step 4: Lead Employee / Worker

- To release the Field Clearance, verifies all work is complete, verifies all employee/workers are in the clear, and that grounds have been removed.
- Removes Master Safety Card.
- Orders switchable device and/or jumper(s) to be returned to normal.
- Verifies that power is restored, if applicable.
- For non-storm work, after energizing back to normal condition, notify ECC by phone or radio that device is closed
- During a storm, call designated ECC number (425-783-5023): Identify themselves, the location, device, pole number, time of energizing and the status of the line.

Servicemen Lateral Procedures

Step 1: Serviceman

- Patrols out radial-fed laterals to the end of the line.

Step 2: Serviceman

- If no damage or minimal damage is found (such as a limb on the line that can be safely removed by Servicemen) Servicemen can reenergize by refusing and closing cut-outs.

Procedures for Customer Owned, Abandoned or Unmapped Lines & Equipment & Battery/Energy Storage Installations:

Field Clearance shall only be used under the following conditions:

- **Customer Owned Equipment Field Clearance:** District employees working on a customer owned high voltage system, not mapped or under the control of the ECC, shall establish their own Field Clearance per WAC 296-45-335 (2b, c&d). The Master Safety Card(s) shall be used along with District lock(s), where appropriate. The employee/worker in charge, establishing the Field Clearance, shall meet with the customer representative responsible for the work to receive the necessary information to properly identify the lines/equipment to be de-energized. The customer representative shall ensure that the customer's employees will understand that the District's Master Safety Card(s) is the District's form of lockout/tagout. If there are any questions, the customer representative can also install their company lock/tag for additional safety. If the work requires a clearance on a line(s), cable(s) or piece(s) of equipment under District ECC control, the employee/workers shall follow standard procedure for obtaining a point of clearance from the System Operator to allow the employee/worker to establish their Field Clearance. The ECC System Operator shall only issue a point of clearance on the line(s), cable(s), or piece(s) of equipment under ECC control; clearance on the customer owned system shall be secured by the District employee/worker in the field. Terminal Clearance does not apply in this section.
- **Abandoned or Unmapped Lines/Equipment:** This includes abandoned 55kV lines. Notification to ECC prior to beginning work and upon termination of work shall be made giving name of employee/worker in charge, location of work, and proximity to any high voltage lines or equipment.
- **Battery/Energy Storage Installations:** Any part of the battery/energy storage installations downstream from ECC's last point of jurisdiction or not under ECC's control.

Major Disaster Field Clearance Procedures

- **Major disaster:** This is when the ECC is unable to operate and control the District's electric system. Field Clearances in this situation can be used; however, every attempt shall be made to reestablish communications with the ECC. This can only be done when it is confirmed and communicated to all affected employee/workers that the ECC is no longer in control of system operation.

Major Disaster Field Clearance shall only be established when the following criteria are met:

- All forms of communication (District radio and telephone) to and from the ECC are lost and recovery will take more than 24 hours.

OR

- Energy Control System Operators are unable to staff the Energy Control Center due to a catastrophic event i.e., major earthquake, structure fire, etc., and a temporary Energy Control Center cannot be established within 24 hours.

When one of the above conditions exists, the Distribution Services Assistant General Manager or designee may authorize the implementation of the Major Disaster Field Clearance Procedure.

The Assistant General Manager or designee will request that the implementation of the Field Clearance Procedure be communicated to all affected employee/workers.

The following procedure describes how Field Clearances shall be established.

- The lead employee/ worker shall record all switching steps pertaining to the Field Clearance before issuing the clearance and allowing work to be performed. (See Field Clearance Switching Log in this section.)
- 12 kV Circuits: Field Clearances shall be established between any line primary fused devices, opened gang-operated switches, primary solid blade disconnects, or opened and rolled back primary jumpers including to the end of the line.
- 12 kV Laterals: Field Clearances shall be established from a line primary fused device(s), opened gang-operated switch(es), opened solid blade disconnects, or opened and rolled back primary jumpers to the end of the line isolated from any other sources of energy.
- 115 kV Circuits: Field Clearances shall be established on the District's transmission system only from an opened and locked open gang-operated switch(es), or opened and rolled back transmission jumpers isolated from any other source of energy.
- Substations: Field Clearances shall be established on District substations by opening the 115 kV switch(es) with visible opens, opened and locked open gang-operated switch(es), racked out 12 kV breaker(s), 12 kV single pole disconnect switch(es), opened 12 kV getaway switch(es) or opened and rolled back transmission or 12 kV jumpers isolated from any other source of energy.

Field Clearances may not be established on any substations fed by a foreign utility without the foreign utility's cooperation.

Major Disaster Field Clearance Process

The following process describes how to obtain and release a Field Clearance in the event of a major disaster. See WAC 296-45-335. For clearances at the Jackson Project, see “Clearance Procedures within the Jackson Project.”

Step 1: Lead Employee / Worker

- Verifies the location of the worksite and all clearance points.

Step 2: Lead Employee / Worker

- Patrols lines to verify source of feed and identifies visible open(s).
- Opens or verifies switching device(s) are open and disable or render inoperative, any automatically or remote controlled switching device(s).
- Fills out Master Safety Card(s) using the word “Field” as the “Clearance No.” and places it on each switchable device or opening.
- Completes Field Switching Log (located in this section) which establishes the Field Clearance.

The employee/worker shall check those devices having SF6 gas for gas targets before operating the devices.

Step 3: Lead Employee / Worker

- Communicates clearance point(s) with crew members.
- Gives orders to test, ground, and proceed with work.

Step 4: Lead Employee / Worker

- To release the Field Clearance, verifies all work is complete, verifies all employee/workers are in the clear, and that grounds have been removed.
- Removes Master Safety Card(s).
- Completes Field Switching Log. The Field Clearance has now been released.
- Orders switchable device(s) and/or jumper(s) to be returned to normal.
- Verifies that power is restored, if applicable.

Step 5: Lead Employee / Worker

- All Field Clearance Switching Logs shall be turned in to a supervisor by the end of their shift.

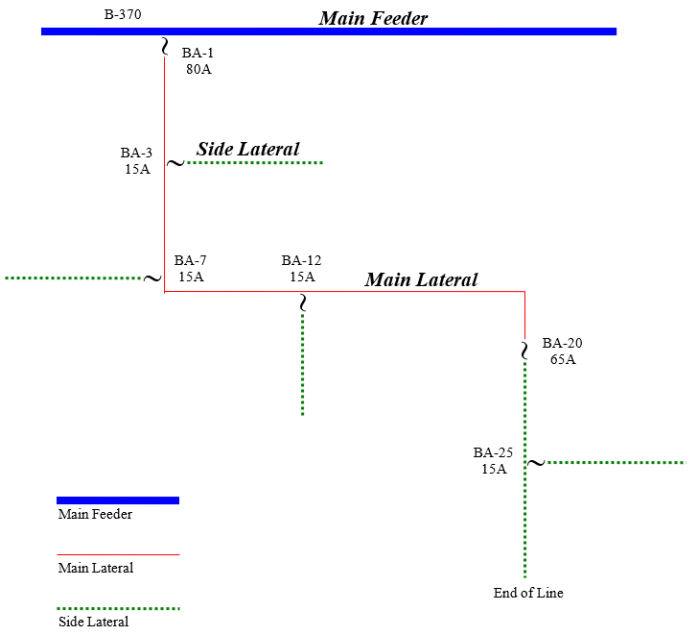
Step 6: Supervisor

- Forwards all original Field Switching Logs to ECC Superintendent or designee.

Return of the Electric System Authority to the Energy Control Center

The following procedure describes how the Energy Control Center shall re-establish authority over the District's electric system:

- The Energy Control Center shall be staffed with the minimum crew structure of System Operators for all shifts.
- District radio communication shall be re-established to all active affected field employee/workers.
- The Energy Control System Operator(s) will broadcast over all ECC District radio frequencies that the Energy Control Center is now in control of the electric system. This broadcast will continue every hour until all field employee/workers and all locations have been verified. Once notified, all switching and clearances under ECC's control on the District's distribution and transmission electric system shall take the authority of an Energy Control System Operator(s).
- All established Field Clearance work shall be completed by the lead employee/ worker.
- All Field Switching and Clearance Logs shall be turned into the Energy Control Center Superintendent or designee as soon as possible to establish current electric system configuration.


B-370
Main Feeder
BA-1
80A
BA-3
15A
Side Lateral
BA-7
15A
BA-12
15A
Main Lateral
BA-20
65A
BA-25
15A
End of Line
Main Feeder
Main Lateral
Side Lateral

General Operating Procedures

De-Energizing or Clearing of Lines and Equipment

Lines, cables, stations, or equipment, which have been cleared by making an adequate air break in all connections that are possible sources of energy, are said to be de-energized. All lines/equipment carrying potentials in excess of 601 volts to ground, or in excess of 601 volts between wire of the same circuit, at the point of work, shall be worked with approved hot line tools, or with a clearance issued. (Identified, Isolated, Tagged, Tested, and Grounded). See WAC 296-45-335, 345 & 355.

The Energy Control Center shall issue a Do Not Operate Card on District lines, cables, or equipment normally energized at 601 volts A/C and above when requested to be de-energized for a customer to work on their own electrical equipment. The Card shall not be removed until the customer in-charge or their designee, whose name appears on the card, meets with District employee/worker(s) on site and states that their electrical equipment is safe to re-energize. The following procedure describes the process to complete the customer request.

Procedures for De-Energizing Customer-Owned Equipment

Scheduled arrangements for de-energizing customer owned equipment served by the District's electric system for customers wanting to work on their own electrical system where a Do Not Operate Card is required shall be referred to a Designer/Engineer. The Designer/Engineer will contact the customer, determine what type of work is to be done and what the District can do to assist the customer, then prepare a Service Order Request (1818). The 1818 should include the lines/equipment to be deenergized, the name of the customer-in-charge, phone number, date requested, and District supervisor's approval.

The 1818 is then sent to the appropriate Manager/Superintendent for review and a Switching Request is prepared. The Switching Request shall include the name and contact phone number of the customer-in-charge. The Switching Request is then sent to the Energy Control Center for review. The District employee/worker de-energizing the line/equipment shall meet the customer-in-charge or designee at the site and ensure they understand what lines and/or equipment will be de-energized.

The customer-in-charge can request that their card(s) and lock(s) also be placed at the point of disconnection when the District equipment serves only that customer. If requested, the District employee/worker will place the customer's card, along with the Do Not Operate Card and place a District lock into the customer's multi locking device on the equipment, if lockable. If the District needs to enter the equipment, the District shall notify the customer-in-charge of the work so they can remove their lock.

If the District has multiple customers served by the equipment, the District shall disconnect the customer's service and place a Caution Card, but shall not allow a customer's card or lock to be placed on the equipment. The District employee/worker on site shall review with the customer-incharge the status of the lines/equipment de-energized and have the customer sign and date the 1818 and provide the customer a copy.

If contact at the job site is not accomplished, the lines/equipment will not be de-energized.

The District shall not install protective personal grounds for the customer. The customer shall install their own protective grounds as needed.

In order to remove the Do Not Operate Card and re-energize the lines/equipment, the customer-in-charge or designee, whose name appears on the card as the contact person, shall contact the Designer/Engineer 48 hours before the work is completed. The customer in-charge shall provide the Designer/Engineer with the date the Do Not Operate Card was issued (off the 1818). The Designer/Engineer shall inform the customer-in-charge that they shall be at the work site to meet the District employee/worker before the System Operator will authorize the lines/equipment to be re-energized. The District employee/worker at the job site shall confirm that the customer-in-charge understands that the lines/equipment are going to be re-energized. The District employee/worker will then contact the System Operator and request the removal of the Do Not Operate Card and receive authorization to reenergize the lines/equipment. The District employee/worker shall have the customer-in-charge sign and date the 1818, completing the work.

If contact at the job site is not accomplished, the lines and /or equipment shall not be re-energized.

Safe Working Distances (non-electrical workers)

The minimum safe work clearances (10 feet for voltages up to 50kV and 12 feet, 2 inches on 115kV) shall be maintained until the line/equipment has been de-energized and grounded. Visual barriers may be placed as a warning of potential hazard but minimum safe work distances, as stated above, must be maintained. See WAC 296-155-428 & 655.

Procedures for Those Working in Close Proximity

Arrangements for de-energizing District lines/equipment normally energized at 601 volts and above for a customer wanting to work in close proximity shall be referred to a District Designer/Engineer. The Designer/Engineer shall meet with the customer-in-charge at the work site to review what type of work is to be performed, it's location to District lines/equipment and when it is needed. The Designer/Engineer shall then determine what can be done to assist the customer and prepare a Service Order Request (1818). The request shall include a drawing of the lines/equipment affected, where the work will be conducted in relation to the lines/equipment, the name and 24 hour phone number of the customer-in-charge at the work site, what the Designer/Engineer is requesting to be done, and the District supervisor's approval. The 1818 is then routed to the appropriate Superintendent/Manager for review and approval. The Designer/Engineer shall inform the customer that the customer-in-charge shall be on site when the qualified District employee/worker implements the measures and when the measures are removed. In an emergency the customer's designee may serve as the customer-in-charge. If the work doesn't require switching or a clearance it will be released to work.

If switching or a clearance is needed, a Switching Request will be generated. A Switching Request Form with a copy of the 1818 and any drawings shall be sent to the Energy Control Center. A copy of the 1818 shall also be attached to the Switching Order. The qualified District employee/worker de-energizing the line and/or equipment shall meet the customer-in-charge or their designee at the site and ensure they clearly understand what lines/equipment will be de-energized. Upon receiving orders from the System Operator, the qualified District employee/worker shall de-energize the line/equipment and install a Master Safety Card in the District employee/workers name. Only a qualified District employee/worker shall hold the clearance. The qualified District employee/worker holding the clearance is not required to remain on site because the customer shall not contact, in any way, the District's line/equipment. Before leaving the site, the clearance holder may request that their clearance be released with the grounds installed and the clearance tagged for ECC. If the clearance is going to be released with grounds in place, the System Operator will have a Master Safety Card tagged for ECC. The clearance holder would then release their clearance and their Master Safety Card(s) would be removed.

The District reserves the right, depending on the nature of the work being performed in proximity to our lines/equipment, to have a qualified District employee/worker on site.

The qualified District employee/worker on site shall review with the customer-in-charge the status of the lines/equipment de-energized. This shall include the normal operating voltages, what has been de-energized and what continues to be energized, location of the grounds that shall be within view of the work site, and that the customer can not make contact with the lines/equipment cleared at any time. The qualified District employee/worker shall also place the Switching Order number on the 1818. The customer-in-charge shall then sign and date the 1818 acknowledging that they understand the condition of the line/equipment. The qualified District employee/worker shall leave a copy of the 1818 with the customer-in-charge and review what the customer will need to do when they are close to completing their work.

If contact at the job site is not accomplished, the line/equipment will not be de-energized.

In order to remove the clearance and re-energize the lines and/or equipment, the customer-in-charge or designee shall call the Designer/Engineer 48 hours before the work is to be completed. The customer-in-charge shall provide their name, clearance number off the 1818, and the date and time their work will be completed.

The Designer/Engineer shall review with the customer-in-charge that they shall meet with the qualified District employee/worker holding the clearance at the work site and shall call the Designer/Engineer back if the completion time changes. The Designer/Engineer shall contact the appropriate Manager/Superintendent and provide the information from the customer-in-charge.

The Manager/Superintendent shall provide the information to the qualified District employee/worker holding the clearance who shall contact the Energy Control Center to release the clearance. If the clearance is tagged for ECC, then the employee/worker who will be performing the work will take a new clearance. After meeting the requirements above with the customer, the qualified District employee/worker will check the lines/equipment, remove grounds, then release their clearance with the System Operator. The System Operator will

order the removal of the clearance holders and ECC's Master Safety Card(s) and then order the necessary switching to re-energize the line/equipment.

The employee/worker holding the clearance shall confirm that the customer-in-charge understands that the lines/equipment will be reenergized and shall verify that all others are clear of the line/equipment within the clearance. The customer-in-charge shall sign and date the 1818. If the clearance is not in the qualified District employee/worker name that will be performing the work and the Master Safety Card(s) are still in place, the employee/worker will be issued a new clearance by the System Operator. After meeting the above requirements with the customer, the qualified District employee/worker will check the lines/equipment, remove grounds, and release their clearance to the System Operator. The System Operator will order the removal of the clearance holders' Master Safety Card(s) then order the necessary switching to re-energize the line/equipment.

If contact at the job site is not accomplished, the lines/equipment shall not be re-energized.

Disaster Procedures (See Field Clearance Section)

In the event of a major disaster (earthquake, etc.) while working in the field, contact your supervisor, the Energy Control Center, or Crew Dispatch. If they can not be contacted, report to the nearest headquarters that you are able to reach.

Substation Switching Procedures

The following procedures describe basic switching guidelines for taking substations out of service. These procedures can be modified to fit particular circumstances.

General Instructions to Clear a Substation to the Feeder Getaway Switches.

These instructions assume there is a standard type of circuit switcher, and Notes indicate differences if there is no circuit switcher or if it is a “post” type such as S&C series 2030.

Note: Stations equipped with circuit switchers for bank high-side protection, use SF6 gas for the arc-breaking medium. There are gas “targets” which indicate the absence of gas. These “targets” are found on the “bottle” of the circuit switcher. The switch or circuit switcher shall NOT be operated when a “target” is found. The System Operator shall be notified immediately. If you are not certain that the circuit switcher SF6 gas target is OK, do not operate the circuit switcher and contact the Energy Control Center, immediately.

Follow these steps to clear a station with a bank circuit switcher.

Step 1: Employee/Worker

- Submits a completed Switching Request to the Energy Control Center (See Section A)

Step 2: System Operator

- Verifies the request and prepares the switching order
- Works with the employee/worker to transfer the substation load
- Remotely opens the circuit breakers via SCADA. As the breakers are opened, takes note of SCADA to verify zero amperage

Step 3: Employee/Worker

- Works with the System Operator to verify that the breakers are open
- Checks the SF6 gas target(s) on the circuit switcher(s)

Step 4: System Operator

- Opens the circuit switcher(s) via SCADA. Most circuit switchers have motor operated disconnects which shall have the linkage decoupled, locked open, and tagged with a Master Safety Card

If the station does not have a circuit switcher, or has a “post” type circuit switcher, the high-side switch shall be manually opened, locked, and tagged. If the substation is fed from transmission circuit breaker(s), the circuit breaker(s) should be opened first to de-energize the transformer

Step 5: Employee/Worker

- Verifies with the System Operator that the circuit switcher (or other high-side switch if appropriate) has opened via SCADA. Decouples the linkage, locks open, and tags
- Checks the SF6 gas target(s) on the circuit switcher(s)

Step 6: System Operator

- If the clearance extends to the feeder getaway switches, the System Operator shall order disconnects open and tagged
- Another clearance option would be to open, rack out, and tag the circuit breakers

Step 7: Employee/Worker

- Opens the feeder getaway switches and tags. Or, for metal clad stations, racks out and tags the circuit breakers

Step 8: System Operator

- Issues the clearance

Step 9: Employee/Worker

- Receives clearance and proceeds to Verify, Test and Ground, as applicable
- Proceeds with and completes the work
- Restores the system within the clearance to the original status or informs the System Operator of any addition or changes to the system or its operation. (This does not include the clearance points)
- Clears temporary station service backfeed(s), if applicable
- Releases the clearance and notifies the System Operator that they removed their personal grounds and all personnel and equipment are in the clear

Step 10: System Operator

- Verifies 12 kV circuit breakers are open
- Orders the card(s) removed
- Orders low-side bank switch(es) closed, as appropriate
- Closes the circuit switcher(s) via SCADA

If the substation is fed from transmission circuit breaker(s), the circuit breaker(s) should be the last device closed to energize the station.

- Orders feeder getaway switches closed

Step 11: Employee/Worker

- Closes low-side bank switch(es), as appropriate
- Removes the card(s) and verifies the SF6 gas target(s) on the circuit switcher(s)
- Unlocks, and re-couples the linkage before the System Operator can close the circuit switcher via SCADA

If there is no circuit switcher or a “post” type circuit switcher, closes and verifies all three phases of the high-side switch.

- Closes feeder getaway switches to the open circuit breakers

Step 12: System Operator

- Initiates switching procedure to restore load to the station
- Closes the circuit breakers via SCADA and verifies that each breaker indicates closed and shows load

Step 13: Employee/Worker

- Verifies the circuit breakers closed
- Restores the Load Tapchanger (LTC) or regulator to automatic
- Station back to normal

Hot Line Hold: Before operating distribution voltage circuit breakers or transfer bus switches, the affected circuit(s) shall be placed in Hot Line Hold mode.

Remote Racking: At stations where remote racking has been installed, the remote racking equipment shall be used whenever racking circuit breakers into or out of an energized bus.

Substation Voltage Regulators, LTC's and Controls

Substation Voltage Regulators/ LTC’s and Controls

Do not by-pass a regulator unless the tap changer is verified to be in the NEUTRAL position and the controller is in MANUAL or OFF.

Closing the by-pass with the regulator off neutral will result in large amounts of circulating currents that can be hazardous to the employee/worker and may cause catastrophic equipment failure. If the regulator cannot be verified in the NEUTRAL position, report the situation to the System Operator. Further switching shall be done to transfer or drop load as the circumstance warrants.

When switching between substations, follow the procedure in the Substation Switching Procedures Section. After the switching, the station carrying the new load may remain on switching settings, if applicable, until switched to normal. Follow District Conservation Voltage Reduction (CVR) procedures.

To Bypass a Station Regulator

Step 1: Employee/Worker

- Submits a completed Switching Request to ECC (see Section A)

Step 2: System Operator

- Reviews the request and verifies the exact location of the work.
- Orders the regulator placed in neutral and the controller placed in manual or off.
- Orders the by-pass switch(es) closed and the source and load side disconnect switch(es) opened.
- Orders the regulator to be tagged with an Abnormal Condition Card, if applicable.

Step 3: Employee/Worker

- Verifies or places the regulator in the neutral position and the controller in the manual or off position.

> ⚠ If the neutral position cannot be verified, see next procedure in this section.
>
> DO NOT CLOSE THE REGULATOR SOURCE OR LOAD DISCONNECTS WITH THE BY-PASS SWITCH(ES) CLOSED WHEN NOT ON NEUTRAL.

- Closes the by-pass and opens the source and load side disconnect switch(es).
- Tags the device with an Abnormal Condition Card, if applicable.

To restore regulator to service, reverse above steps as ordered by the System Operator.

To Remove a Station Regulator/LTC NOT on NEUTRAL Cannot be bypassed and has acceptable voltage.

The following procedures describe steps to remove a regulator/LTC that is NOT in the NEUTRAL position, when the voltage is acceptable.
(Removing a regulator/LTC with unacceptable voltage is covered in the next section.) These procedures can be modified to fit particular circumstances.

NOTE:

Acceptable voltage is usually 120 volts + or - 5%.

Step 1: Employee/Worker

- Submits a completed Switching Request to ECC (see Section A)

Step 2: System Operator

- Verifies the request and prepares the switching order
- Orders the regulator/LTC controller placed on manual or off.

Step 3: Employee/Worker

- Verifies voltage (usually at the control panel).
- Places the regulator/LTC controller on manual or off.

Step 4: System Operator

- Works with employee/worker(s) to transfer the substation load. Verifies the voltage after each circuit breaker is opened. (As the station is off-loaded the voltage on the unregulated station will increase.)

Step 5: Employee/Worker

- Works with the System Operator to off-load station, arrange for a clearance, installs Master Safety Card(s) and provides station service as needed.

Step 6: System Operator

- Issues clearance, if applicable.

Step 7: Employee/Worker

- Receives clearance and proceeds to Verify, Test and Ground, as applicable.
- Proceeds with and completes the work.
- Informs the System Operator of the status of any addition or changes to the system or its operation.
- Clears temporary station service backfeed(s).
- Releases the clearance and notifies the System Operator that they have removed their personal grounds and all personnel and equipment are in the clear.

Step 8: System Operator

- Verifies the 12kV circuit breakers and regulator by-pass switches to be in the open position.
- Orders the 12kV circuit breaker disconnects closed, if applicable.
- Orders the regulator source and load disconnects closed.
- Closes the 115kV circuit switcher (or orders the high-side switch(es) closed, if applicable).

Step 9: Employee/Worker

- Verifies that the regulator/LTC is in the neutral position and controller is in manual or off.
- Verifies the 12kV circuit breakers and regulator bypass switches are open.
- Closes the 12kV circuit breaker disconnects.
- Closes regulator source and load disconnects.
- Verifies the 115kV circuit switcher has closed (or closes the highside switch, if applicable).

Step 10: System Operator

- Initiates switching to restore load to the station.
- Orders the employee/worker to place the controller in the auto position.

Step 11: Employee/Worker

- Works with the System Operator to transfer load back on the station, adjusting voltage as necessary.
- Returns the regulator/LTC back to the normal settings.
- Verifies voltage to insure that the regulator/LTC is working.

Note: The employee/worker on site may request the regulator/LTC to be energized from a remote location.

To Remove a Station Regulator or LTC NOT on NEUTRAL (Unacceptable Voltage - Emergency Situation)

The following procedures describe steps to remove a regulator/LTC that is NOT in the NEUTRAL position, when the voltage is unacceptable (above 126 or below 114 volts). These procedures can be modified to fit particular circumstances.

Step 1: System Operator

- Verifies SCADA for an abnormal condition at the station.

Step 2: Employee/Worker

- Places the regulator or LTC controller on manual or off, if it can be done safely.
- Verifies the by-pass is open.

Step 3: System Operator

- Opens circuit breakers via SCADA.

Step 4: Employee/Worker

- Works with the System Operator to isolate the regulator or LTC for a clearance and places Master Safety Card.
- Provides station service as needed.

Step 5: System Operator

- Issues clearance.

Step 6: Employee/Worker

- Receives clearance and proceeds to Verify, Test and Ground, as applicable.
- Proceeds with and completes the work.
- Restores the system within the clearance to the original status or informs the System Operator of any addition or changes to the system or its operation. (This does not include the clearance points.)
- Clears temporary station service backfeed(s).
- Releases the clearance by notifying the System Operator that they removed their personal grounds, and all personnel and equipment are in the clear.

Step 7: System Operator

- Orders regulator source and load disconnects closed and verify the bypass switches opened (if applicable).
- Closes the transformer bank circuit switcher (or high-side switch as appropriate).
- Orders controller placed in automatic position.

Step 8: Employee/Worker

- Verifies that the regulator or LTC is on neutral and the controller is in manual or off.
- Verifies the circuit breakers are open, closes the circuit breaker disconnects.
- Closes regulator source and load disconnects, opens the regulator by-pass switches (if applicable).
- Places controller in the automatic position.

Step 9: System Operator

- Transfer load back on to the station.

Step 10: Employee/Worker

- Restores control power to the regulator or LTC.
- Works with the System Operator to transfer load back on to the station.
- Verifies voltage to ensure that the regulator is working. Station normal.

Distribution Switching Devices and Equipment

⚠

- Energized load break elbows on Kuhlman submersible transformers shall not be used to isolate or drop load unless the transformer has a yellow plastic sign on top stating “OK to switch.” For more information see Standards Bulletin #180 and T&D Guideline #4-20-12.0. If the transformer cannot be identified in the field, ECD shall attempt to verify the type of transformer before switching is ordered
- Non-load break underground elbow shall not be used to drop load
- Load break elbows shall not be used to make or separate ties between two different substations

If the overhead equipment does not have an additional load side disconnect switch, disregard references to the load side disconnect switch(es) in the following switching procedure.

Switching Underground Switchgear:

1. Verify that the location and the number of the vault or UG switch matches the switching order or the Energy Control System Operator instructions.
2. Unlock and open the switch cabinet and visually inspect the condition of the cabinet and switch(es). (Refer to District T & D Guideline 4-20-10.2 for information regarding “Missing Arc Compressor Covers in S & C Padmounted Switch Cabinets”)
3. Visually verify the switch(es) position and the barrier board location. (The barrier board shall only be placed between the switch(es) when a clearance is in place, all other times the barrier board should be hanging in front of the switch blades providing a barrier from the exposed conductors.)
4. After ECC gives permission to operate the switch(es), make sure no one is standing in front of the open bay doors or close the bay doors before operating the switch(es). You shall wear your rubber gloves or provide another form of insulation (i.e., rubber blanket to stand on) before operating the switch(es).
5. Operate the switch(es) as instructed by ECC.
6. After you have operated the switch(es), visually inspect the contacts to verify that the switch(es) functioned correctly.

To Disable Reclosing on Line Recloser

The District has two basic types of line reclosers; hydraulic and electronic.
The hydraulic reclosers may be manually or electrically controlled.

When requesting a Hot Line Hold on a 12kV circuit, all source side reclose device(s) shall be placed on Hot Line Hold.

For this process refer to Tagging Procedures, Hot Line Hold section.

To Remove a Line Recloser from Service

The following procedures describe basic switching orders for the overhead and underground distribution systems. These procedures can be modified to fit particular circumstances.

Step 1: Employee/Worker

- Submits a completed Switching Request to the Energy Control Center (See Section A)

Step 2: System Operator

- Reviews the request and verifies the exact location of the work
- Orders the bypass switches closed
- Orders the source and load disconnect switches to be opened, if applicable
- Orders recloser tagged with Abnormal Condition Card

The line side of the recloser may have solid connections. A crew will need to open the line side jumpers of the recloser if a clearance is requested.

Step 3: Employee/Worker

- Closes the recloser's by-pass switches and opens the recloser's source and load side disconnect switches
- Tags recloser with Abnormal Condition card
- Verifies with the System Operator that the line recloser is out of service

To Isolate a Line Sectionalizer

The following procedures describe basic switching orders for the overhead and underground distribution systems. These procedures can be modified to fit particular circumstances.

For certain switching conditions, (trap run, cold load pick up, etc.) the System Operator may request that the sectionalizer be by-passed.

Step 1: Employee/Worker

- Submits a completed Switching Request to the Energy Control Center (See Section A)

Step 2: System Operator

- Reviews the request and verifies the exact location of the work
- Orders the employee/worker to close the by-pass switch(es) and open the sectionalizer
- Orders source and load connections opened
- Orders the sectionalizer to be tagged with an Abnormal Condition Card

The sectionalizer may have solid connections. A crew will be needed to disconnect the sectionalizer.

Step 3: Employee/Worker

- Closes the sectionalizer's by-pass switch(es) and opens the sectionalizer
- Opens the sectionalizer's source and load connections and tags with an Abnormal Condition card
- Notifies the System Operator that the sectionalizer has been bypassed, and that the source and load connections are opened and tagged

To Isolate an Auto-Booster/Regulator

Do not by-pass an auto booster/regulator unless the tapchanger is verified to be in the NEUTRAL position and the controller is in MANUAL or OFF.

Closing the by-pass switch(es) with the auto booster/regulator off neutral will result in large amounts of circulating currents that can be hazardous to the employee/worker and may cause catastrophic equipment failure. If the auto booster/ regulator cannot be verified in the NEUTRAL position, report the situation to the Energy Control System Operator. Further switching shall be done to transfer or drop load as the circumstance warrants.

For certain switching conditions, (trap run, etc.) the System Operator may request that the equipment be by-passed.

Along with regulators, auto-boosters shall be operated correctly to avoid injury or catastrophic failure. They shall be on neutral prior to being bypassed. Auto-boosters are single-phase, rated at 10%, four-step voltage control devices (four steps to raise voltage 10%).

Step 1: Employee/Worker

- Submits a completed Switching Request to the Energy Control Center (See Section A)

Step 2: System Operator

- Reviews the request and verifies the exact location of the work
- Orders the auto-booster/regulator placed in neutral and controller to manual or off
- Orders the by-pass switch(es) closed and the source and load side disconnect switch(es) opened
- Orders the auto-booster/regulator to be tagged with an Abnormal Condition Card, if applicable

Step 3: Employee/Worker

- Verifies or places the autobooster/ regulator in the neutral position and the controller in the manual or off position

⚠ If the neutral position cannot be verified, orders will be issued to drop load by opening auto-booster/regulator source and load side disconnect switch(es) (if load break rated) or at the next up stream load break device.

DO NOT CLOSE THE AUTOBOOSTERS/REGULATOR SOURCE OR LOAD DISCONNECTS WITH THE BY-PASS SWITCH(ES) CLOSED WHEN NOT ON NEUTRAL.

- Closes the by-pass and opens the source and load side disconnect switch(es)
- Tags the device with an Abnormal Condition Card, if applicable

To restore auto-booster/regulator to service, reverse above steps as ordered by the System Operator.

De-energizing a three-phase Distribution line that could have a capacitor on-line

Overhead lines

All lines can be safely de-energized at any location by using:

- All three-phase gang operated devices
- All single-phase devices rated to break load, such as a single phase recloser or sectionalizer
- All single blade line switches when a load buster tool is used

Exception:

The District has a small number of capacitors that have been installed off the main three-phase line. All of these capacitors have 100 amp fuses protecting the line between the main line and the capacitor.
The fuses can be safely opened with a load buster tool to de-energize the line without taking the capacitor off first.

Underground lines

All lines can be safely de-energized at any location by using:

- All three-phase gang operated devices
- All underground padmount capacitors are identified on the underground prints. When a three-phase section of line needs to be de-energized and is feeding an underground capacitor the capacitor shall be taken off-line first, unless the outage is from the gang operated device. The capacitor can be taken off-line by pushing a button on the inside of the enclosure or by pulling the yellow operating handle on the side of the unit. When completed, all other switching can be done

Transmission Switching Procedures (115kV)

Line Testing

Where possible, 115kV line testing for new construction or energizing new or rebuilt station transformers should be accomplished by testing from a “clean” line (that is, a line with no stations or load) with that line on Hot Line Hold.

District Types and Ratings of 115kV Switches

“A” SWITCHES

SWITCH TYPE “A” Disconnect Switch with Standard Arcing Horns
LOAD DROPPING CAPABILITIES ARE: • Disconnecting circuit breaker(s). • Breaking one transformer’s magnetizing current. • Breaking charging currents on sections of line up to 2 miles.
LOAD PICKUP CAPABILITIES ARE: • Energize circuit breakers. • Energize one unloaded transformer. • Energize unloaded sections of line up to 2 miles.

“B” SWITCHES

SWITCH TYPE “B” High Speed Arc Restrictor Switch
LOAD DROPPING CAPABILITIES ARE: • Breaking one transformer’s magnetizing current. • Breaking charging current of lines up to 20 miles in length.
LOAD PICKUP CAPABILITIES ARE: • Crank Handle—Line and/or one unloaded transformer making parallel between two energized lines. • Swing Handle—Load up to the rating of the switch but no more than 100MW or making parallel between two energized lines. • Motor Operator—Load up to the rating of the switch or making parallel between two energized lines.

"C" SWITCHES

SWITCH TYPE "C" Loop Breaking Interrupter Switch
LOAD DROPPING CAPABILITIES ARE: • Breaking loop current in loop feeds but not for load dropping.
LOAD PICKUP CAPABILITIES ARE: • Crank Handle—Line and/or one unloaded transformer making parallel between two energized lines. • Swing Handle—Load up to the rating of the switch but no more than 100MW or making parallel between two energized lines. • Motor Operator—Load up to the rating of the switch or making parallel between two energized lines. .

"D" SWITCHES

SWITCH TYPE "D" Load Interrupter Switch
LOAD DROPPING CAPABILITIES ARE: • Breaking transformer magnetizing currents and transformer load current. • Breaking line charging currents. • Breaking loop feeds or radially-fed loaded lines up to the rating of the switch. Note: When used for transformer protection, the switch will have a fault interrupting rating.
LOAD PICKUP CAPABILITIES ARE: • Crank Handle (S&C switches or Siemens Allis Switches)—Load up to the rating of the switch, but not more than 100MW or making parallel between two or more energized lines. • Crank Handle (All other switches)—Line and/or one unloaded transformer or making parallel between two energized lines. (Not commonly found) • Swing Handle—Load up to the rating of the switch but no more than 100MW or making parallel between two energized lines. (Not commonly found) • Motor Operator—Load up to the rating of the switch or making parallel between energized lines.

“CIRCUIT BREAKER”

SWITCH TYPE “CIRCUIT BREAKER” Oil and SF6 Circuit Breakers
LOAD DROPPING CAPABILITIES ARE: • Breaking any load up to the rating of the switch.
LOAD PICKUP CAPABILITIES ARE: • Any pick-up conditions up to the rating of the circuit breaker.

To Clear a Motor-Operated Switch

The following procedures describe basic switching orders for the overhead and underground distribution systems. These procedures can be modified to fit particular circumstances.

A clearance shall not be issued on any line that has a motor-operated switch on any SCADA terminal until the following switching has been done. These switches are cleared for two basic reasons:

- Used for a clearance point.
- Cleared for maintenance.

Follow these procedures to clear a motor-operated switch.

Step 1: Employee/Worker

- Submits a completed Switching Request to the Energy Control Center (See Section A)

Step 2: System Operator

- Reviews the Switching Request and verifies the exact location.
- Verifies the electric system configuration to accommodate the request.
- Remotely opens the switch via SCADA (if applicable) or orders switch to be manually opened.
- Verify the switch is open, orders switch to be de-coupled, and the motor operator locked and tagged with a Master Safety Card.
  Note: The employee/worker will have the authority to open the DC supply to the motor operator. The employee/ worker will notify ECC prior to proceeding as an alarm may be received via SCADA.

Step 3: Employee/Worker

- Verifies the switch(es) to be open, de-couples the motor operator, locks the switch open, and tags the device with a Master Safety Card.
  Note: The employee/worker will have the authority to open the DC supply to the motor operator. The employee/ worker will notify ECC prior to opening the DC power as an alarm may be received via SCADA.
- Check for SF6 gas targets. (If it is a circuit switcher)
- Verifies with ECC that the switch has been opened, locked, decoupled, and tagged.

Step 4: System Operator

- Proceeds with the Switching Order and issues the clearance.

Step 5: Employee/Worker

- Receives clearance and proceeds to Verify, Test and Ground, if applicable.
- Completes repairs and makes the switch ready for service.
- Releases the clearance and notifies the System Operator that they removed their personal grounds, and all personnel and equipment are in the clear.

Step 6: System Operator

- Orders all cards removed on the open switch.
- Orders switch to be unlocked, recoupled and closed.

Step 7: Employee/Worker

- Verifies the switch to be open and removes all cards.
- Unlocks and re-couples the motor operator. (DC power restored) Notifies ECC.
- Verifies that the switch is closed via SCADA or manually closes the switch.
- Verifies to ECC that the switch is back to normal.

Automatic Sectionalizing Scheme

Automatic switching is installed to quickly sectionalize and restore sections of high voltage lines, and to improve service reliability to distribution substation loads. When used in conjunction with SCADA, automatic switching should assist the System Operator in determining which section(s) of line is faulted, enabling faster customer restoration.

Automatic switching is any circuit breaker, load-break, or disconnect switch that will open or close automatically in response to loss of potential (voltage) or re-energization of potential.

District Generating Facilities

Authority

The Lock Out/Tag Out (LO/TO) Coordinator shall have authority and responsibility for all generation facilities on lines and equipment up to the demarcation points listed below. Clearances will not be used on these lines or equipment. Employee protection will be provided through the LO/TO procedures in the District's Accident Prevention Manual (APM).

The System Operator shall have authority and responsibility for switching and clearances for the District's Distribution and Transmission system up to and including the demarcation point at the District's Generating Facilities. The demarcation points between the Energy Control Center (ECC) and District's Generation Facilities shall be as follows:

JHP - 115kV switches 1780, 1782, 1784 and vaults A-11121, A-11120, and A-37834.

A Terminal clearance will be issued from the System Operator to the LO/TO Coordinator from 115kV or 12kV switch as needed to provide clearance points for the LO/TO Coordinator. A Terminal clearance will be issued at the switch(es) and will be tagged with a Master Safety Card.

The LO/TO Coordinator would then proceed with the LO/TO procedures to ensure all other sources of energy are secured for employee protection. A Do Not Operate Card will also be placed at the terminal clearance.

Youngs Creek Powerhouse – PMH Switch 12-5085 at Vault A-45256

Woods Creek Powerhouse – 480v to 12kV 750kVA Pad-Mount Transformer

See schematics at end of this section outlining the dividing line between using LO/TO or the clearance procedures for employee protection. Lines and devices under ECC control are delineated in red, Generation in green.

At the request of a public official, or in emergency situations when life or property is endangered, the System Operator or Generation Operator/Constructor shall have authority to de-energize lines or equipment, in accordance to the System Operator or Generation Operator/Constructor's best judgment.

A full account of the details of such emergencies shall be called into the ECC as soon as possible and recorded in the JHP Log. The name, address, and position of the official shall be recorded in the System Operator and the JHP Logs.

Responsibility

Generation staff shall report immediately to the System Operator, and the Hydroelectric Superintendent, or their designee, any abnormal conditions or improper operations which could affect normal operation of services or equipment.

The System Operator shall issue all switching orders and clearances up to the point where control has been turned over to the LO/TO Coordinator by ECC. All switching for the high voltage energy sources 601volts A/C and above of in-plant generating equipment, as defined above, shall be planned and executed under the direction of the LO/TO Coordinator.

Obtaining a Clearance

Under ECC Authority:

Follow procedures in Section E (Clearance Procedures for District Employees) of this manual.

The Hydroelectric Superintendent, System Operator, and Power Scheduler shall determine if the equipment requested can be made available. If so, the System Operator shall advise the employee/worker and proceed with the switching process to establish the clearance if needed at the pre-arranged time.

Note: The clearance holder(s) shall be on site while work is being performed on lines/equipment under their clearance. The intent is to assure the clearance holder is monitoring the work being done under his/her clearance and safe work practices are being followed. Although the clearance holder may leave the immediate area for a few minutes, his/her primary responsibility is there at that clearance site.

If leaving the area but still on site, the clearance holder(s) must stop the work on lines/equipment under clearance or ensure communications are maintained between the clearance holder and those working under the clearance.

Should it become necessary for the clearance holder to leave the jobsite, see Section E, “Conditions and requirements for Releasing a Clearance.”

Establishing LO/TO

Establishing LO/TO: See Accident Prevention Manual (APM)

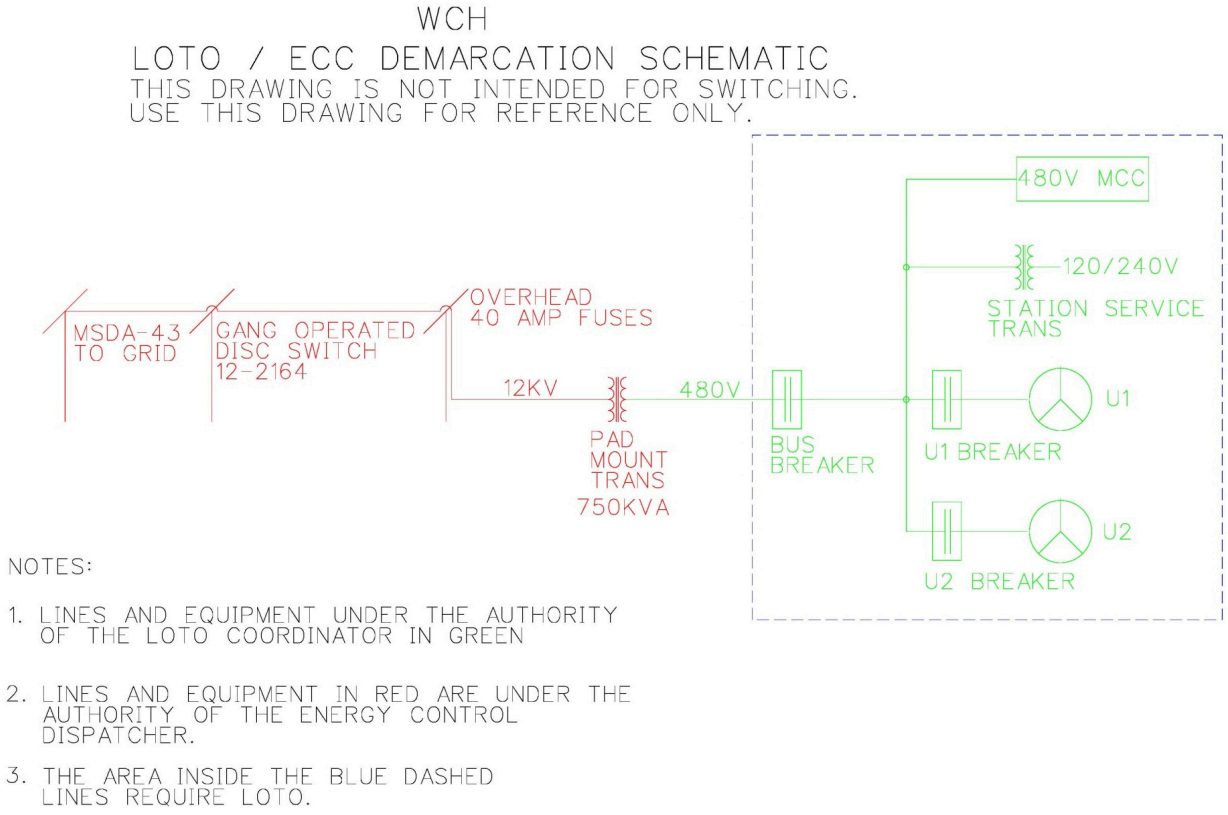
Contractors Working on Generation Facilities

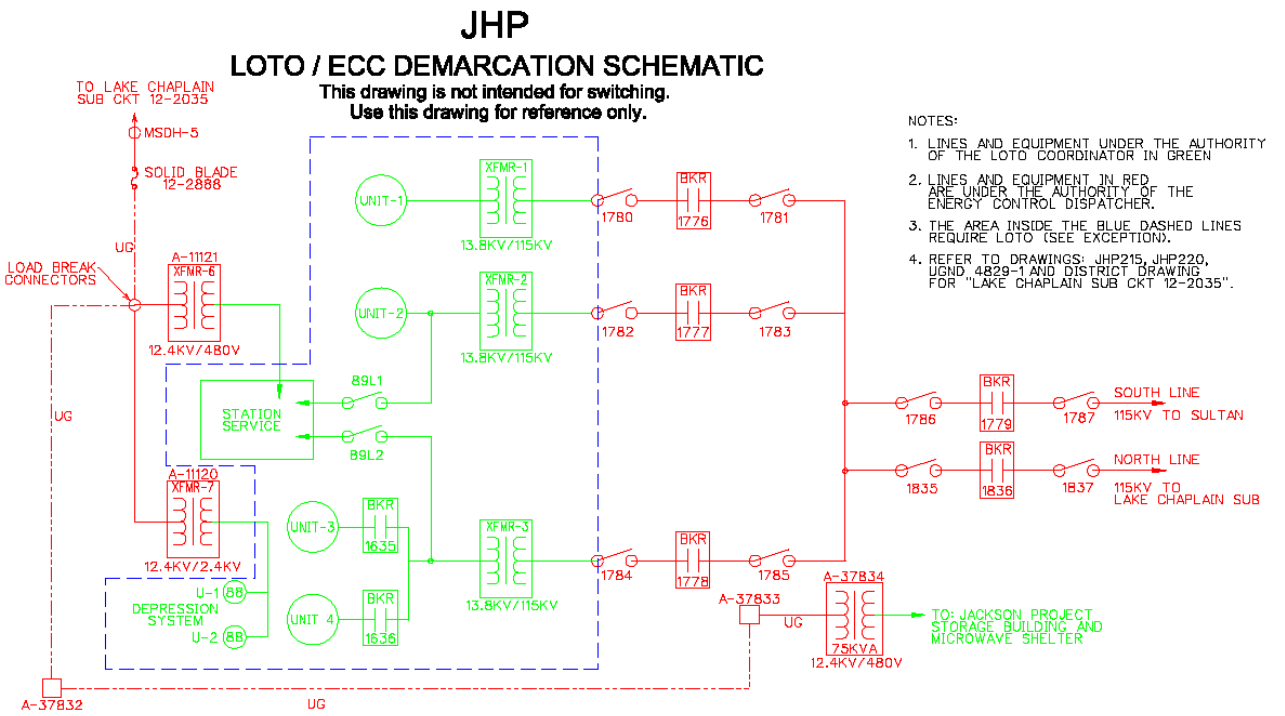
Upon completion of the annual Switching and Clearance and/or LO/TO procedure review and test, contractors shall follow the same procedures as District employee(s).

New Construction

When new construction becomes part of the electric system, the clearance and LO/TO procedures shall be required when work is completed to a point where it is tied into existing transmission or distribution components.

Grounds may be installed on new construction without a clearance, provided it does not meet any of the above conditions.

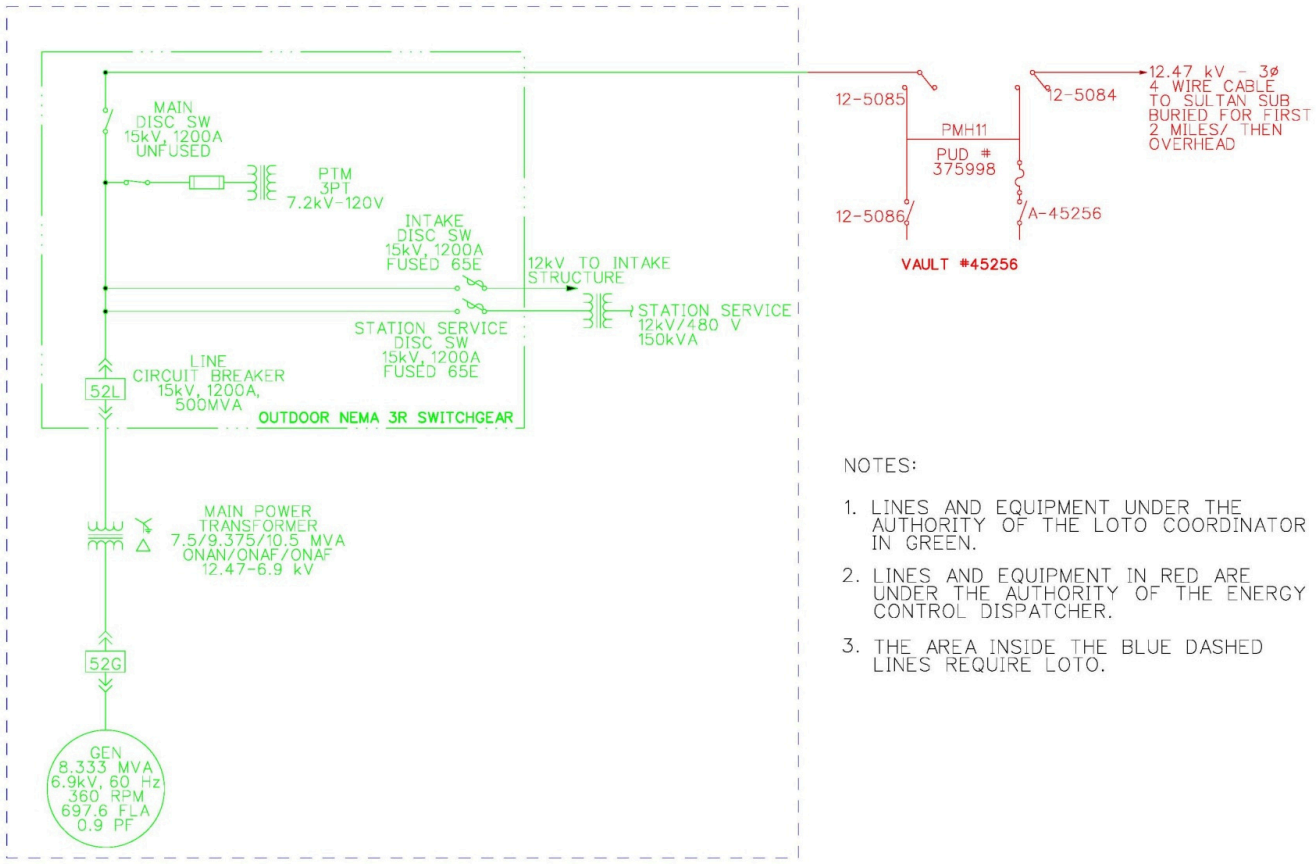



JHP
LOTO / ECC DEMARCATION SCHEMATIC
This drawing is not intended for switching.
Use this drawing for reference only.
TO LAKE CHAPLAIN SUB CKT 12-2035
MSDH-5
SOLID BLADE 12-2888
UG
LOAD BREAK CONNECTORS
A-11121
XFMR-6
12.4KV/480V
UG
STATION SERVICE
89L1
89L2
A-11120
XFMR-7
12.4KV/2.4KV
DEPRESSION SYSTEM
U-1
U-2
88
UNIT-1
UNIT-2
UNIT-3
UNIT 4
XFMR-1
XFMR-2
XFMR-3
13.8KV/115KV
BKR
1635
1636
1776
1777
1778
1779
1780
1781
1782
1783
1784
1785
1786
1787
1835
1836
1837
SOUTH LINE
115KV TO SULTAN
NORTH LINE
115KV TO LAKE CHAPLAIN SUB
A-37832
UG
A-37833
A-37834
75KVA
12.4KV/480V
TO: JACKSON PROJECT STORAGE BUILDING AND MICROWAVE SHELTER
NOTES:
1. LINES AND EQUIPMENT UNDER THE AUTHORITY OF THE LOTO COORDINATOR IN GREEN
2. LINES AND EQUIPMENT IN RED ARE UNDER THE AUTHORITY OF THE ENERGY CONTROL DISPATCHER.
3. THE AREA INSIDE THE BLUE DASHED LINES REQUIRE LOTO (SEE EXCEPTION).
4. REFER TO DRAWINGS: JHP215, JHP220, UGND 4829-1 AND DISTRICT DRAWING FOR "LAKE CHAPLAIN SUB CKT 12-2035".

YCH

LOTO / ECC DEMARCATION SCHEMATIC

THIS DRAWING IS NOT INTENDED FOR SWITCHING.
USE THIS DRAWING FOR REFERENCE ONLY.



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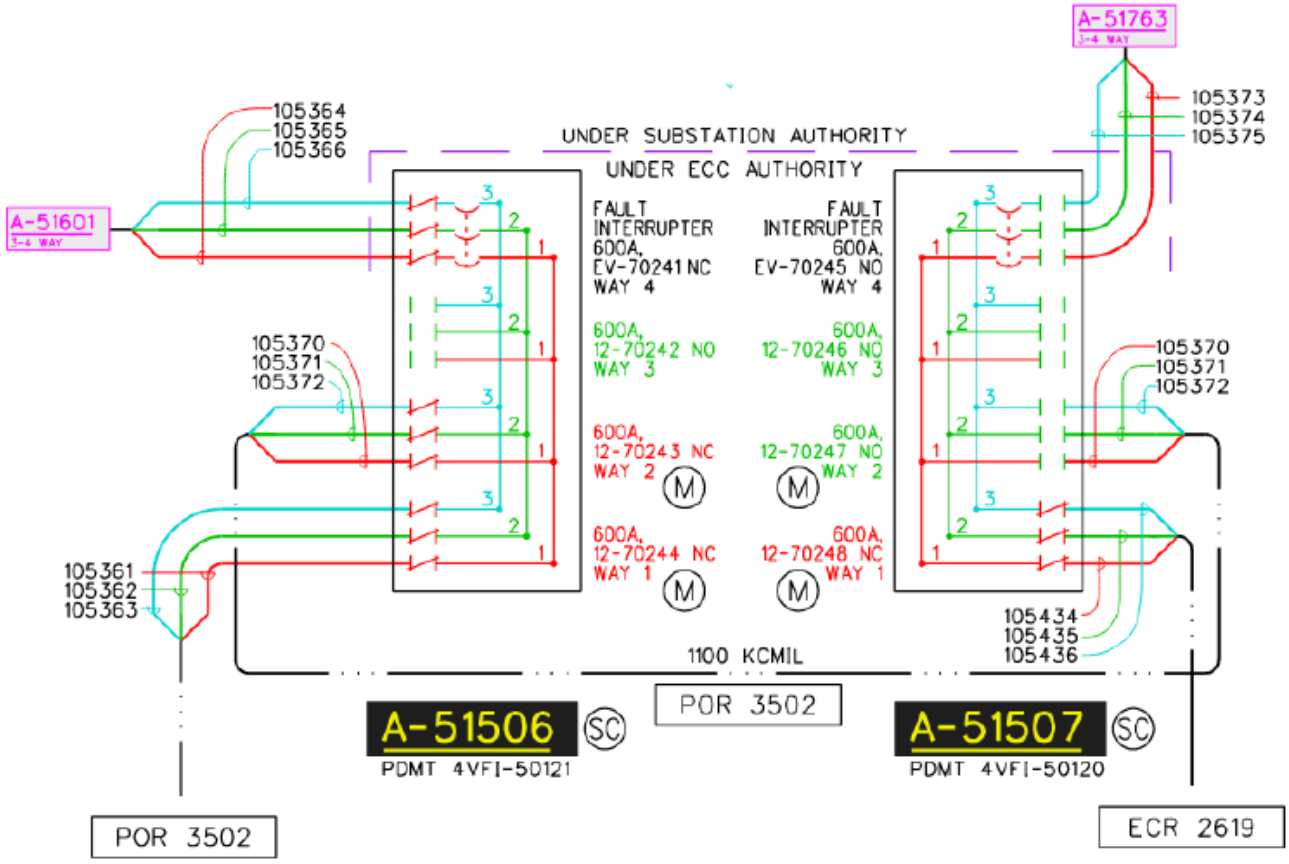
3. THE AREA INSIDE THE BLUE DASHED LINES REQUIRE LOTO.

Arlington Microgrid



Multiple Clearance/Step and Touch Potential (115kV)

Topic: Analysis to determine step potential levels due to mutual coupling of a de-energized District 115kV circuit with parallel energized circuits

Background

The Clearance Committee has asked about induced voltages in a de-energized 115kV overhead line due to mutual coupling with parallel 115kV, 230kV or 500kV lines of the District or other utilities in a corridor. The most commonly encountered levels on the District's system would be generated by a District double 115kV circuit with one circuit carrying load and the other de-energized and grounded. Analysis was conducted to determine these mutually induced voltage levels in a double circuit configuration during high load conditions on a 115kV line that is parallel to a de-energized grounded line.

Induced voltages are dependent upon current levels, inter-phase spacing, coupling distance and intercircuit spacing. Because of the number of variables and the wide range of values within each variable, this analysis did not attempt to cover all possibilities. In order to assess other field conditions, two extreme examples were evaluated in addition to the double circuit configuration.

The committee was concerned about the level of ground potential rise (GPR) on ground rods that is created as a result of linemen installing single-point grounds at two separate points within a clearance. There is a concern that this could lead to dangerous step potential levels for personnel on the ground.

Assumptions

An analysis was completed to determine the step potential due to GPR in the zone between ground rods tied to single-point grounds. The analysis considered a de-energized 115kV line on the same pole line with another 115kV line during high load conditions. During this situation, a voltage is induced upon the de-energized 115kV conductors due to the flux generated by the load current and the mutual coupling between the two 115kV lines.

The induced voltage level on the de-energized conductors is dependent upon several factors. These include separation between conductors and circuits, magnitude of load current, and line length of parallel operation. For separation between conductors and circuits, this analysis assumed the worst case – maximum spacing between individual energized 115kV phase conductors and one single conductor of the de-energized 115kV circuit. A maximum load current on our 115kV system was used to again obtain the worst case results. The table below shows voltage levels for parallel distances of one, two and four miles between ground rods.

Earth resistivity (ρ) is a factor that affects the effective resistance to earth of a ground rod and the actual circulating current between ground rods. The value of ρ can vary significantly from place to place and is rather

difficult to ascertain. The common range of values is from 10 to 1000 meter-ohms with most studies using a value of 100 meter-ohms. This analysis used 10, 100 and 1000 meter-ohms with 1000 meter-ohms yielding the highest calculated ground path resistance and lowest ground circulating current, yet not affecting the step potential. Resistivity has more effect on induced voltages in the case of imbalanced currents on the energized circuit.

Results

Table 1 lists the results of the step potential analysis on a de-energized 115kV line that runs parallel to another District 115kV line:

Load Current	Earth Resistivity (ρ)	Distance Between Grounds	Maximum Step Potential
1000 amps	10 meter-ohms	2 miles	65.0 V
1000 amps	100 meter-ohms	2 miles	65.0 V
1000 amps	1000 meter-ohms	2 miles	65.0 V
1000 amps	10 meter-ohms	3 miles	97.6 V
1000 amps	100 meter-ohms	3 miles	97.6 V
1000 amps	1000 meter-ohms	3 miles	97.6 V
1000 amps	10 meter-ohms	4 miles	130.1 V
1000 amps	100 meter-ohms	4 miles	130.1 V
1000 amps	1000 meter-ohms	4 miles	130.1 V

Table 1: Step Potential Levels for Double Circuit 115kV w/ Multiple Single Point Grounds

Notes:

1. The step potential levels assume a step distance of 1 meter (39.37 inches).
2. The maximum step potential was from the ground rod to the earth one meter away.

A similar analysis was completed to determine the step potential at a ground rod due to mutual coupling voltages induced on a de-energized circuit under the following conditions: two miles between ground rods of parallel construction along a 500kV line (using BPA construction standard M17 with a GMD of 41.92 feet) with 3000 amps flowing and 48 feet of space between the nearest energized and deenergized conductors. The step potential voltage calculated under these conditions is 364 volts. When the parallel distance is reduced to ½ mile, the step potential level is reduced to 91V.

Another analysis was completed under the following conditions: two miles between ground rods of parallel construction along a 230kV (using BPA construction standard J9 with a GMD of 33.14 feet) line with 2000 amps flowing and 48 feet of space between the nearest energized and de-energized conductors. The step potential voltage calculated under these conditions is 322 volts. When the parallel distance is reduced to ½ mile, the step potential level is reduced to 81V.

Discussion

At some of the ground rod separations listed above, the resultant step potentials exceed the acceptable level and may present a danger to District personnel or the public. The District's acceptable level for step potential voltage has been adopted from BPA standards and is 100V. Based upon the cases analyzed above, it is recommended that the following rules be implemented by the District:

- Multiple clearances shall not be issued on a District 115kV line when the section of line between personal protective grounds is running parallel (in a transmission corridor) from another District energized 115kV line for more than 15,840 feet (3 miles).
- Multiple clearances shall not be issued on a District 115kV line when the section of line between personal protective grounds is running parallel (in a transmission corridor) to another utility's line energized at 115kV or above for more than 2,640 feet (1/2 mile).

These rules have been developed using extreme loading on energized lines. In all other cases, the actual voltages encountered will be less than those listed above.

Guidelines for Responding to Downed Power Lines Revised on June, 2007

The following are guidelines for District qualified electrical workers when responding to downed power lines. Because each situation may be different, these are only general guidelines. The District will rely on the discretion of our qualified electrical workers at the site to take the necessary precautions to make the site safe from being re-energized from the District's electrical system. These guidelines also provide direction for trained District assessors when needed to perform a field assessment during major emergency/ storm conditions.

Guidelines for a qualified electrical worker responding to an accident site, such as a carpole accident or a person making accidental contact with District power lines.

1. Notify ECC of situation.
2. Advise lead emergency personnel and the public if on site, of the status of the line and request them to stay clear until told it has been made safe.
3. If the line has not been de-energized by the District's automatic protection system, (i.e. fuses, switches or breakers) obtain authorization from ECC to open and de-energize line.
4. If no one is on site and the employee needs to leave to de-energize line, leave a visual warning (i.e. flares, cones or danger tape) in place to alert public of the hazard.
5. If the situation at the scene is life threatening, the worker should cut down the wire to allow emergency access to the site of the accident, if it can be done safely. If it is not safe to cut wire and the energized line needs to be de-energized immediately, contact ECC and request the line to be de-energized via SCADA. Then clear the downed wires to allow emergency personnel to reach the injured.

Guidelines for a qualified electrical worker responding to or discovering a downed wire under emergency/storm conditions.

1. Notify ECC of situation.
2. If the line has not been de-energized by the District's automatic protection system, (i.e. fuses, switches, or breakers) obtain authorization from ECC to open and de-energize line.
3. Advise lead emergency personnel and the public if on site of the status of the line and request them to stay clear until told it has been made safe.
4. If no one is on site and the electrical worker needs to leave to de-energize line, leave a visual warning (i.e. flares, cones or danger tape) in place to alert public of the hazard.
5. After the line has been de-energized, cut the line(s) at a point that it will remove hazards to the public from the source of the District's electrical system. If the load side of the line is down in roads, driveways, or areas likely to have exposure to the public cut the wire down if the work can be done safely.
6. If the line cannot be cut down safely and the location has a reasonable chance of exposure to the public, call and report to ECC. ECC will issue a tag at the open cutout or device that protects the downed section of line from being re-energized by the District. After completing the above, if emergency services are on site, give them the status so they can determine if it is OK for them to leave and call ECC/Storm Center and report situation.

Guidelines for a qualified electrical worker responding to or discovering a downed wire during routine work or an isolated call out.

1. Follow steps 1 through 5 in the above section.
2. If the line can not be cut down safely and the location has a reasonable chance of exposure to the public, call and report to ECC. ECC will issue a tag at the open cutout or device that protects the downed section of line from being re-energized by the District. After completing the above steps, if emergency services are on site, go ahead and give them OK to leave and call ECC and report situation. The qualified worker will then provide a visual warning (i.e. flares, cones, or danger tape) around the wire as reasonably possible before leaving the site.

Guidelines for a trained District assessor discovering a downed power line while performing a field assessment of system damage under emergency/storm conditions.

1. If you encounter downed wires of ANY type, stay a minimum of 15 feet away. Consider ALL WIRES ARE HOT.
2. Do not Drive over wires!
3. Report back to the Storm Center if you discover wires are arcing or if the switch(s) is closed, and the Storm Center manager will inform the ECC superintendent. You will be required to stay and protect the site until ECC can dispatch a qualified electrical worker to de-energize the line.
4. If the switch(s) is open, and the line in NOT on the road blocking traffic and does not appear to have high exposure to the public, report to storm center and then keep moving on to complete the assessment. On two and three phase lines, all switches feeding the lines must be OPEN.
5. If police or fire personnel are encountered standing by downed wires, report the situation back to the Storm Center and standby. The Storm Center will determine if you must stay and will ask you to advise the police or fire personnel of the situation so they can determine if they can leave. ONLY police and fire department personnel can decide if they stay or leave the site. If you are asked to stay, a qualified electrical worker will be sent to the location to clear the problem.

Communication/Work Guidelines for Crews Working Together During Emergencies

A tree crew working under the direction/clearance of the line crew foreman may perform work on the same line section, remote from the line crew foreman, under the following conditions:

1. The line crew foreman and tree crew foreman/lead shall patrol the areas to be worked together. The line crew foreman shall take the necessary steps to ensure the area(s) is safe for the tree crew to work. The line crew may leave the tree crew and work at a different location on the same line section once the area is determined safe for the tree crew to perform their work.
    - If there is structural damage to the system that makes it unsafe for the tree crew to perform the work, the line crew shall cut the line(s) down to isolate the work area from the system before the tree crew can proceed.
    - If the position of the trees is such that the tree crew can safely perform the work as if the line is energized, they can proceed after setting up a communication link with line foreman.
2. The two foremen shall have a method of communication between crews (i.e. radio/cell phone) and shall contact each other to ensure they have a communication link before starting work at their respective work sites. The two crews can then proceed with the work. One of the crew guides can take a radio and go with the tree crew or both can stay with the line crew.

Super crews consisting of two or more line crews may perform work under the following conditions:

1. The crews shall be assigned work in the same line section and one of the crew foremen shall serve as the lead foreman. That foreman shall be responsible for all switching and clearances needed for the work and for providing the overall job briefing to the crews. The lead foreman shall have communication established with each foreman before work begins on the lines or equipment. The means for communication can be radios or cell phones. The other crew foreman can take a clearance on the same line section as the lead foreman if needed.

Crew Guides shall be issued two District radios to allow a guide the ability to leave the work site for short periods of time when a personal break is needed. One crew guide and their radio shall stay with the lead crew foreman unless all work is stopped.

Revised 7/02/07

Appendix II - Glossary

AMMETER

An indicating device that shows the amount of current flow on a particular piece of equipment such as a breaker or transformer. There are two types of indicating ammeters: instantaneous reading and maximum demand reading.

ARCING HORN

An additional length of smaller conductor connected to the end of a solid blade switch to protect the end of the disconnect from pitting when opening and closing.

AUTO-BOOSTER

A single-phase line voltage regulating auto-transformer. The four-step regulators (5% or 10%) can only raise or lower the load voltage, dependent on their connection.

AUTOMATIC TRANSFER SCHEME

A switch or set of switches that automatically operate the transmission or distribution system according to input received from potential-sensing devices on the line or station bus.

BREAKER FAILURE RELAY

A relay that is used as back up protection if a breaker fails to operate to clear a fault.

BUSHING, FEED THROUGH

A device used on the underground distribution system to connect two elbows for the purpose of feeding primary current through them; or, the connection of a separate ground source to a de-energized conductor.

BUSHING, PARKING

An insulating device used on the underground distribution system to isolate an elbow so that no current can flow through it.

BUS, MAIN

The principal group of conductors (usually rigid) that serves as a common connection between two or more circuits in a substation, interconnecting equipment of the same voltage.

BUS TIE SWITCH

A switch that separates two sections of a bus, for example, the two main buses of a two-bank station.

BUS TIE BREAKER

A breaker that separates two sections of a bus, for example, the two main buses of a two-bank station.

BUS, TRANSFER

A group of conductors (usually rigid) that serves as an alternate connection between two or more circuits in a substation. Used when transferring load between two circuits, it can be energized only when a circuit breaker or set of transfer disconnects is closed.

BUS TRANSFER SWITCH OR DISCONNECT

A switch or disconnect that transfers load to a different source through the transfer bus.

BYPASS DISCONNECT

A set of disconnects used to parallel the current around a device such as a regulator, sectionalizer, or recloser. The device can then be opened without dropping load current or load.

CAPACITOR BANK

A set of capacitors connected to the primary line or station bus to improve the system power factor or voltage.

CAPACITOR DISCONNECT

A solid blade, non-load interrupting device used to isolate a capacitor bank after the current has been interrupted by a load interrupting device.

CAPACITOR FUSE

A protective device that operates during overcurrents and fault situations within a capacitor bank. They may be used as the isolating point for the capacitor bank if no capacitor disconnects are available.

CHARGING CURRENT

The amount of current that flows into a line, cable, or piece of electrical equipment that is energized, but has no load connection.

CIRCUIT BREAKER

A switching device that can interrupt a circuit in a power system under over-load or fault (short circuit) conditions, usually automatically tripped by protective relays. The circuit breaker can also be operated by SCADA or local control to interrupt normal load currents.

CIRCUIT BREAKER, MAIN

The circuit breaker and associated disconnects between the low side of a substation transformer and the main bus.

CIRCUIT SWITCHER

A motor-operated SF6-filled transmission switch with load and fault interrupting capability. The disconnects open automatically after the load or fault current has been interrupted in the SF6.

CLEARANCE

“The certification by the proper authority that a specified line, cable or station is de-energized, that the proper precautionary measures have been taken and the line, cable or station is being turned over to the employee/worker.” Formal, recorded permission by the System Operator for the employee/worker(s) to work on a particular line, cable or station that has been identified, isolated, de-energized, and tagged with a Master Safety Card(s).

CLEARANCE, FIELD

A procedure that allows employee/workers to establish clearance(s) on lines, cables or stations not under the control of the Energy Control Center.

CLEARANCE POINT

A primary device under the control of the ECC that shall be cleared and tagged for an employee/worker.

CLEARANCE, POINT OF

A point to allow the employee/worker to establish a Field Clearance when the end of the line is not under the control of the ECC.

CLEARANCE, TERMINAL

The procedure whereby a switch or terminal is cleared and tagged for a foreign utility Dispatcher or District Generation LO/TO Coordinator. For example: A District generation facility wishes to work on a section of their line that is fed by the District. The District employee/worker will be requested to open the source switch and tag for the Generation LO/TO Coordinator with a Master Safety Card(s).

CLEARED

A term referring to lines, equipment or stations which have been de-energized by providing visible air breaks to all possible sources of feed. Must be treated as energized until a clearance has been issued.

CREW (SUBSTATION OR LINE)

Two or more electrical workers assembled to construct, maintain, or repair lines, cables or stations.

CURRENT LIMITING FUSE

A fuse that, when melted by current within its current limiting range, produces a high resistance, which reduces the current's magnitude and duration.

CURRENT TRANSFORMERS (CT)

A transformer used to step down current values to an amount suitable for use in metering and relays.

CVR (CONSERVATION VOLTAGE REDUCTION)

Lowered tap changer control voltages to achieve lower power consumption.

DEAD FRONT

A piece of electrical equipment with no exposed energized parts or conductors over 600 volts.

DE-COUPLED LINKAGE

To disconnect the operating mechanism and motor from the operating linkage of a motor-operated switch, preventing the inadvertent operation of the switch.

DE-ENERGIZED (NO LOAD) TAP CHANGER

A device for changing the taps of an apparatus only when the apparatus is de-energized.

DIFFERENTIAL RELAY

A protective relay that measures the current flowing into and out of a transformer or bus section. When the currents are not matched, or not within certain parameters, the relay will operate to isolate the device.

DIRECTIONAL RELAY

A protective relay (overcurrent, ground, and distance) that allows for the opening of the protected device only when the over-current is flowing in a pre-determined direction.

DISCONNECT SWITCH

A mechanism used to open or close a circuit. Disconnect switches can be manual or motor-operated.

Types of disconnect switches:

- Load or Line Disconnects—The disconnects to the load or line side of a switch or device.
- Source Disconnects—The disconnects to the source side of a switch or device.

DISTANCE RELAY (IMPEDANCE OR ZONE)

A relay used exclusively on the transmission system that operates for phase-to-phase faults, due to the change in impedance of a line during fault conditions. It is directionally controlled and can have up to three zones of protection.

ELBOW, LOAD BREAK

A connecting point on the underground distribution system between the primary cable and a piece of equipment that can be operated under normal load.

ELBOW, NON-LOAD BREAK/ DEAD BREAK

A connecting point on the underground distribution system between the primary cable and a piece of equipment that cannot be operated under load.

EMPLOYEE/ WORKER

An employee/worker who is familiar with the construction and operation of lines and/or equipment that concerns his/her position and who is fully aware of the hazards connected therewith; or, one who has passed a journey status examination for the particular branch of the electrical trades with which he/she may be connected.

FAULT

- A short circuit between conductors or between conductors and ground which can cause an abnormal current flow.
- The breaking of conductors or the point of failure which causes an outage on a line, piece of equipment, or station.

FAULT INDICATOR

A device on the electrical system that shows if fault current has flowed through a given point.

FEEDER

A three-phase primary line that supplies the distribution load from the substation to the transformers. Feeders normally have alternate sources from other distribution substations.

FEEDER TIE

A normally open switch usually outside the substation that separates two feeders, for example, two feeders from different substation banks.

FEED THROUGH BUSHING

A device used on the underground distribution system to connect two elbows for the purpose of feeding primary current through them; or, the connection of a separate ground source to a de-energized conductor.

FIELD CLEARANCE

A procedure that allows employee/workers to establish clearance(s) on lines, cables or stations not under the control of the Energy Control Center.

FOREIGN UTILITY

A utility that has inter-tie capabilities with the District’s electric system.

FUSE, CURRENT LIMITING

A fuse that, when melted by current within it’s current limiting range, produces a high resistance, which reduces the current’s magnitude and duration.

FUSE DISCONNECT

A disconnect with a fusible element that opens when a predetermined amount of load or fault current passes through it and can also be opened manually under normal load conditions.

FUSE, HIGH-SIDE

An individual phase overcurrent or fault current protective device on the high voltage side of a distribution substation transformer.

GANG OPERATED SWITCH

A three-phase switch operated by a handle. All three phases are connected by a common linkage, and open or close simultaneously.

GET-AWAY SWITCH

The three-phase primary feed from a substation circuit breaker out of the substation to the first point of disconnection (get-away switch) from the power system. “Get-away” switches can be overhead line disconnects or underground padmount switches.

GROUND

A conducting connection whether intentional or accidental, between an electric circuit or equipment and the earth, or to some conducting body that serves in place of the earth.

GROUND OVERCURRENT RELAY

A protective relay that responds primarily to system neutral or ground faults. This relay can also detect large unbalanced load currents on a three-phase system.

GROUND, PERSONAL PROTECTIVE

Temporary protective grounds placed on a line, cable, or equipment to prevent each employee/worker from being exposed to hazardous differences in electrical potential.

GROUND SWITCH

A permanently mounted switch on a line, capacitor, or a piece of equipment that, when closed, grounds the device. Ground switches are to be closed only after all means of energization have been opened and isolated.

HIGH-SIDE FUSE

An individual phase overcurrent or fault current protective device on the high voltage side of a distribution substation transformer.

HIGH-SIDE SWITCH

A manually operated visible air break switch on the high voltage side of a station transformer, with arcing horns to drop the bank charging currents.

HOT LINE HOLD

A safety tag issued to the foreman in charge when working on energized distribution lines. When Hot Line Hold is enabled, breakers and/or reclosers upstream of the work location are set to non-reclose and instantaneous trip.

HOT LOG

A written log used and maintained by the System Operator to document any switching and clearance steps not performed on a switching order.

INRUSH CURRENT

A short duration, large value current required to initially magnetize the core of a transformer.

INSULATOR

A non-conductive support for a conductor. It inhibits the flow of current from the conductor to earth or to another conductor.

J-BOX

A junction device on the underground distribution system that connects multiple elbows so that primary current can flow through them.

LATERAL

A circuit with one source of feed which can be one, two or three phase.

LIGHTNING ARRESTOR

A device designed to protect electric equipment from high transient voltage by diverting to earth a momentary high voltage surge. Usually found on substation transformers on the high and low sides, and on underground cable terminations.

LIVE FRONT

A piece of electrical equipment with exposed parts or conductors energized over 600 Volts.

LOAD BREAK ELBOW

A connecting point on the underground distribution system between the primary cable and a piece of equipment that can be operated under normal load.

LOAD BUST TOOL

A tool for opening disconnects under normal load conditions. The disconnect(s) must be equipped with hooks to accommodate this tool.

LOAD INTERRUPTER

A switching device that can be opened under normal load conditions. It can safely interrupt current up to its nameplate rating.

LOAD TAP CHANGING TRANSFORMER (LTC)

A station transformer that, under load, can vary the output windings of the secondary for voltage control. The tap changing compartment is part of the entire transformer enclosure,and shall not be taken out of service until all load has been transferred from the transformer, and the transformer has been de-energized.

LOCAL/REMOTE SWITCH

A switch at the device used to enable or disable supervisory control.

LOCKOUT (BREAKER)

The final cycle of a station circuit breaker, line recloser, sectionalizer, etc., that opens and remains open during a fault after going through its predetermined operations.

LOCKOUT RELAY (86 DEVICE)

A device that shuts down or holds equipment out of service when abnormal conditions occur. Substation/Generation employee/worker shall manually reset it before the equipment can be placed back in service.

LOCKOUT/ TAGOUT (LO/TO)

A procedure of installing cards and locks used to provide employee/workers safety by isolating a stored energy source.

LOOP FEED

A line that can be fed from more than one source. Can consist of one, two, or three phases.

MAIN BUS

The principal group of conductors (usually rigid) that serves as a common connection between two or more circuits in a substation, interconnecting equipment of the same voltage.

MAIN CIRCUIT BREAKER

The circuit breaker and associated disconnects between the low side of a substation transformer and the main bus.

MOTOR OPERATED SWITCH

A switch that is opened and closed by an electric motor.

NEUTRAL POSITION (VOLTAGE CONTROL DEVICE)

The point on a voltage regulator, LTC, or auto-booster where no difference in voltage exists between the load and source sides. This is the only position in which a voltage regulating device shall be bypassed while it is energized.

NEUTRAL REACTOR

A large coil connected between the neutral bushing of a wye-connected substation transformer and ground. It limits the amount of fault current that flows through the transformer when a close-in ground fault occurs.

NON-LOAD BREAK ELBOW

A connecting point on the underground distribution system between the primary cable and a piece of equipment that cannot be operated under load.

PARALLEL

Two or more lines running side by side for a distance.

PARALLELING

Two or more lines or pieces of equipment that are connected to the same bus or load.

PARKING BUSHING

An insulating device used on the underground distribution system to isolate an elbow so that no current can flow through it.

PERSONAL PROTECTIVE GROUND

Temporary protective grounds placed on a line, cable or equipment to prevent each employee/worker from being exposed to hazardous differences in electrical potential.

PHASE OVERCURRENT RELAY

A protective relay that operates when the current through it is equal to or greater than its setting. Overcurrent relays are usually a combination of instantaneous and time delay units.

POTENTIAL TRANSFORMER (PT)

A transformer used to step down primary voltage to a low voltage (usually 120) for use in metering and relays.

POWER TRANSFORMER

A transformer used to change the voltage level for power transmission or distribution. A step-up transformer increases the voltage; a step down transformer decreases the voltage.

PRIMARY DISTRIBUTION VOLTAGE

The voltage at which electricity is delivered from the distribution substation to the consumer's transformer. The District's primary distribution voltage is typically 12kV.

QUALIFIED PERSON, QUALIFIED EMPLOYEE OR QUALIFIED SUPERVISOR

An employee/worker or supervisor who is familiar with the construction and operation of lines and/or equipment that concerns his/her position and who is fully aware of the hazards connected therewith, or, one who has passed a journey status examination for the particular branch of the electrical trades with which he/she may be connected.

RADIAL

A line fed from one direction, with no other means of tying to another source. The line can be one, two, or three phase.

RECLOSER

An automatic load or fault interrupter that opens when a predetermined amount of current flows, and can be set to reclose a number of times to test the line. If the fault or overload still exists after attempting the preset number of recloses, the recloser will stay open until it has been manually reset. This device can be single or three phase.

RECLOSING OR NON-RECLOSING CUTOUT SWITCH

A switch that opens the reclosing circuit and prevents a circuit breaker or recloser from going through its automatic reclose cycle.

RECLOSING RELAY

A programming relay that will automatically reclose a Circuit Breaker after it has tripped open. The relay can be set to reclose the breaker multiple times. If the fault or overload still exists after attempting the preset number of recloses, the relay will lock open and block further automatic attempts to reclose.

RELAY, BREAKER FAILURE

A relay that is used as back up protection if a breaker fails to operate to clear a fault.

RELAY, DIFFERENTIAL

A protective relay that measures the current flowing into and out of a transformer or bus section. When the currents are not matched, or not within certain parameters, the relay will operate to isolate the device.

RELAY, DIRECTIONAL

A protective relay (overcurrent, ground, and distance) that will allow for the opening of the protected device only when the over-current is flowing in a pre-determined direction.

RELAY, DISTANCE (IMPEDANCE OR ZONE)

A relay used exclusively on the transmission system that operates for phase-to-phase faults, due to the change in impedance of a line during fault conditions. It is directionally controlled and can have up to three zones of protection.

RELAY, GROUND OVERCURRENT

A protective relay that responds primarily to system neutral or ground faults. This relay can also detect large unbalanced load currents on a three-phase system.

RELAY, LOCKOUT (86 DEVICE)

A device that shuts down or holds equipment out of service when abnormal conditions occur. Substation/Jackson employee/worker shall manually reset it before the equipment can be placed back in service.

RELAY, PHASE OVERCURRENT

A protective relay that operates when the current through it is equal to or greater than its setting. Overcurrent relays are usually a combination of instantaneous and time delay units.

RELAY, RECLOSING

A programming relay that will automatically reclose a Circuit Breaker after it has tripped open. The relay can be set to reclose the breaker multiple times. If the fault or overload still exists after attempting the preset number of recloses, the relay will lock open and block further automatic attempts to reclose.

RELAY, UNDERFREQUENCY

A relay that operates at a preset frequency value; usually associated with load shedding schemes to maintain system frequency.

SCADA

(Supervisory Control and Data Acquisition) A computer system that the System Operators use to remotely monitor and control the power distribution throughout the service area. SCADA also provides for the remote monitoring and control of the Jackson Hydroelectric Project and SCADA data (i.e. System load) that is used by others within the District such as power scheduling and system planning.

SECONDARY VOLTAGE

The voltage that PUD supplies to the consumer from the low voltage side of the distribution transformer, usually in the range of 120 volts to 480 volts.

SECTIONALIZE

To divide lines, cables, or substation bus into sections.

SECTIONALIZER

A fault isolating device that shall be used with an automatic line recloser or circuit breaker. The sectionalizer opens on a de-energized line after counting a predetermined number of overcurrent interruptions on the source protective device. Sectionalizers do not have fault interrupting capability, but can interrupt load up to their continuous current rating. This device can be single or three phase.

SOLID BLADE DISCONNECT

A manual unfused device that opens or closes a circuit.

STACKED ELBOWS (HAMMERHEADS)

A connection point on the primary underground distribution system. Stacked elbows shall be de-energized to be separated. (See Elbow, Non-Load Break/Dead Break.)

STATION SERVICE TRANSFORMER

A distribution transformer used within a substation to step down primary voltage to 120 or 240 volts for station lighting, battery chargers, etc.

SUPERVISORY CONTROL (SCADA)

The ability to operate a device from a remote location such as the Energy Control Center. (See SCADA.)

SURGE ARRESTOR

A device designed to protect electric equipment from high-transient voltage by diverting to earth a momentary high-voltage surge. Usually found on substation transformers on the high and low sides, and on underground cable terminations.

SWITCH

A device for making or breaking an electric circuit.

SWITCH CABINET

A switching and/or isolating point on the underground primary distribution system. Switch cabinets may contain manually operated disconnects (single blade or gang operated), fusible elements, or any combination of both.

SWITCH, GANG-OPERATED

A three-phase switch operated by a handle. All three phases are connected by a common linkage, and open or close simultaneously.

SWITCH, GROUND

A permanently mounted switch on a line, capacitor, or a piece of equipment that, when closed, grounds the device. Ground switches are to be closed only after all means of energization have been opened and isolated.

SWITCH, HIGH-SIDE

A manually operated visible air break switch on the high voltage side of a station transformer, with arcing horns to drop the bank charging currents.

SWITCHING ORDERS

Detailed instructions to perform switching operations in a specific sequence.

SWITCHING SETTINGS

Alternate tap changer adjustments used when the distribution system is in an abnormal configuration.

SWITCH, LOCAL/REMOTE

A switch at the device used to enable or disable supervisory control.

SYSTEM OPERATOR

An employee/worker who has authority over switching and clearances on lines, cables, stations and equipment for the District's electric system.

TARGETS (EQUIPMENT)

A visual display that indicates the status of a device.

TERMINAL CLEARANCE

The procedure whereby a switch or terminal is cleared and tagged for a Foreign Utility Dispatcher. (For example: A generation facility wishes to work on a section of their line that is fed by the District. The District employee/worker will be requested to open the source switch and tag for the Foreign Utility Dispatcher with a Master Safety Card.)

TRANSFER BUS

A group of conductors (usually rigid) that serves as an alternate connection between two or more circuits in a substation. Used when transferring load between two circuits; it can be energized only when a circuit breaker or set of transfer disconnects is closed.

TRANSFORMER, LOAD TAP CHANGING (LTC)

A station transformer that, under load, can vary the output windings of the secondary for voltage control. The tap changing compartment is part of the entire transformer enclosure, and shall not be taken out of service until all load has been transferred from the transformer, and the transformer has been de-energized.

TRANSFORMER BANK DISCONNECT OR "MAIN" BREAKER

The isolating point on the distribution side of a substation transformer, between the transformer and the main bus.

TRANSFORMER, POTENTIAL (PT)

A transformer used to step down primary voltage to low voltage (usually 120) for use in metering and relays.

TRANSFORMER, POWER

A transformer used to change the voltage level for power transmission or distribution. A step-up transformer increases the voltage; a step down transformer decreases the voltage.

TRANSFORMERS, CURRENT (CT)

A transformer used to step down current values to an amount suitable for use in metering and relays.

TRANSFORMER, STATION SERVICE

A distribution transformer used within a substation to step down primary voltage to 120 or 240 volts for station lighting, battery chargers, etc.

UNDERFREQUENCY RELAY

A relay that operates at a preset frequency value; usually associated with load shedding schemes to maintain system frequency.

VOLTAGE REGULATOR

A device used to automatically maintain a predetermined voltage level in distribution substations and on distribution lines.