



Subject: Electric System Switching and Safety Tagging

To: Unitil Energy Systems Inc. – Capital DOC
Unitil Energy Systems Inc. – Seacoast DOC
Fitchburg Gas and Electric (d.b.a. Unitil MA)
Unitil Service Corp. Personnel

Policy # RB, DS 5.02 (H)

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PURPOSE:

To ensure effective electric system *Switching Operations* and *Safety Tagging* procedures on the transmission, sub-transmission, and distribution systems while providing maximum personnel safety and system integrity.

APPLICABLE STANDARDS:

Occupational Health and Safety Administration

29 CFR 1910.269(m) - *Deenergizing lines and equipment for employee protection*

ANSI/IEEE (NESC)

C-2 Section 442– *Switching Control Procedures*

Section 444 –*De-energizing Equipment or Lines to Protect Employees*

OVERVIEW:

This Policy outlines and standardizes the process of completing electric *Switching Operations* and electric *Safety Tagging* at all Unitil locations where personnel are engaged in the operation or maintenance of lines and equipment, including the areas of transmission, subtransmission, distribution and substations. This Policy defines the requirements for electric system switching and *Safety Tagging* operations. The primary goals of this policy are to protect employees working under all conditions, protect equipment from damage, and direct attention to abnormal or special conditions.

DEFINITIONS:

Words and phrases which appear in *italics* have the special meanings set forth in the DEFINITIONS section of this policy.

Approval – refers to the process of reviewing and endorsing a *Switching Schedule*.

Authorize (Authorization) – refers to the process of providing permission to proceed with *Switching Operations*.

Controlling Authority – refers to a *Qualified* individual designated as such by the Company who is responsible for coordinating and directing switching and tagging activities. The *Controlling Authority* shall have full knowledge of the job and shall be aware of the ramifications switching might have on the Unitil system, as well as other utility's systems, and shall coordinate issues with the other utilities as required. A *Controlling Authority* has met all training requirements for their specific task assigned.

Coordinating Authority – refers to a *Qualified* individual designated as such by the Company who is responsible for coordinating switching and tagging activities. The *Coordinating Authority* shall have a full understanding of the *Switching Operation* being performed. A *Coordinating Authority* has met all training requirements for their specific task assigned. The *Coordinating Authority* receives direction from the *Controlling Authority*.

Designee – refers to a *Qualified* individual who has been given authority to complete specific tasks beyond their normal responsibilities but meets all the training requirements for the task for which they are being made responsible.

Emergency – refers to an event that requires an immediate *Switching Operation* to prevent loss of life or property.

Employee in Charge – refers to the employee designated as being responsible for receiving and returning clearance to perform work. An *Employee in Charge* must be familiar with the equipment to be switched and has met all training requirements for their specific task assigned.

Issue of Clearance – refers to the process of notifying the *Employee in Charge* that the *Switching Operation* has been completed and they are authorized to proceed with the work. *Issue of Clearance* may only be granted by either a *Controlling Authority* or *Coordinating Authority*.

Planned – refers to a switching request that is known in advance of the *Switching Operation*.

Qualified – refers to an individual who has a full understanding of what is required for safely executing switching and tagging operations. A *Qualified* individual has met all training requirements for their specific task assigned.

Restoration – refers to the process of re-establishing electric service following an outage caused by a system trouble.

Return of Clearance – refers to the process of notifying either the *Controlling Authority* or *Coordinating Authority* that the work has been completed and permission to remove safety tags is granted. *Return of Clearance* may only be granted by the *Employee in Charge*.

Safety Tagging – refers to the process of applying safety tags to devices in the field or from SCADA.

Switching Operation – refers to any change in the existing configuration or operation of the electric system and the return switching.

Switching Schedule – refers to the standardized form (Unitil Form #1) used to document steps of *Switching Operations*.

Transfer of Clearance – refers to the process of changing the *Employee in Charge* of the work.

Unplanned – refers to switching that is required due to unforeseen system conditions.

Zone of Clearance – refers to the work area defined by the location of *Safety Tags*.

RESPONSIBILITY:

Unitil Employees:

All employees of Unitil who are involved in electric system *Switching Operations* and *Safety Tagging* are responsible for following both this Policy and the applicable guidelines as set forth. The Policy is subject to audits at any time to ensure compliance. The guidelines shall specify the responsibilities of each job function.

All employees of Unitil who are involved in electric system switching and *Safety Tagging* operations are required to be trained on a routine basis. The training shall be specific to the requirements of each job function.

Contractors:

Contractors are expected to follow procedures in this policy and the applicable guidelines as set forth.

Neighboring Utilities:

When coordinating switching with neighboring utilities, the *Controlling Authority* shall verify that applicable operating procedures and specific *Switching Operations* are mutually agreed upon and understood by both parties.

ELECTRIC SYSTEM SWITCHING OPERATIONS:

Switching Operations, for the purposes of this Policy, is defined by the items listed below:

115kV Transmission and 69kV & 34.5kV Subtransmission Systems

- 1) Operations changing the existing configuration,
- 2) Operations involving changes to substation equipment loading,
- 3) Disabling/enabling automatic relay schemes,
- 4) Disabling/enabling normal reclosing (hotline clearance).

Distribution Systems

- 1) Distribution *Switching Operations* involving transfer of load from one circuit or source to another at any voltage,
- 2) The need for switching schedules for underground systems will be determined by individuals *Qualified to Approve* switching schedules.
- 3) Any lines which have generators, co-generators or other small power producers which are interconnected to the electric system.

Electric system *Switching Operations* not identified above are beyond the scope of this policy.

Switching Schedule Requirements:

Planned Switching:

All *Planned* electric system *Switching Operations* as defined in this Policy, require a written and approved *Switching Schedule*. All *Planned* switching must follow the appropriate *Approval* and *Authorization* process as defined in this Policy. Every attempt shall be made to submit the *Switching Schedule for Approval* at least 2 business days prior to the date of the switching.

Unplanned Switching:

All *Unplanned* system *Switching Operations* require a written and *Authorized Switching Schedule*. All *Unplanned* switching must follow the appropriate *Authorization* process as defined in this Policy. However, the following individuals shall be notified as soon as possible after the switching is completed:

Manager, Electric Operations
Systems Supervisor
Manager Distribution Engineering

Emergency Switching:

A *Qualified* individual without prior *Authorization* may carry out *Emergency* switching. In an *Emergency*, with total loss of communication, an on site *Switching Operation* by *Qualified* personnel is permissible under the direction of the *Employee in Charge*. The *Employee in Charge* shall document all switching steps. However, the following individuals shall be notified as soon as possible after the switching is completed:

Manager, Electric Operations
Systems Supervisor
Manager Distribution Engineering

Restoration Switching:

Restoration switching may be completed without a written *Switching Schedule* provided it is completed under the direction of a *Qualified* individual.

Preparing a Switching Schedule:

Qualified Individuals:

Switching Schedules shall be prepared by *Qualified* individuals. This includes knowledge of the existing system configuration and involved equipment needed to create a safe work zone. Awareness and understanding of existing safety and operating policies and practices are necessary to properly prepare *Switching Schedules*.

These schedules would normally be prepared by the Operations and Engineering positions listed in Table 1 of the appendix.

Schedule:

All *Switching Schedules* shall be completed on the standardized switching form (Unitil Form #1), and shall document work to be performed. Each step shall clearly state work to be completed, the location, and the device name or number. The schedule shall have a logical sequence of steps. When tagging, the color of the tag and the name of whom the tag is issued are to be specified. Each *Switching Schedule* shall have a unique control number and a revision date. Previously prepared *Switching Schedules*, or "canned" schedules shall be used for reference only and a new schedule prepared for each event.

Contents of a Switching Schedule:

The *Switching Schedule* must document all steps to be taken in a specific order and include:

- 1) Document control number
- 2) Date of switching
- 3) *Approval* and *Authorization* signatures
- 4) Name of *Controlling Authority*
- 5) Name of *Coordinating Authority*
- 6) Name of *Employee in Charge*
- 7) General description of switching
- 8) Specific switching steps and times
- 9) Equipment designations of devices being operated
- 10) Record of time switching steps completed and truck #
- 11) Color of tags applied and removed
- 12) Record of time *Issue of Clearance* was granted to the *Employee in Charge*
- 13) Record of time *Return of Clearance* was received by the *Employee in Charge*
- 14) Time and names of *Employee in Charge* involved in *Transfer of Clearance* (if applicable)

Review and Approval Process:

Qualified Individuals:

Switching Schedules shall be reviewed and approved by *Qualified* individuals listed in Table 1 of the appendix. These individuals shall have a full understanding of the job and the requirements for safely implementing the necessary switching. These individuals shall have a complete understanding of the impact to the system and all affected lines and equipment.

Individuals preparing *Switching Schedules* shall have an awareness and understanding of existing safety and operating policies and practices.

It is recognized that any one person may not be *Qualified* to meet all of the requirements listed above. Generally, the review and *Approval* by Engineering shall be focused on loading and voltage. The review by Operations shall be focused on existing system configuration and availability and operation of equipment.

Planned Switching:

All *Planned* switching shall be reviewed and approved by at least one representative from Engineering and one representative from Operations. The following personnel are designated to represent these departments. However, *Designees* are acceptable in their absence.

- Engineering
 - o Manager, Distribution Engineering
- Operations
 - o Manager, Electric Operations
 - o Systems Supervisor

When practicable, *Switching Schedules* shall be submitted for *Approval* 2 business days in advance of expected execution.

Once approved, *Switching Schedules* may not be carried out until *Authorized* by a representative from Operations. *Authorization* may only be granted on the same day as the expected execution of the *Switching Schedule*. The following personnel are designated as having this authority. However, *Designees* are acceptable in their absence.

- Manager, Electric Operations
- Systems Supervisor

Unplanned Switching:

A formal review and *Approval* process is not required for switching in response to unforeseen system conditions that require immediate action to either restore electric service or prevent unacceptable system conditions. However, all *Unplanned* switching shall require the *Authorization* of a *Qualified* individual.

The following personnel shall be immediately notified following *Switching Operations*.

- Manager, Distribution Engineering
- Manager, Electric Operations
- Systems Supervisor
- Line Supervisor

Emergency Switching:

There is no requirement for *Approval* or *Authorization* when performing *Emergency Switching*. However, the following personnel shall be immediately notified following *Switching Operations*.

- Manager, Distribution Engineering
- Manager, Electric Operations
- Systems Supervisor
- Line Supervisor

Assigning Designees:

In the event that one of the positions normally responsible for *Approval* and *Authorization* of *Switching Schedules* is expected to be unavailable, *Qualified Designees* shall be assigned as soon as practicable. If the individual expected to be absent cannot assign a *Designee* themselves, their immediate supervisor shall assign the *Designee*. The following personnel involved in *Switching Operations* shall be notified of such *Designees*.

- Manager, Distribution Engineering
- Manager, Electric Operations
- Systems Supervisor
- Line Supervisor
- Systems Dispatcher and/or Systems Communication Associate

Coordination of Switching Schedule:

Controlling Authority:

The *Controlling Authority* or *Designee* is the individual who is responsible for coordinating an *Authorized Switching Schedule* on the day of switching. Prior to switching the *Controlling Authority* will:

- Obtain a full understanding of all switching steps.
- Review *Switching Schedule* with personnel involved

During *Switching Operations* the *Controlling Authority* or *Designee* will:

- Coordinate *Switching Schedule* steps via radio system (log times and crews)
- Confirm orders received in field are understood
- Have the authority to stop or modify *Switching Operations* where unforeseen circumstances prevent completion of the specific order of steps.
- Oversee the *Employee in Charge*.
- Provide direction to the *Coordinating Authority* as applicable.
- *Issue Clearance* and receive *Return of Clearance*.

All communication involving switching shall be performed utilizing the company's radio frequencies. Land line or cell phones shall only be utilized where radio communications is not available.

The *Controlling Authority* must be available during the switching. An individual is considered unavailable if they are sick, on vacation or any other leave. The *Controlling Authority*, using proper judgment, can turn the coordination of switching over to the *Coordinating Authority* without supervision. Individuals identified as a primary *Controlling Authority* can relinquish responsibility to a *Designee*.

Coordinating Authority:

The *Coordinating Authority* is the individual who is responsible for coordinating routine *Switching Operations* according to a specific *Switching Schedule Authorized* on the day of switching. Prior to switching the *Coordinating Authority* will:

- Obtain a full understanding of all switching steps.

During *Switching Operations* the *Coordinating Authority* will:

- Focus solely on *Switching Operations* unless other emergencies arise.
- Coordinate *Switching Schedule* steps via radio system (log times and crews)
- Confirm orders received in field are understood
- Have the authority to stop *Switching Operations* where unforeseen circumstances prevent completion of the specific order of steps. In such instances the *Coordinating Authority* shall immediately notify the individual who *Authorized* the *Switching Schedule*.
- Perform switching operations via SCADA controlled devices.
- *Issue Clearance* to and receive *Return of Clearance* from *Employee in Charge*.

It is the responsibility of the *Coordinating Authority* of the work to notify the *Controlling Authority* immediately if there is any doubt concerning switching steps.

All communication involving switching shall be performed utilizing the company's radio frequencies. Land line or cell phones shall only be utilized where radio communications is not available.

Employee in Charge of the Work:

Whenever switching is performed, there shall be only one person designated as the *Employee in Charge*. This person is designated as being responsible for receiving and returning clearance to perform work.

It is the responsibility of the *Employee in Charge* of the work to notify the *Controlling Authority* or *Coordinating Authority* immediately if any work on lines or equipment is thought to jeopardize the integrity of the system or there is any doubt concerning proper switching steps.

The *Employee in Charge* of the work is responsible for transferring clearance to another *Qualified* individual in the event they will be absent. The *Transfer of Clearance* will include:

- Notifying immediate supervisor of the *Employee in Charge* issuing *Transfer of Clearance*
- Notifying the *Controlling Authority* of the transfer
- *Controlling Authority* shall notify all persons performing work under this clearance
- *Controlling Authority* shall update *Switching Schedule* with transfer including the date, time, person releasing clearance, person accepting clearance and a reason.
- *Controlling Authority* shall have the sole authority for authorizing the *Transfer of Clearance*.

Contractors:

It is acceptable for *Qualified* contractors to be assigned as the *Employee in Charge* of the work.

Review of Switching Schedule:

A review shall take place prior to all *Planned* and *Unplanned* switching with all personnel involved. The review shall at a minimum include the following topics:

- Specific switching steps (and assignments) to create the work zone
- Assignment of the *Employee in Charge* of the work
- Other crews and/or work being performed in the work zone
- Abnormal system conditions that may affect normal switching procedures

ELECTRIC SAFETY TAGGING:

General:

The *Safety Tagging* rules shall apply to all electrical work on the transmission, sub-transmission, and distribution systems.

- 1) No work shall be done on or near equipment except in accordance with these rules.
- 2) Clearance to work on lines or equipment will not be issued unless safety tags have been applied to the appropriate controls or switches. All equipment shall be considered and worked upon as energized until tested otherwise and properly grounded or secured.
- 3) Each safety tag shall be used only for the purpose for which it is intended. Use of any safety tag as a sign, as a card to make notes, or for any purpose other than that which is defined by instructions covering its use is prohibited. All safety tags, including those initiated and used locally, shall be properly and completely filled out and when removed, returned to the person responsible for final disposition of tags.
- 4) Any device, which is SCADA controlled, whether operated locally or via SCADA, shall have the appropriate colored tag placed on it via SCADA. Such devices must comply with the requirements of ANSI 442 E.
- 5) Removal of tag(s) is prohibited until the *Employee in Charge* issues *Return of Clearance* and reports that all crews working under this clearance are clear of the lines and/or equipment being worked on.
- 6) In the event a SCADA alarm from a substation or control device within the clearance zone is received, the *Employee in Charge* shall be immediately notified of the alarm and instructed to stop work and remain clear until further notice. The cause for the alarm will be determined and clearance re-issued when it is proper to do so.
- 7) Whenever multiple crews are working under tagging clearance within close proximity of each other, the designated *Employees in Charge* must know of each other's presence and have a full understanding of the work being performed.

Definition of Safety Tags:

There are four (4) different Safety Tags, each with a single purpose and each of a different color. The four (4) tags shall cover all of the various operating and working conditions. These Safety Tags are as follows:

Red Safety Tag - (black printing on red card)

Used on switches or controls, which isolate or ground equipment, which must not be operated.

Blue Safety Tag - (black printing on blue card)

Used on switches or controls which (1) isolate equipment, (2) MAY have test potential (3) are solely under the control of one person.

Orange Safety Tag - (black printing on orange card with black borders)

To be used for Hot Line purposes only. Hot line work is considered work on any energized or de-energized circuit which is not grounded.

White Safety Tag - (black printing on white card)

Used to indicate abnormal conditions or cancellation of normal operating procedures not covered by red, blue, or orange safety tags.

Tagging Procedures for Hot Line Work:

The following rules are applicable when hot line clearance is issued to crews in the field, including situations involving SCADA (Supervisory Control and Data Acquisition) systems.

- 1) Normally open, manually operated devices do not need to be visually checked open as a part of *Switching Operations*. However, the *Employee in Charge* can request that these devices be visually checked open if special circumstances exist where this may be necessary.
- 2) Normally open SCADA controlled sources of supply shall be visually checked open and remote control inhibited prior to issuing hot line clearance.
- 3) Normally open automatically (non-SCADA) controlled sources of supply shall be visually checked open, and automatic closing schemes shall be disabled and properly tagged prior to issuing hot line clearance.
- 4) Visual checking and tagging of automatic reclosing on reclosers/circuit breakers at remote locations operated by the SCADA system shall not be required. Any time the SCADA system is used to defeat automatic reclosing, a tag shall be properly applied via SCADA.

Tagging Procedures for Dead Line Work:

The following rules are applicable when red tag clearance is issued to crews in the field, including situations involving SCADA systems.

- 1) Normally open manually operated devices must be visually checked open and tagged. Normally open SCADA controlled sources of supply shall also be visually checked open, tagged, and remote control inhibited.
- 2) Normally open automatically (non-SCADA) controlled sources of supply must be visually checked open, and automatic closing schemes shall be disabled and properly tagged.
- 3) Once *Switching Operations* have been completed, the equipment/lines to be worked on shall be treated as energized until tested and grounded with approved devices.

DOCUMENT RETENTION:

A standard form shall be used for documenting *Switching Schedules (Unitil Form #1)*. All information for the *Switching Schedules* and safety tags shall be filled out completely, accurately, and legibly. The *Switching Schedule*, along with tags, will be retained for a six month period.

Appendix

Table 1: Acceptable positions that may assume the following responsibilities

	Write Switching Schedules	Approve Switching Schedules	Authorize Switching Operations	Controlling Authority	Coordinating Authority	Employee in Charge
<u>Operations</u>						
Manager Electric Operations	X	X	X	X		
Systems Supervisor	X	X	X	X		X
Line Supervisor	X	X	X	X		X
Field Services Supervisor	X				X	X
Project Leader	X				X	X
Dispatcher					X	
Systems Communications Associate					X	
Lead/Head Lineworker						X
Lineworker I						X
Lead Line Technician						X
Line Technician I						X
Head Maintenance Worker						X
Maintenance Worker I						X
Utility Lineworker I						X
Head Cable Splicer						X
Cable Splicer I						X
Unitil Approved Contractor						X
<u>Engineering (Distribution or ESE)</u>						
Manager of Engineering	X	X	X	X		
Sr. Engineer	X	X	X	X		
Titled Engineer	X					
Engineer	X					

FORM 1: Util Switching Schedule

Description:			
File Name:		Submitted by/date:	
File revision date:		Engineering Approval by/date:	
DOC:		Operations Approval by/date:	
Date of Switching:		Authorized by/date:	
Controlling Authority:		Clearance Issued (type/date/time):	
Coordinating Authority:		Clearance Returned (type/date/time):	
Employee in Charge:		Transfer of Clearance to (name/date/time):	
Mimic Boards Updated (Date/Time):		Transfer of Clearance from (name/date/time):	

Operator shall carry this order while performing switching operation.				Control #:	
Step	Truck	Time	Location/Equipment	Instruction	
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					