

PRISM™ Emergency Load Shedding



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PRISM Emergency Load Shedding

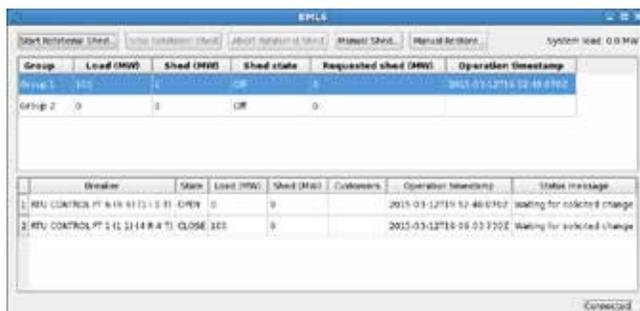
In extreme cases where the generation and transmission systems may not be able to meet peak demand requirements within a given region, utilities must be prepared to lower demand quickly to prevent uncontrolled service disruptions such as widespread blackouts. Utilities may need to implement load shedding on targeted service areas by shedding blocks of load for a specified period, or via "rolling blackouts" to share the burden equitably between load blocks by cycling through them on a predetermined schedule.

The PRISM Emergency Load Shedding (ELS) application provides this capability to PRISM SCADA customers, enabling them to easily pre-define load groups and rotational schedules with an intuitive interface. PRISM ELS performs load shedding through operation of breaker/recloser switching.

Features

PRISM Emergency Load Shedding features include:

- Configuration of Load Blocks to use for load shed monitoring and/or load shed action
- Display of load values for the Load Block and for the individual switches
- User interface to facilitate the load shedding and restoration capability
- Alarm conditions of failure of a control action to successfully complete
- Ability to support rotational load shed within a group of switches in a block
- Support for load shedding based on Under Frequency condition



Primary EMLS Interface

Description

PRISM ELS allows the utility to easily select and deselect breakers/switches within the network to be used to reduce load as entered by an operator. The program supports manual load shedding and restoration as well as block editing and management capabilities for rotational load shedding. ELS suggests a set of breakers (loads) of a block to open given a user-specified amount of load to shed. The user may select different switches to operate, or choose to use those suggested by the program. The program utilizes logic that orders the suggested list of switches by magnitude of load served and by date of last operation. This helps the user/operator to effectively spread the burden across the available switches rather than always following a predetermined order.

Manual Load Shed and Restoration

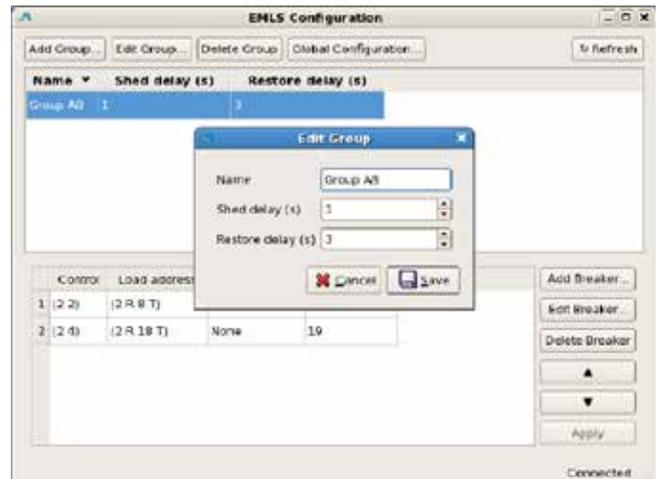
ELS supports manual load shed by permitting the operator to select a load block to use for the shedding action, and then selecting the Load Shed function. From the ELS user interface, the user simply enters an amount of load to shed (in MW) and selects the button to show the program's solution. ELS searches through the breakers defined in the selected group and determines the one(s) to be opened. It begins with the feeder breaker with the largest load and continues in descending order of loads until the target is reached and the best solution is found. It displays the selected breakers as well as those included in the group that will not be opened due to having reached the target MW. Once the execute command is given, the application will shed all selected devices as fast as the communication allows, quickly implementing the requested shedding action. The program monitors the operations and produces an alarm if any breaker does not successfully complete the operation requested. ELS also provides the capability for the user to manually shed an entire block of load, by selecting the block and executing a total block load shed command. There is no limit on the number of feeders/switches within a load block, and no limit on the number of load blocks defined. The manual load shed function monitors the load of each load block, the load of individual feeders within the load block and the total system load. When executing a manual load shed, the user can enter a time delay (in seconds) to be used between individual controls within the block.

ELS also provides a Restore Load function for manual shedding. The display shows any previously shed loads of the defined load block that are available to be restored. The user simply selects the blocks to be restored and then executes the restoration process. The amount of load to be restored for each action is shown in the ELS display. The Restore Load function can also be used to restore load to individual breakers. A user-defined time delay setting is available to permit staggering of the closing operations for breakers involved in a block restoration. ELS displays unserved loads, sorted by estimate of unserved energy, duration of the outage for each breaker, by blocks, and by priority. The display also provides total system load to be restored as well as an estimate of the total unserved load.

Rotational Load Shedding

ELS also includes a Rotational Load Shed function. In this mode, the user specifies the desired amount of load to be shed and selects the rotational mode. The desired load shed amount can be entered as a fixed kW value or as a percentage of the total telemetered network load. ELS looks at all the breakers that comprise a group and determines if one or more breakers is required to address the load shed amount requested. The program then goes through the list of devices in sequential order and opens the number of breakers needed to meet the load shed request. As the breaker group goes through the rotational shed sequence, ELS will continuously display the sum of the load of all the breakers that are still closed. The user can specify the maximum off-time per breaker and the anticipated number of customers served by the breaker. The delay times (seconds) between shedding operations and between load restoration operations are also user definable.

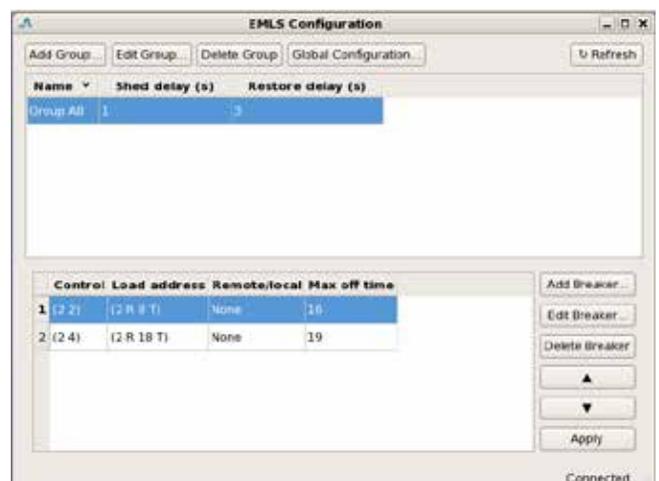
When rotational mode is active, ELS monitors the opened breakers to ensure that they are re-energized before the maximum allowable time off has been reached. The application determines the amount of load served for those breakers that are approaching the maximum off time, and coordinates the shedding of additional switches and the restoration of others to maintain the requested amount of shed load. ELS rotational shedding will cycle back to the beginning of the sequence when the end of the list is reached. This cyclic sequence will continue until termination of the function by the operator. When the rotational load shed sequence is terminated by the user, ELS begins restoration with the breaker that has been off the longest and continues restoring breakers while adhering to the time delay defined for the period between operations.



EMLS Group Configuration



Rotational Load Shed Value



EMLS Group Configuration

PRISM Emergency Load Shedding

Configuration and User Interface

ELS configuration and monitoring of the application is performed through a simple, intuitive user interface. The UI is used to define the switches involved with each block type and the PRISM RTDB point references for the inputs as well as the control information needed for control of the breakers. All parameter settings required to govern the different load shed operations are entered through the UI. There is no need to make changes in the RTDB. The parameters and definitions available through the ELS configuration interface include:

Manual Shed and Restore

- Breaker definition that includes the status, load, remote/local indication reference points of the RTDB
- Breaker definition that includes the control record references for the specified devices in the list (used to issue the remote control for open/close)
- Timer values for the shed delay and restore delay used between operations
- Number of customers downstream of the device

Rotational Load Shed

- Breaker definition that includes the status, load, remote/local indication reference points of the real-time database
- Breaker definition that includes the control record references for the specified device.
- Definition of a 'maximum rate' of shed or restore
- Definition of the maximum off time for switches (feeder)
- Priority definition for each breaker
- Number of customers downstream of the device

Minimum System Requirements

- PRISM 10 or later
- RHEL 6 or later
- Remote control capability for substation breakers
- System load and breaker load RTDB points

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