LUMA

LOAD SHEDDING

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LOAD SHEDDING

1.0 Executive Summary

Load shedding is the intentional shutdown of electric power in a part or parts of a Bulk Power System in a systematic and controlled manner, to prevent the failure of the entire system when the demand becomes or is anticipated to become greater than the available capacity of the system.

2.0 Objective/Scope/Roles

2.1 Objective

This procedure is to define the conditions under which selective load shedding is initiated and the steps necessary to maintain system integrity during and after a deficit of generation to meet current load demand.

2.2 Scope

This procedure defines the tasks Transmission Operations Center and the Distribution Operations Center **shall** take during the two (2) types of Load Shedding events:

- Automatic Load Shedding occurs when there is a loss of a generation unit or a sudden load reduction that creates a situation wherein system frequency cannot be maintained to acceptable defined levels. When such a condition occurs, the SCADA system automatically triggers a sequence of Load Shed blocks. Each block contains a specific amount of client load consumption, measured in megawatts. See Appendix D for more information.
- Manual Load Shedding is a planned event that typically occurs when there is a generation deficiency in the system. The process is managed proactively, and the Load Shed blocks have a different composition and measurement than the blocks that are shed during an automatic event. See Appendix C for more information.

2.3 Roles and Responsibilities

The following are key roles in the TOC and DOC for the execution of load shedding of the Bulk Power System (BPS).

2.3.1 Supervisor, Distribution (SD)

The Supervisor, Distribution reports directly to the Manager Control Center Operations (MCCO) and directs specific actions to be taken by Senior Distribution Operators.

2.3.2 Supervisor Transmission and Generation (STG)

The Supervisor Transmission and Generation informs the TOC management team of the Load Shedding event and is the main decision maker during the process.

2.3.3 Transmission Operator (TO)

The Transmission Operator is responsible for all actions directed by the STG for the 38kV system.

2.3.4 Senior Transmission Operator (STO)

The Senior Transmission Operator is responsible for all actions directed by the STG For the 230kV and 115kV system

2.3.5 Manager Control Center Operations (MCCO)

The Manager Control Center Operations is responsible for communicating the event to LUMA Customer Experience to inform customers regarding outages.

2.3.6 Manager Control Center Support (MCCS)

The Manager Control Center Support is responsible for manually updating the Critical Loads listing with input from Customer Experience and for annual updates of the Critical Load List.

3.0 Procedure

The following procedure is divided into two distinct sections. The first being the manual steps which are initiated by transmission operations personnel during an instability in the BPS due to loss of generation or transmission capability. The second section outlines the automated process which is pre-programmed into the SCADA system and takes place independent of transmission system operators. The MCCO **shall** communicate with Customer Service as the load shedding event occurs and changes.

LOAD SHEDDING

3.1 Manual Load Shedding

3.1.1 **The STO / TO shall determine the amount of MW that needs to be shed to match available supply.**

3.1.2 **The STG shall prepare the Control Center middle console for the load shed activity by making sure all displays are active.**

3.1.3 **The STG shall coordinate the plans for the Load Shed with the SD.**

3.1.4 **The STO / TO shall communicate the load shed plan with the Interconnected Facilities so that all are aware of the planned activities.**

3.1.5 **The STO / TO shall begin Load Shedding when Spinning Reserves reaches 0 MW, when the frequency begins to drop in accordance with Appendix C Manual Load Shedding.**

3.1.6 **The STO in coordination with SDO will continue to drop blocks until the frequency is stable. When the frequency flattens, a sustainable peak has been reached.**

3.1.7 **The STG in coordination with STO / TO shall rotate the Load Shed blocks based on MW every hour to reduce the time any block is without power.**

3.1.8 **The STG in coordination with STO / TO shall begin re-establishing the blocks when the frequency reaches 60.10 or 60.15 Hz levels as the frequency is rising and Spinning Reserves are re-established.**

3.1.9 **The STG in coordination with the STO / TO shall record if the feeders do not operate properly during the Load Shed or load re-establishment process for subsequent maintenance requests.**

3.2 Automatic Load Shedding

Automatic Load Shedding occurs when there is a loss of a generation unit or a sudden load reduction that creates a situation wherein system frequency cannot be maintained to acceptable defined levels. When such a condition occurs, the SCADA system automatically triggers a sequence of Load Shed blocks. Each block contains a specific amount of client load consumption, measured in megawatts (MW) as shown in Appendix D.

3.3 Situational Awareness

Situational awareness during a load shedding event is critical.

If an automatic Load Shed is triggered during a manual Load Shed due to the continuing degradation of BPS frequency, the manual Load Shed becomes exacerbated. It is necessary to drop additional load until the frequency is re-established at the new sustainable peak level.

Managing the process poorly can extend the duration of the Load Shed event. Additionally, if the proper frequency is not maintained, the risk of damaging equipment in the field increases.

Appendix A: Glossary

Term	Definition
Situational Awareness	Situational Awareness is the understanding of what is happening, why it is happening and what might happen next. It involves utilizing a questioning attitude to challenge assumptions and proactively operate the system to minimize or mitigate system events.
Underfrequency Load Shedding	Under Frequency Load Shedding (UFLS) is to balance generation and load when an event causes a significant drop in frequency of an interconnection or islanded area. The UFLS activation metric measures the number of times it is activated, and the total MW of load interrupted in each Regional Entity and NERC-wide.

Appendix B: Procedure Cross-Reference Matrix

Procedure Reference Matrix, Part 1 of 2	Short Term Load Forecasting	New Facility Interconnection	Resource Adequacy Planning	Interconnected Facility Retirements	Legacy T&G Demarcation	Interconnected Facilities Capabilities	Black Start	Telemetry	Cybersecurity	Root Cause Analysis & Corrective Actions	Public Reporting	Performance Reporting	Stakeholder Management	Policy on Reserves
Short Term Load Forecasting														
New Facility Interconnection														
Resource Adequacy Planning														
Interconnected Facility Retirements														
Legacy T&G Demarcation														
Interconnected Facilities Capabilities														
Black Start														
Telemetry														
Cybersecurity														
Root Cause Analysis and Corrective Actions														
Public Reporting														
Performance Reporting														
Stakeholder Management														
Policy on Reserves														
Reducing Risk Exposure to Contingencies														
Critical Loads														
Load Shedding														
Contingency and System Operating Limits Response														
Energy Dispatch, Scheduling and Merit Order														
Transmission Operations														
Plant Level Communications														
Balancing Frequency and Voltage														
Demand-Side Resources (Non-Wire Alternatives)														
System Operator Training														
Scheduling Planned T&G Outages														
Forced Outage														
Outage Execution and Closeout														
Emergency Response Execution														
Emergency Response Drills														

LOAD SHEDDING

Procedure Reference Matrix, Part 2 of 2	Reducing Risk Exposure to Contingencies	Critical Loads	Load Shedding	Contingency & System Operating Limits Response	Energy Dispatch, Shedding & Merit Order	Transmission Operations	Plant Level Communications	Balancing Frequency & Voltage	Demand Side Resources (NWA)	System Operator Training	Scheduling Planned T&G Outages	Forced Outage	Outage Execution & Closeout	Emergency Response Execution	Emergency Response Drills
Short Term Load Forecasting															
New Facility Interconnection															
Resource Adequacy Planning															
Interconnected Facility Retirements															
Legacy T&G Demarcation															
Interconnected Facilities Capabilities															
Black Start															
Telemetry															
Cybersecurity															
Root Cause Analysis and Corrective Actions															
Public Reporting															
Performance Reporting															
Stakeholder Management															
Policy on Reserves															
Reducing Risk Exposure to Contingencies															
Critical Loads															
Load Shedding															
Contingency and System Operating Limits Response															
Energy Dispatch, Scheduling and Merit Order															
Transmission Operations															
Plant Level Communications															
Balancing Frequency and Voltage															
Demand-Side Resources (Non-Wire Alternatives)															
System Operator Training															
Scheduling Planned T&G Outages															
Forced Outage															
Outage Execution and Closeout															
Emergency Response Execution															
Emergency Response Drills															

Appendix C: Manual Load Shedding

PROCEDIMIENTO PARA RELEVO DE CARGA MANUAL (LOAD SHEDDING)

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Appendix D: Automatic Underfrequency Blocks

AUTORIDAD DE ENERGÍA ELÉCTRICA DE PUERTO RICO

DEPARTAMENTO DE ESTUDIOS Y MEJORAS AL SISTEMA DE PROTECCIÓN

SISTEMA DE RELEVO DE CARGA Y GENERACIÓN AUTOMÁTICO

13/08/2020

FRECUENCIA: 66.0 Hz			
LUGAR	EQUIPO A RELEVAR	RELÉ	# ORDEN
SAN JUAN PLANTA	REDACTED	REDACTED	
SAN JUAN PLANTA			

FRECUENCIA: 62.0 Hz			
LUGAR	EQUIPO A RELEVAR	RELÉ	# ORDEN
PALO SECO	REDACTED	REDACTED	REDACTED
PALO SECO			
PALO SECO			
PALO SECO			
PALO SECO			
PALO SECO			

FRECUENCIA: 59.2 Hz			
LUGAR	EQUIPO A RELEVAR	RELÉ	# ORDEN
BAY VIEW SECT.	REDACTED	REDACTED	REDACTED
BERWIND T.C.			
CACHETE			
CANAS T.C.			
CANÓVANAS SECT.			
CANÓVANAS T.C.			
HERMANAS DÁVILA			
MIRADOR AZUL			
PALO SECO GIS			
SABANA LLANA T.C.			
SAN GERARDO SECT.			
VENEZUELA SECT.			

FRECUENCIA: 59 Hz			
LUGAR	EQUIPO A RELEVAR	RELÉ	# ORDEN
CACHETE	REDACTED	REDACTED	REDACTED
CANÁ			
CAROLINA			
CREA			
FONALLEDAS			
JARDINES METROPOLITANOS			
MAGNOLIA			
SIERRA LINDA			
TAFT			
TAPIA			
VILLA BETINA			
VILLA DEL REY			

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