LUMA

SHORT TERM LOAD FORECASTING

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Procedure Title: **Short Term Load Forecasting**

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SHORT TERM LOAD FORECASTING

1.0 Executive Summary

This procedure defines the steps to prepare the daily system load forecast and 7-day look ahead load forecast for operational purposes in the Transmission Operations Center. The procedure also defines the methods for analyzing and maintaining the historical load data.

2.0 Objective/Scope/Roles

2.1 Objective

This procedure is to define the data and calculations required to accurately forecast system load for its day-to-day operational needs. The data **shall** be analyzed to provide System Operations with a forecast of system load to accurately plan and dispatch available generation according to the security-constrained economic dispatch procedure.

2.2 Scope

This procedure defines the tasks the Lead Engineer in Energy Planning takes to construct an accurate and detailed forecast for the Manager, Energy Management and to be referenced by the Manager of Control Center Operations Team. This detailed forecast **shall** be used to prepare dispatch plans for the generation resources. The procedure output is also utilized by the Energy Management department in evaluating planned T&G Outages occurring within 7-days. This procedure outlines the steps that will be used in a similar day approach to load forecasting and will incorporate seasonal, weekday, holiday and environmental considerations for similar day variability analysis.

- Provides a forecast of system load on a day ahead and seven-day ahead basis for operational allocation of current generation resources to meet the load.
- This procedure and its results are intended to be used with current generating assets for operational purposes and are not intended for use in Integrated Resource Planning.

2.3 Roles and Responsibilities

The following are key roles for the preparation and maintenance of the system load forecast.

2.3.1 Lead Engineer Energy Planning (LEEP)

The Lead Engineer, Energy Planning is responsible for verifying the underlying data and assumptions. The Lead Engineer is then required to report the completed load forecast to the Manager, Energy Management.

2.3.2 Manager, Energy Management (MEM)

The Manager, Energy Management is accountable for implementing the load forecast procedure and the continuous maintenance and improvement of underlying data and assumptions.

2.3.3 Engineer, Energy Balancing (EEB)

The Engineer, Energy Balancing is responsible for maintaining the underlying data and assumptions. This Engineer is then required to input the load data and collaborate with the LEEP and MEM to prepare the load forecast report. Also communicates load forecast data to SCADA department for integration into the SCADA system.

2.4 Data Collection and Reporting

2.4.1 Collect Data

Pull the following information from the “m” drive:

- The last year’s peak for the same week in the previous year as the forecasted week.
- The past two years ago peak data for the same week as the forecasted week.
- The last week’s peak data.
- The last seven days forecasted data.
- Scada 12-hour load forecast.
- Forecasted temperature for next seven (7) days.

Next, obtain the actual load data from System Operations for the last 4 weeks of records.

2.4.2 Regression Analysis

Determine how many weeks to use for regression analysis conducted in EEB spreadsheet.

2.4.3 Identify Data Anomalies

Review data for any unusual days that impacted the load such as load shedding events.

2.4.4 Remove Anomalies from Data Set

Exclude all anomalies from the sample for the forecast. Anomalous data is data that does not reflect the true and actual load on the island. As a manner of example, a period in which there was a Load Shed event or a major generation or transmission trip could lead a non-representative load data point.

2.4.5 Consider the Weather

Review the weather forecast for San Juan Central and align with dataset values for temperature, cloud cover, holidays, rain, etc. Record forecasted high temperature, forecasted relative humidity per period.

2.4.6 Calculate the Average Load

For the data set selected, average the load forecast for each hour and apply the seasonal adjustment factor.

2.4.7 Seasonal Adjustment

Perform a seasonal adjustment to equivalent days (adjustment factor) contained in the “System Operations” Load Forecasting Excel spreadsheet maintained by EEB considering of the following:

- Previous two years peak.
- Previous week’s high temperature.
- Previous week’s relative humidity
- Amount of rain.
- Cloud cover.
- Wind speeds.
- Seasonal adjustment factor.

This data is utilized to derive a seven (7) day daily peak:

2.4.8 Calculate Hourly Projections

The hourly load forecast projections are calculated by using the output of the above peak forecast utilizing hourly adjustment factors related to SCADA 12-hour forecast, historical similar seasonal and monthly data.

2.4.9 Finalize and Communicate Forecast

Finalize the load forecast and communicate to the MEM for T&G outage planning.

2.4.10 Review and Communicate to TOC

MEM reviews, approves the final forecast data and then communicates the values to the TOC.

2.4.11 Upload Forecast to SCADA

EEB communicates the approved load forecast data to the SCADA department for integration into the system.

2.5 Report Production and Frequency

2.5.1 Weekly Forecast

The weekly forecast is produced every Friday for the next seven days (Saturday thru Friday).

Short Term (7-Day) Forecast Input Data

Temporal	Weather	Load	Solar and Wind Production
Season	Temperature	Measured load	Forecasted Solar and Wind projected output
Day of Week	Cloud cover	Similar historical days Previous two years for same week and month along with previous weeks actual peak	
Time of Day	Wind		
Holidays	Humidity		

2.5.2 Daily Forecast Report

Issuance	Forecasted Period
Monday	Tuesday
Tuesday	Wednesday
Wednesday	Thursday
Thursday	Friday
Friday	Saturday, Sunday, Monday

Appendix A Glossary

Term	Definition
Similar day forecasting method	Forecasts load by selecting similar historical days' data and then obtaining a weighted average from them.
Integrated Resource Plan	An integrated resource plan is a roadmap that large utilities use to plan out generational acquisitions over five, 10, or 20 years (or more).
Regression Analysis	The use of mathematical and statistical techniques to estimate one variable from another. Regression analysis helps us determine which factors matter most and which we can ignore.
Seasonal Adjustment	A seasonally adjusted annual rate is defined as a rate adjustment that attempts to remove seasonal variations in the data. Seasonality is a characteristic of a time series in which the data experiences regular and predictable changes that recur every calendar year.

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	X													X
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														
Loads Shedding														
Contingency and System Operating Limits Response														
Energy Dispatch, Scheduling and Merit Order														
Transmission Operations														
Plant Level Communications														
Balancing Frequency & Voltage														
Demand-Side Resources (Non-Wire Alternatives)														
System Operator Training														
Scheduling Planned T&G Outages														
Forced Outage														
Outage Execution & Closeout														
Emergency Response Execution														
Emergency Response Drills														

SHORT TERM LOAD FORECASTING

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			X		X	X					X				
New Facility Interconnection															
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