Delaware Electric Cooperative Load Profile Application Guide

Introduction

The Cooperative provides the weather sensitive equations utilized for converting monthly read data to hourly load data for the purposes of settlements. The resulting values produced by these equations are used by the Cooperative to determine all Hourly Energy Obligations submitted to PJM. Every customer in the Cooperative's service territory will be assigned to one of the provide load shapes. The profiles do not represent each customer's total load, rather the hourly shape should be scaled in order to match the customer's total bill cycle consumption.

Determining a Customer's Load Profile

The load profile equation that should be used for a customer is based upon their Rate Code. The list below shows all the Rate Codes applicable to Customer Choice, and their associated Load Profile. Please note that some rate codes may have an additional 'D' appended to the end on the customer bill. These are treated that same as a Rate Code without a 'D' on the end and are not listed twice in the below mapping.

PRES – 1A1, 1A2, 1B2, 1C2, 1NM
PRSEA – 2N1, 2N2, 2NM, 2NM2
PPH – 1P1, 1P2, 1P3, 4P1, 5P1
PCOM – 4G1, 4G2, 4G3, 4NM, 4T3, 5L1, 5L4, 5L5, 5L9, 5NM, 7G3

PCOMLM – 5G6, 5L6, 5L7, 5L8, 5P6, 5TU
PIRR – 3G2, 3G3, 3G4
PLGPWR – 5L2 ,5L3,5M2
PLGT – 6G3, 6G4, 7G6, AR1, AR2, AR3, AR4, AR5, DL0, DL2, DL3, DL4, FL0, GR1, GR2, LA1, LA2,
LA3, LC1, LC2, LD5, LD6, LED1, LED2, LED3, LED7, LED8, LF0, LG1, LG2, LH, LH1, LP0, LP2,
LP3, LP4, LR1, LR2, MC5, MH1, MP5, MV0, MV2, MV4, MV5, MV7, RS1, RS2, SA1, SA2,
SC1, SP1, SR1, SR2, SUR, YT0

Select the Season for the date

To evaluate a given profile day, the season of the day must be determined. Many load profiles are divided into four seasons. These four seasons are defined below:

- **Spring** – March 1st though May 31st
- **Summer** – June 1st through August 31st
- **Autumn** – September 1st through November 30th
- **Winter** – December 1st through February 28th

If a profile does not utilize four seasons, each month is treated as a season. In this case, the month season-type represent any day in that calendar month.

Select the Day-Type for the date

For all load profiles there are 3 possible seasons as defined below.

- **WEEKDAY** – Monday through Friday where the weekday does not fall on a NERC holiday.
- **WEEKEND** – Saturday, Sunday, and NERC Holidays
- **ALL** – When the profile does not have separate Weekday/Weekend profiles (such as lighting) ALL is used for every day of the week and all holidays.

Select the Weather Response function

Based on the Season and Day-type where will be a set of Weather Response Functions. For each hour, there may be multiple equations. Only one equation will be applicable to a given hour, and should be selected based on the Input Variable, Lower Bound, and Upper Bound. The input variable will one of the two below:

- **Temperature** : Hourly Temperature at that hour
- **Peak Daily Temperature**: Peak Hourly Temperature value for that day

All temperature values come from those recorded by the National Weather Service at the Dover Air Force Base (KDOV) weather station.

In the below example, if it were a Spring Weekday and the temperature at Hour Beginning 12 was 74 degrees, the second equation would be utilized and the first would be ignored.

Profile	Season	Day Type	Hour	Input Variable	Lower Bound	Upper Bound	Coefficient	Constant
PRES	SPRING	WEEKDAY	12	Temperature	-50	72	-0.00809124	1.342102839
PRES	SPRING	WEEKDAY	12	Temperature	72	150	0.053160763	-3.19907357

Apply the Weather Response Function

After selecting the appropriate equation for each hour, there should be a total of 24 weather response functions for a given day (excluding the Spring Ahead Day which will have 23 and the Fall Back Day which will have 25). Each weather response function has a coefficient and a constant. The profile value should be calculated as shown below:

$$Profile\ Value = Coefficient * Input\ Variable + Constant$$

Using the previous example of a Spring Weekday with a Temperature of 74, the equation would look like the below.

$$Profile\ Value = 0.053160763 * 74 + (-3.19907357)$$

The resulting profile value for that profile and hour would be 0.734822892.

Construct the Full Load Profile and Apply the Customer Usage

For a typical customer bill period there will be approximately 31 days of metered usage, although this number can vary based on a variety of factors. In a typical 31 day period, there will be a total of 744 hours. After evaluating the WRF equations for the specific temperature, season, and day-type at each of the 744 hours, the full load profile for the customer's bill period is represented by concatenating the 744 values sequentially.

The customer's single monthly usage can now be applied to the Hourly Load Profile for the same date range. This is done by creating a customer Usage Factor for the bill period. The usage factor is calculated as:

$$Usage\ Factor = \frac{Bill\ Period\ Actual\ kWh}{Sum\ of\ Profile\ Values\ for\ the\ Bill\ Period}$$

The Usage Factor should be multiplied by the hourly load profile values for the bill period to produce a time series of hourly values for the specific customer.