2017 WACM AREA LOSS STUDY

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Executive Summary

This report will cover the methodology of calculating the WACM Balancing Authority's loss rate. The report will describe the study approach and the source of data for compilation of the study. In addition, it will explain the details and reasoning for recommending a loss rate percentage of 4.5% for the WACM Balancing Authority.

I. Introduction

The Rocky Mountain Region of Western Area Power Administration (WAPA-RMR) requires a periodic loss study to determine an accurate loss rate and losses percentage for the transmission system within the WACM Balancing Authority area (WACM BA). The Loss Study will be the basis for a potential revision of the WACM BA loss rate effective Oct. 1st.

II. Methodology

Each data set represented the WACM BA on an hourly basis. This data was analyzed using a formula which represented the losses of the WACM BA. The study does not exclude nor carve out any transmission within the WACM BA.

The energy loss of any system is equal to the difference between the output and the input for that system. The inputs are equal to the sum of all energy flow into the WACM BA. The outputs are equal to the sum of all energy flow out of the WACM BA. For all practical reasons, the inputs can be named Resources and the outputs as Obligations. The mathematical representation for losses is as follows.

$$(1)\ \ Losses = Resources - Obligations$$

Where,

$$(1A)\quad Resources = \sum WACM\ BA\ Internal\ Generation + \sum WACM\ BA\ Actual\ Tie\ Flow\ In$$

$$(1B)\quad Obligations = \sum WACM\ BA's\ Internal\ Load + \sum WACM\ BA\ Actual\ Ties\ Flow\ Out$$

To derive and calculate the percent loss for the WACM BA, the calculated losses in (1) is divided by the resources (1A) times 100.

$$(2)\ \ Loss\ (\%) = (\{\ Resources - Obligations\ \} / \{\ Resources\ \}) * 100$$

$$(2A)\ Loss\ (\%) = (1 - \{Obligations / Resources\}) * 100$$

Combining equations (1A), (1B), and (2A), the percent loss rate for WACM BA will be:

$$(3)\ \ Loss\ (\%) = (1 - (\sum WACM\ BA's\ Internal\ Load + \sum WACM\ BA\ Actual\ Ties\ Flow\ Out) / (\sum WACM\ BA\ Internal\ Generation + \sum WACM\ BA\ Actual\ Tie\ Flow\ In)) * 100$$

A convention was established to account for the positive and negative data. Values can be positive or negative. An example of negative generation value would be a pumped storage facility during the pumping cycle which was treated as an obligation in these calculations. Interties are normally bi-directional meaning power may flow in or out of the system. The convention adopted for this study was to treat positive tie line values as obligations and the negative tie line values as resources.

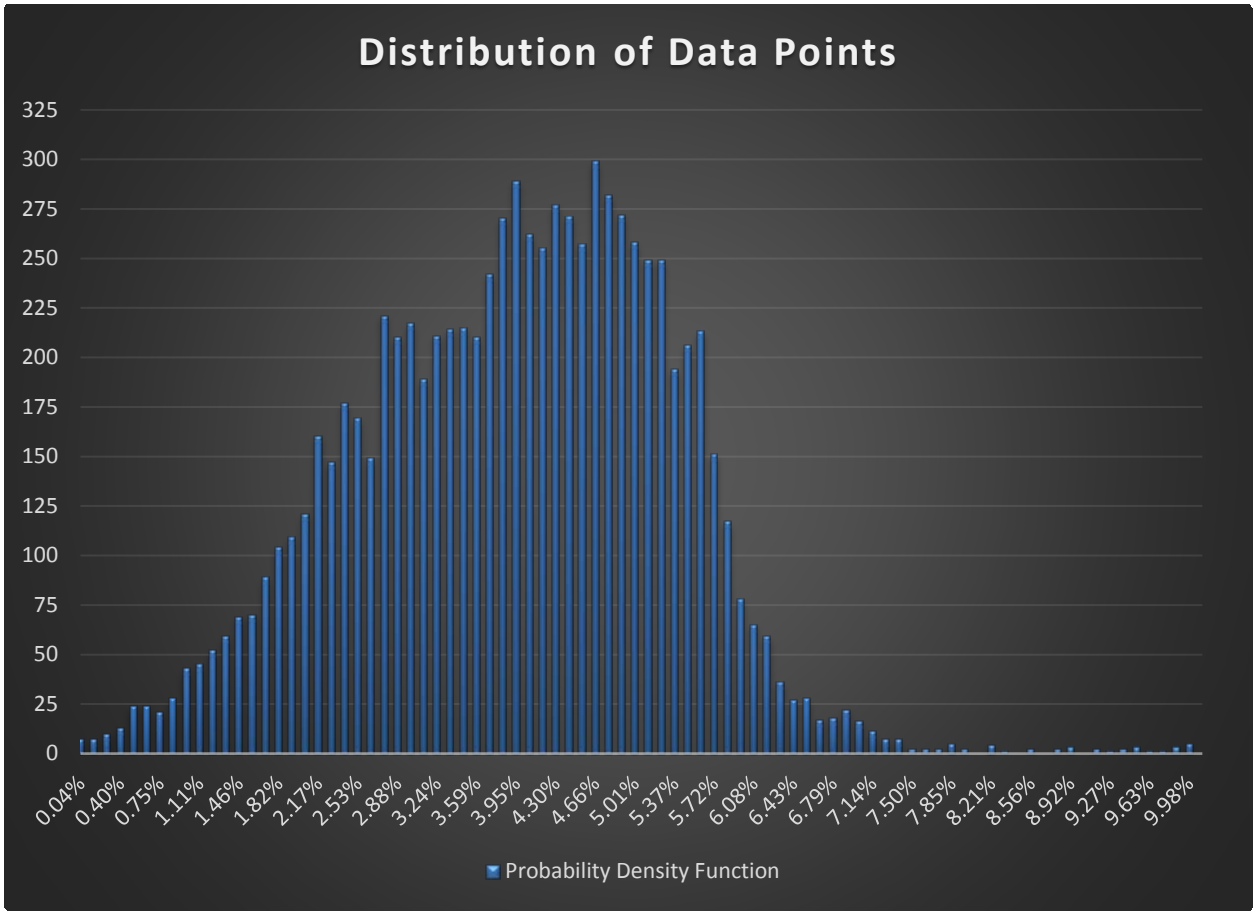
III. Data Source

The data used for this study was from a variety of sources. The WACM BA data was extracted from PI Historian, MV-90 meter data, and Energy Imbalance (EI) accounting files. This data was collected as hourly data for the entire 2016 calendar year. This gave an overall view which includes all seasons of the year.

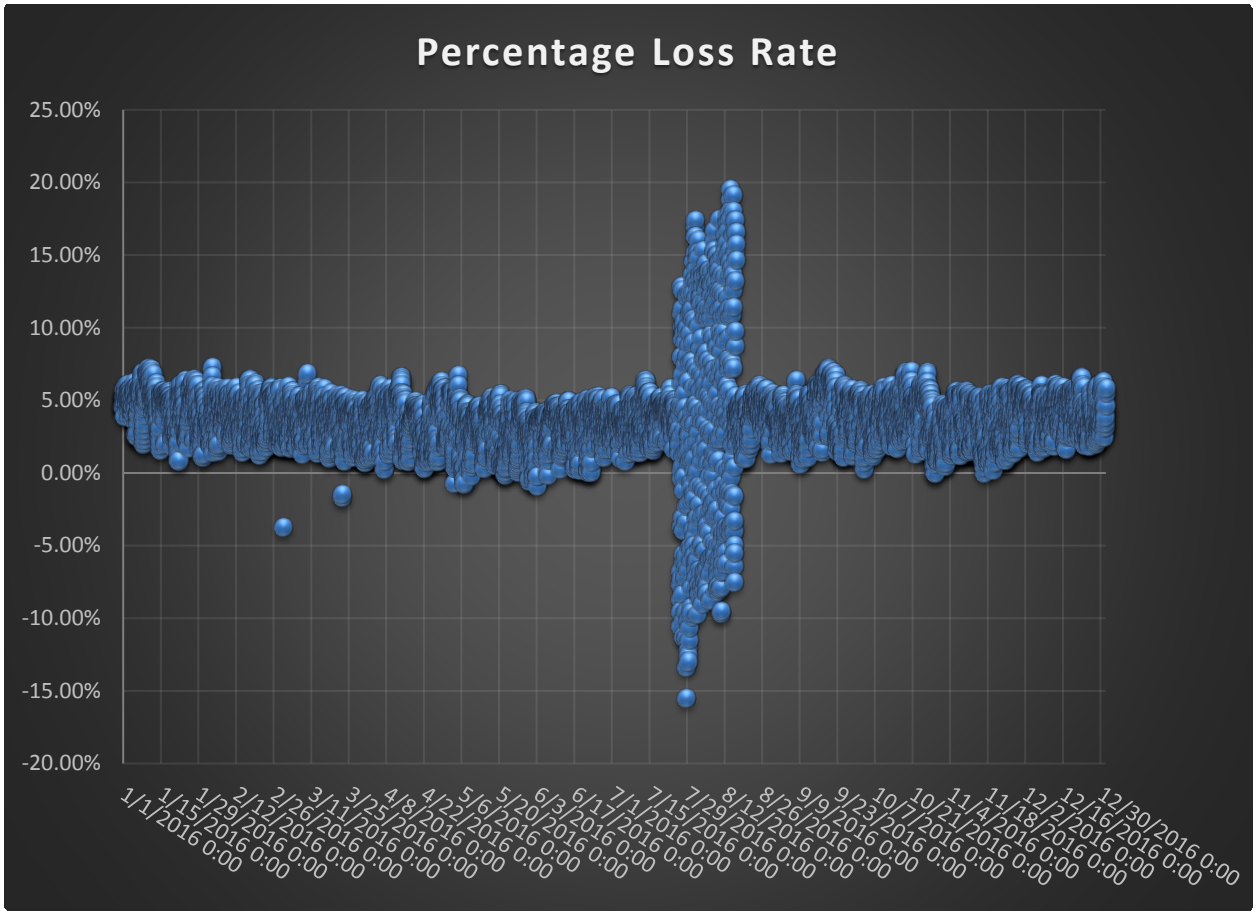
IV. Results

A total of 8784 hourly data sets were used in calculating the loss values. Statistical analysis of the calculated loss percentage showed some anomalies ranging from -15.5% to +20%. Disregarding the anomalies due to meter read error, meter maintenance, and new meter installations; the remaining data sets indicated a loss percentage rate closest to 4.5%.

The graph below shows the distribution of calculated loss percentage rate for the data set between zero and ten percent.



The next graph shows an individualized representation of the entire year's data set.



Analysis of calculated loss percentage results and the distribution of these data in different loss percentage groups indicated the largest concentration between 4.0 and 5.0%. The table below shows the calculated loss percentage rate with the number of data points that fit into that value.

Loss Percentage Rate	Meter Error	3%	4%	5%
Data Set Points	578	2029	2280	1311

V. Recommendation

The present loss rate for the WACM BA is 4.5% which was established in last year's analysis. The results of this year's study is in line with the past studies. Based on the engineering review and statistical analysis of the data, it is recommended a loss percentage rate of 4.5% for the WACM BA.

VI. Summary and Conclusion

The Rocky Mountain Region of Western Area Power Administration requires a periodic review of its published loss rate. This loss study is conducted by the Transmission Services group to provide an updated loss rate for the Rates group. As stated above, the study didn't exclude or carve out any transmission system inside WACM BA. It provided a detailed examination of the loss data as well as calculation of energy losses. The derivation of percentage loss in this study utilized a concept using Resources and Obligations. The study examined yearly hourly data and applied engineering and statistical analysis of the data sets and calculated results. Using 8784 discrete hours, the study computed energy losses and percentage loss rate for each individual hour. Since the largest concentration of energy losses is located between 4% and 5%, the study recommends 4.5% loss rate for WACM BA. The recommended 4.5% loss rate is based on a sound engineering approach and a valid statistical analysis.