

System Analysis

Chapleau Distribution System Analysis

The purpose of the assessment to perform system analysis is to assess overall losses, opportunities for mitigation investments and impacts of those investments on reducing losses. Diagnostics were performed against system capacity and capacity limits for Chapleau's current Distribution System. The base case established of the distribution system with two capacitor banks installed in the following locations.

Capacitor Bank Number	Feeder	Location
1	F8	Node 342 (Junction Point), Richardson St. and Gold Course
2	F9	Node 225 (Junction Point), Elm and Elgin St.

Table 1: Capacitor Installation

Scenario for loss reduction:

The performance of the above title was considered as a combined option for voltage improvement. The object was to establish an appropriate basis from which to determine the impacts of loss mitigation scenario. This base case establishes the system losses before any mitigation scenarios are deployed. Total system losses from the base case analysis were then the basis of comparison with conversation of 4.16 kV to 25 kV systems to determine where optimal gains could be made.

Total feeder losses were acquired and summed through system model runs over a 24 hour period. The peak savings (kW) were calculated by taking the average of the hourly consumption during on peak period. Results are summarized in the Table below.

System Energy Losses				Power Losses
Seasons	Peak kWh	Mid-Peak kWh	Off peak kWh	Total AVG kW-Weekday
Summer	59,543	63,230	94,111	320
Winter	127,567	113,496	140,877	569

Table 2: Base case with capacitors

After the overall conversation of the 4.16 kV to 25 kV systems was consider for loss reduction. The below table is the findings of the mitigation scenario.

System Energy Losses				Power Losses
Seasons	Peak kWh	Mid-Peak kWh	Off peak kWh	Total AVG kW-Weekday
Summer	51,489.92	57,788.56	88,774.36	289.62
Winter	86,200	71,318	100,858	381

Table 3: Re-modeling to 25 kV

System Loss Differential:

The difference in the losses between the base case in Table 2 and new scenario in Table 3 provides the incremental loss savings resulting from the 25 kV systems. The below Table illustrates the loss savings for average days for each seasonal period.

System Energy Savings Loss				Power Savings Loss
Seasons	Peak kWh	Mid-Peak kWh	Off peak kWh	On peak kW
Summer	8,053	5,441	5,337	30.4
Winter	41,367	42,178	40,019	188

Table 4: Loss Savings for full 25 kV Chapleau PUC DS

The following Time-of-Use Schedule is used for the analysis:

Two PEAK Seasons: Summer & Winter

People use electricity differently depending on the season. The Ontario Energy Board, therefore, has established two sets of peak prices. These prices only apply to weekdays. Electricity is at its cheapest price all day on weekends and holidays throughout the year.



Summer Weekdays

May 1 - October 31

In Summer, electricity use peaks during the hottest part of the afternoon, when air conditioners are running on high. On-peak hours are mid-day.



Winter Weekdays
November 1 - April 30

In Winter, less daylight means electricity use peaks twice: once in the morning when people wake up and turn on their lights and appliances, then again when people get home from work. There are two sets of on-peak hours to reflect this.