**Instructions Manual**

**This documentation provides usage instructions for the transformer overloading evaluation algorithm with selected heat pump and EV penetration levels.**

1. **Data Preparation:**

* You need to prepare 2 Excel files in the “.xlsx” extension:

1. AMI\_Data.xlsx
2. transformer\_customer\_info.xlsx

* **AMI\_Data.xlsx:**

This is the file to store one-year hourly AMI data for all the customers in a feeder. The format of the file is as follows:

A screenshot of a data

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Headers: Date, Hour, Day Type, Season, Customer X.

Data Format:

Date: YYYY-MM-DD or MM/DD/YYYY

Hour: **Hour** of the day from the data (0 to 23)

Day type: Specify if the date is a **weekday** or **weekend**

Season: season based on current date. Spring – Mar, Apr, May; Summer – June, July, Aug; Fall – Sep, Oct, Nov; Winter – Dec, Jan, Feb.

Customer X: customer AMI data, from customer 1 to customer n.

* **AMI\_Data.xlsx:**

This is the file to store transformer specifications and transformer-customer connectivity in a feeder. The format of the file is as follows:

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Headers: Transformer, Transformer Rating (kVA), Customer Indexes, Transformer Rating (kW)

Data Format:

Transformer: transformer labels.

Transformer Rating (kVA): KVA rating of the transformer.

Customer Indexes: specify which customers are connected to this transformer.

Transformer Rating (kW): transformer kVA rating converted to kW rating, you can assume a power factor.

1. **Algorithm Usage:**

First, open **Customer profile** **Gen\_EV\_HP.py** for aggregated load profile generation. You need to specify the penetration level of the EV and heat pump (They can be zero).

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Note that this is the number of customers, not the percentage.

Run the rest of the code, and you will get a file in the output folder called “Final Aggregated Data\_EVPenLevel\_{Pen\_Level\_EV} and HPPenLevel\_{Pen\_Level\_HP}.xlsx

The value of {Pen\_Level\_EV} and {Pen\_Level\_HP} will be the same as the one you set. You may change the penetration level and generate multiple profiles.

Next, open **Transformer overloading.py**. Change the Penetration Level to the file that you generated in the previous step.

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Run the rest of the code, you will get an Excel file in the output folder called “Transformer\_Load\_Analysis\_Results\_pen\_level\_{Pen\_Level\_EV} and {Pen\_Level\_HP}.xlsx” with your specified penetration levels.

This file contains three sheets. The first one is the maximum load per transformer over a year. The second one is the count of overloads per transformer over a year. The third one is the monthly overload breakdown for each transformer.