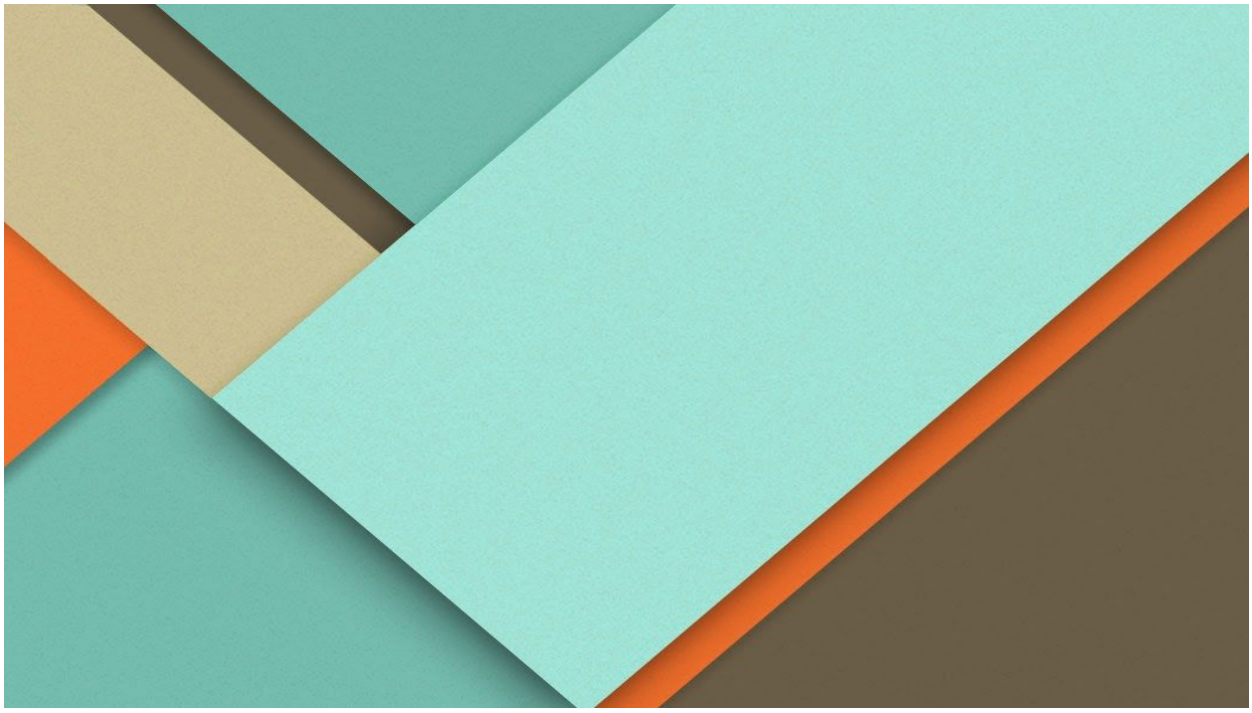

Development of Efficient Electricity Distribution Model

20.10.2020

Team AM

Aryan Kharbanda (2019101018)
Mayank Jain (2019101023)
Umang Srivastava (2019101090)
Arth Raj (2019101094)
Kshitij Mishra (2019111014)

Done and Doing

Division of the model into Levels of Distribution

Stage 1 involved Construction of the Graph i.e. defining the levels of our World and how they will be involved in our algorithm. In our graph we are provided with the coordinates of the houses (the 4th layer).

The locations of the substations will be decided on the basis of the clusters formed...basically we will find the clusters of houses and assign a substation at the mean position of the coordinates of the locality.

The clusters will form the third layer of the structure i.e. the localities. After the substations have been assigned the coordinates, we will connect the substation with every house present in the locality.

Thus we will obtain several connected components. Here the Substations are the second layer of our city structure. Now The first layer i.e. the Source will now be connected to the substations and the location of the Source will be the mean of the coordinates of the substations.

Thus the city will be now a fully connected graph...with the root of the city as the Source(the first layer).

Algorithms and Working on the Model

Making algorithms for graph selection and preparation. This will include making clusters of houses based on average electricity consumption by each house.

Average consumption will be calculated on the basis of historic data, survey and sampling. This data will include appliances in each household and their power consumption along with the time of consumption.

Making algorithm for load-shedding during peak consumption period. This will be done by prioritising comercial, industrial and household consumptions. Electricity will be sent only to the clusters of houses with maximum earning potential. The load-shedding will be done on a rotatory basis to meet demands of each and every sector.

Adding and modifying algorithms for enabling solar energy accumulation by households. This will allow us to include the fact that extra solar energy collection can be sent back to the grid

Layout of our Model

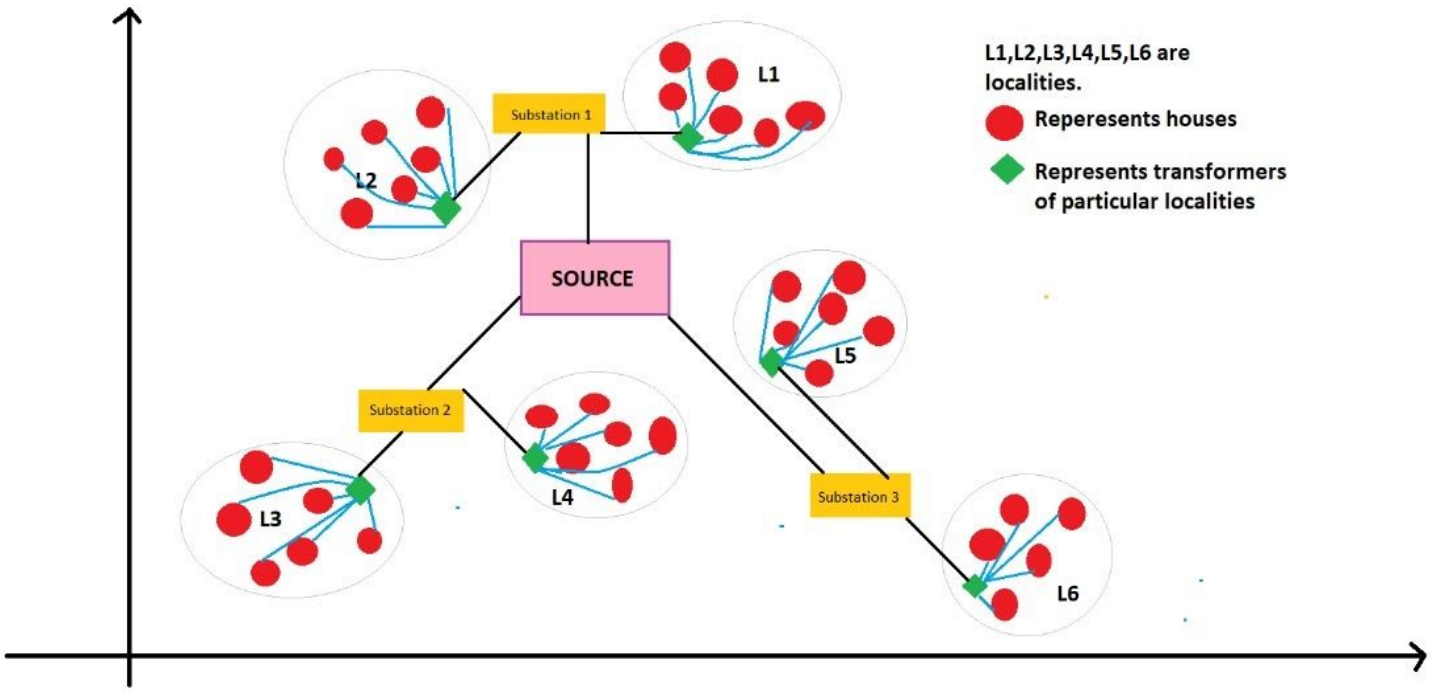

Fig 1. Graph Showing Various Levels of Distribution Model

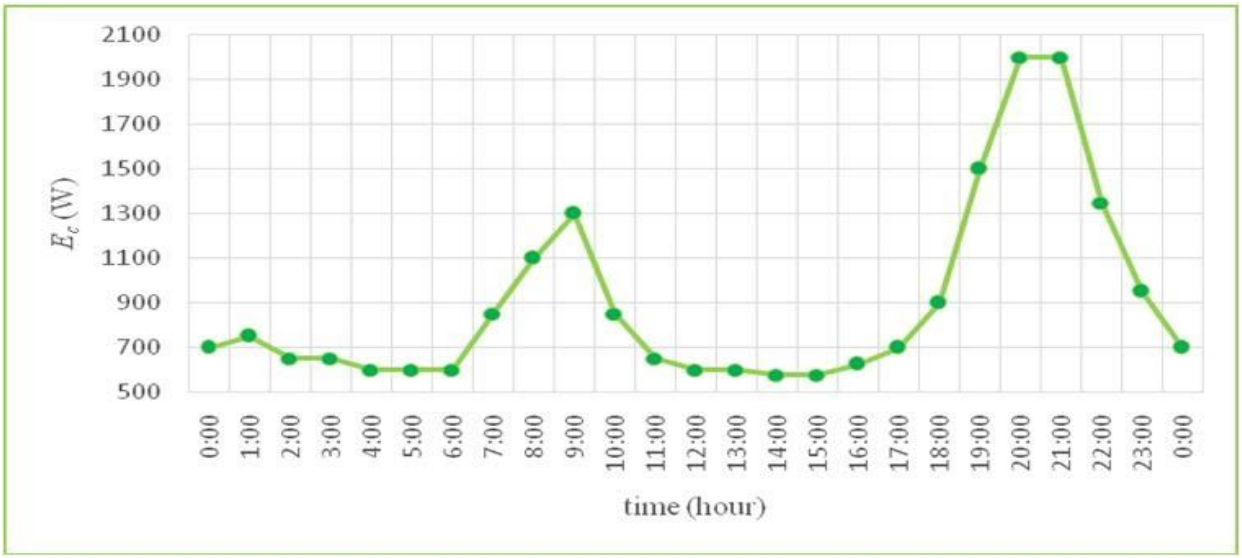

Fig 2. Typical hourly consumption of electricity in an average household

Some Images to convey the idea of distribution

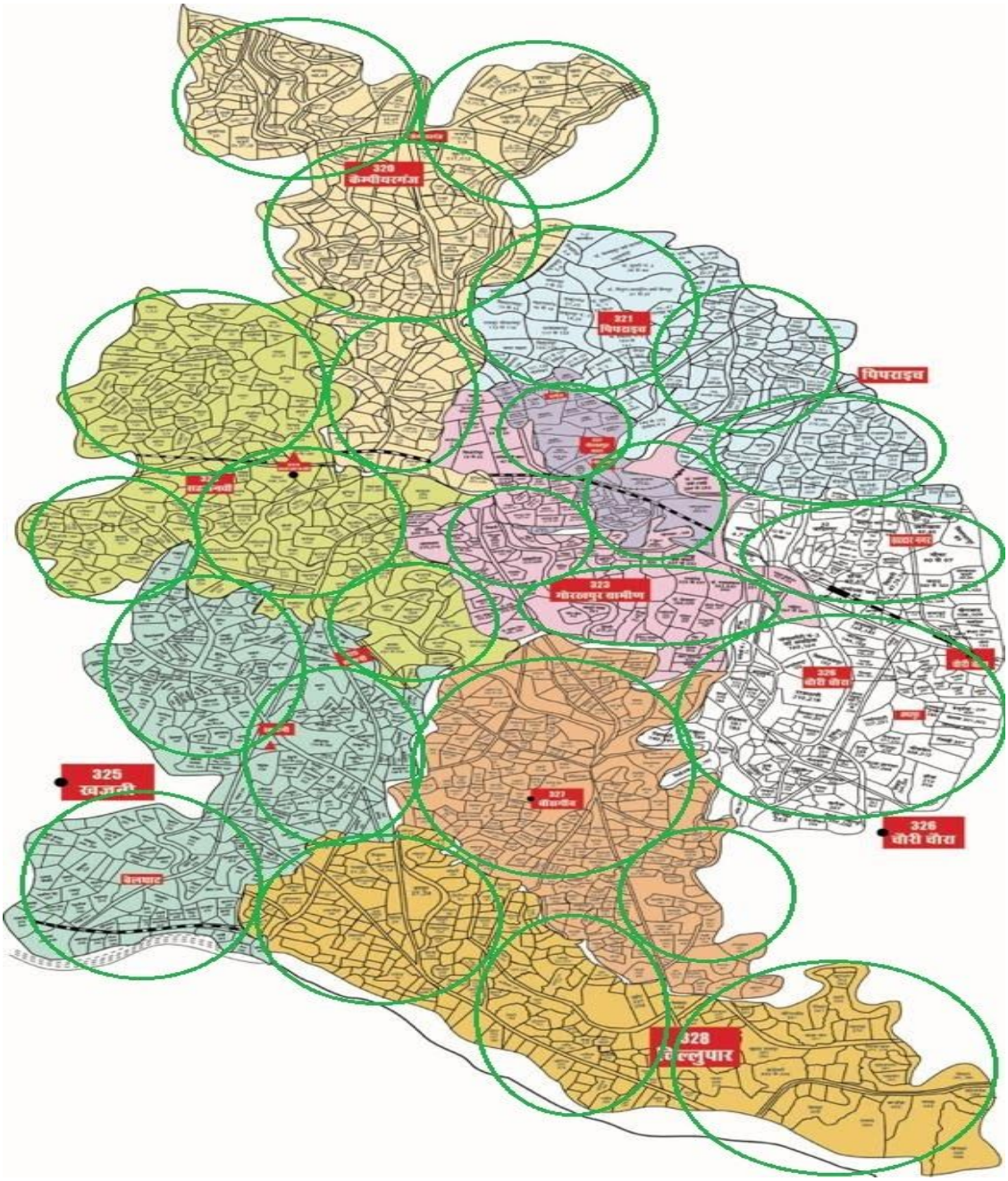

Fig 3. Division of the area into zones/localities

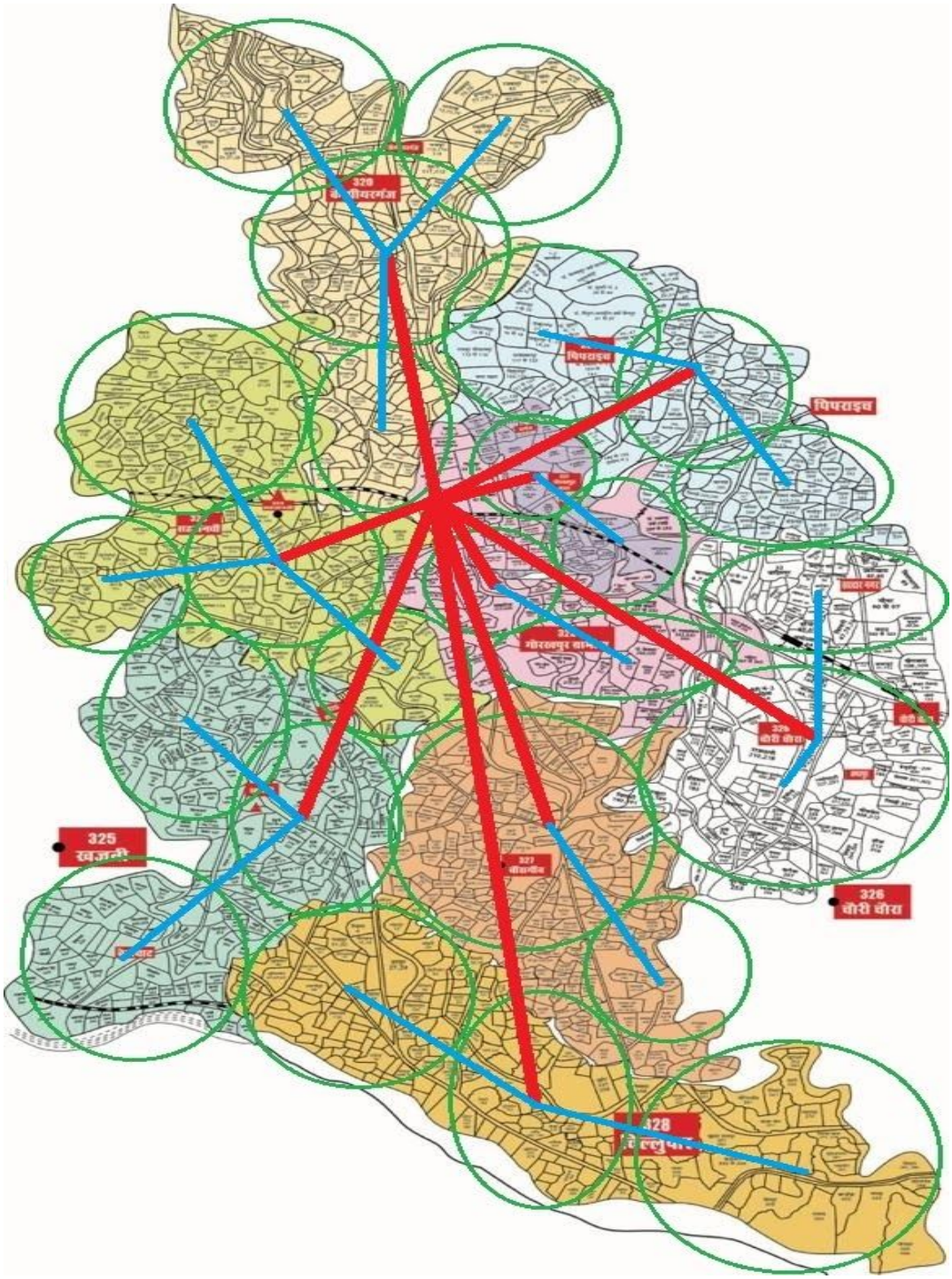

Fig 4. Connecting Various localities to Substations and then connecting substations to Central Power Station

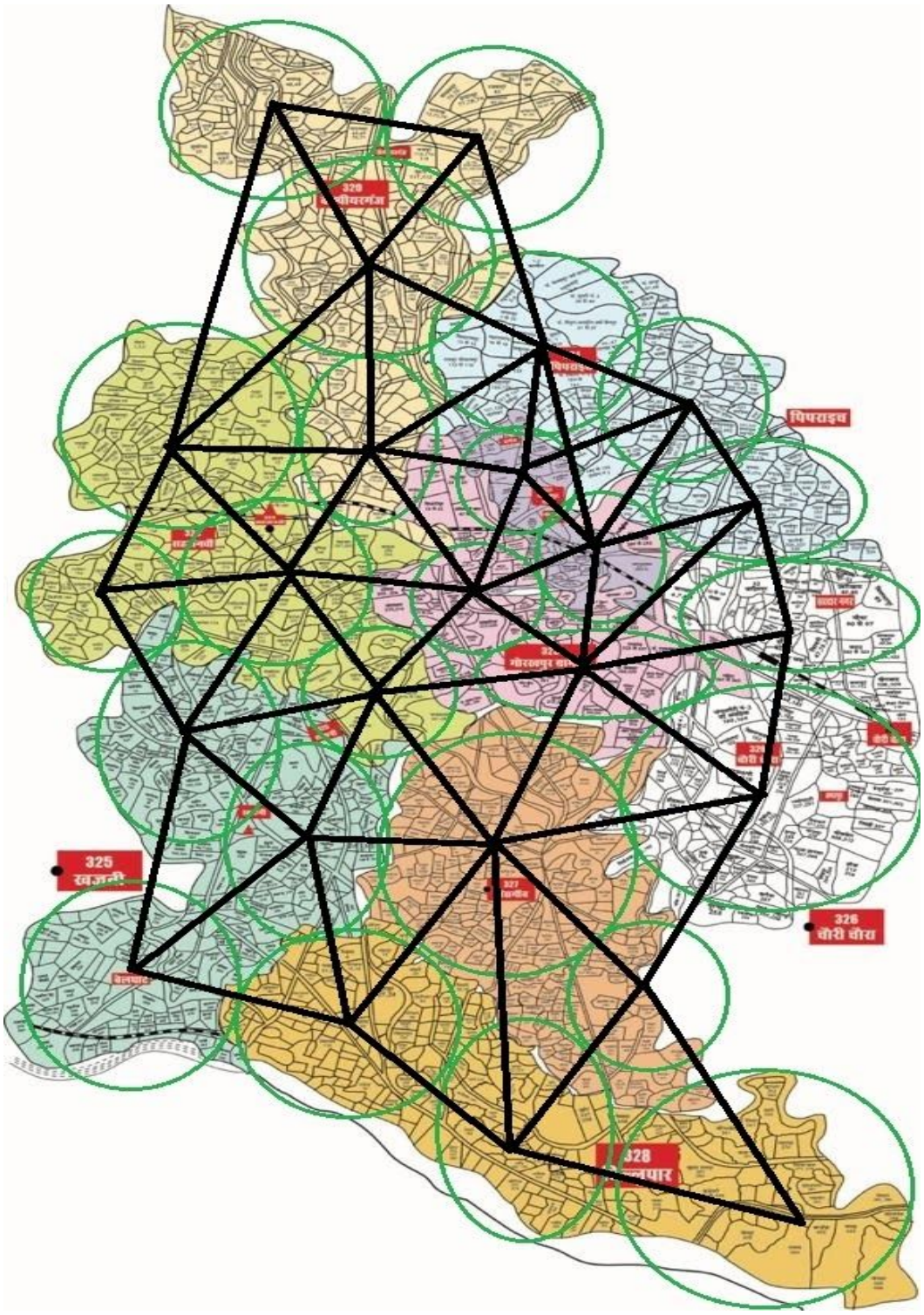

Fig 5.. All Substations Interconnected to remove dependency of a particular locality on just one source. This guarantees reliability in terms of power distribution

Knapsack - An important Algorithm in this Model

To achieve an efficient energy consumption and distribution in our proposed map, the end-users are equipped with some energy controller technologies.

We as well as the consumers note the pattern of consumption and distribution and we get details about the cost of operation in that locality.

This kind of information is provided to assist them in making decisions about altering their consumption behaviour as well as directing electricity intelligently in case of emergencies. Also in case of 2-way distribution of electricity(as the suggestion given), such information can help users decide the amount of energy they need to consume and the amount they need to outsource.

Knapsack can help us in finding the optimum layout of transmission wires for maximum profit and minimum wastage of power. This will help massively in peak hours of consumption. With this approach, not only will the cost of electricity not escalate during peak hours, but also user preferences, satisfaction and minimum change to current lifestyle will be considered.

Also, during peak hours in a day power consumption is usually high and demand exceeds the amount of power a substation has to resolve this problem. We distribute electricity to different houses using different substations in such a way that maximum no of houses receive electricity and demands are matched. To implement this, we use the knapsack approach.