

# Selection of Capacity of the Power Plant

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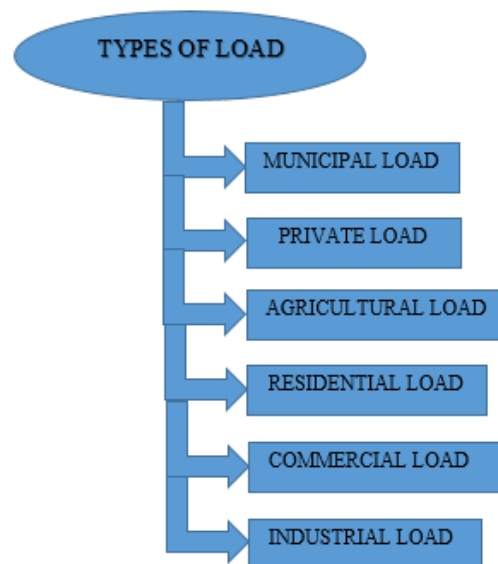
**ABSTRACT:** The power plant is a wide area with reference to electricity. There are different areas of power system are generation of electricity, transmission of electricity and distribution of electricity. The power plant introduces under generation of electricity. The power plant used to fulfil the demand of electricity which is required to operate the device or system. The construction of power plant basically depends upon the demand of customer, which is calculated by demand factor and the connected load. Here in this research paper two areas, area 1 and area 2 has been selected, where the data has been collected from different sources. The calculation of demand factor has been done for area 1 and area 2, according to the demand of consumer and connected load. After the calculation of demand factor, analysis has been done for area 1 and area 2. According to the value of demand factor, different connected loads has been analyzed.

**KEYWORDS:** Connected load, Demand factor, Maximum demand, Power plant, Electricity, Capacity.

## INTRODUCTION

The power systems divide in to the main 3 parts are transmission, generation & the distribution. This generation generates the electricity, transmission transmit the electricity and distribution distributes the electricity [1][2]. power plant comes under the generation of electricity. So the power plant is used to generate the electricity. Power plants used for generation of electricity used to operates large industries, for domestic purpose and can distribution of electricity to remote areas [3]. The load depends upon the electricity application. It takes power as input. The loads are of different types depends where it is connected with the system [4].

The types of load factor are shown in Figure 1 [4].



**Figure 1: Types of load**

The peak demand is called the maximum demand. In the load curve shows the power demand to the duration of demand [5]. So the peak value of power demand to the load is called the maximum demand. The system which are connected to as load, it does not depend whether the system is taking input power or not is called the connecting load [6]. Demanding factors is ratio of the maximum demands from consumer for the load connection. This is beneficial to select the rating of power plant. As the rating of power plant depends upon the demand of consumer and connected load [7][8]. The value of demand factor is one or less than one.

*Research Question*

- Why demand factor is important?
- What is the role of demand factor in improvement of generation of electricity?

**LITERATURE REVIEW**

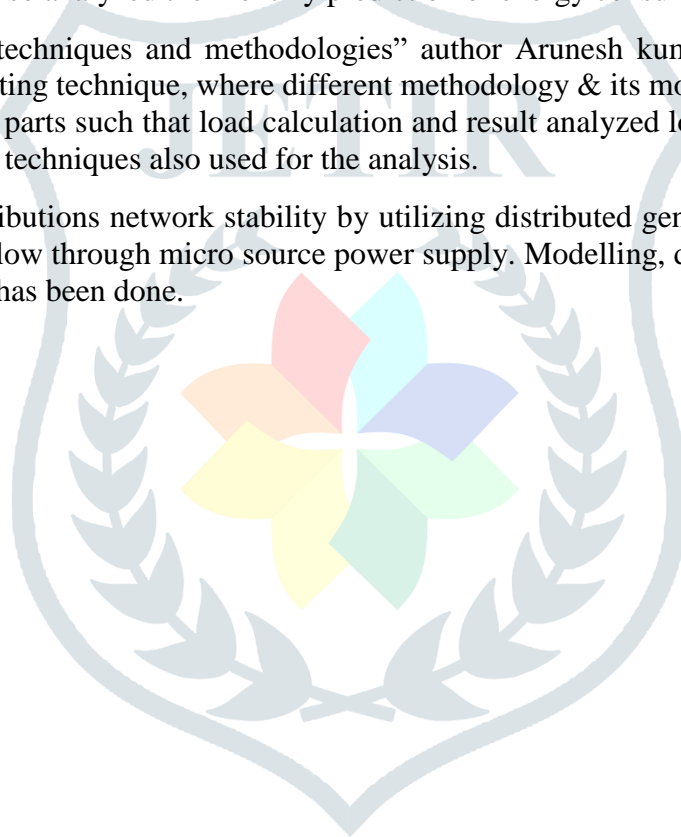
There are different researches related to details of Selection of capacity of the power plant. In which the following are some description:

As in “Load surveys & maximum the power demanding for the transformer into power systems networks into Ondo states Ondo western of case study” author akinrinmade’s akinkugbe’s fedelis et.al analyzed the load density with selected range and the value of load factor and demand factor analyzed with range of demand factor range from 1.1% to 4.0%.

As in “Estimate consumption of energy & the power demanding for the small power equipments into the office building” author A.C. Meneze et.al analyzed the different factor for office building where small power equipments are used and also analyzed the monthly prediction of energy consumption.

As in “Load forecasting techniques and methodologies” author Arunesh kumar Singh et.al reviewed electricity demand forecasting technique, where different methodology & its model are used. Data analysis has been done in different parts such that load calculation and result analyzed load input in hours, weekly, monthly, yearly. Different techniques also used for the analysis.

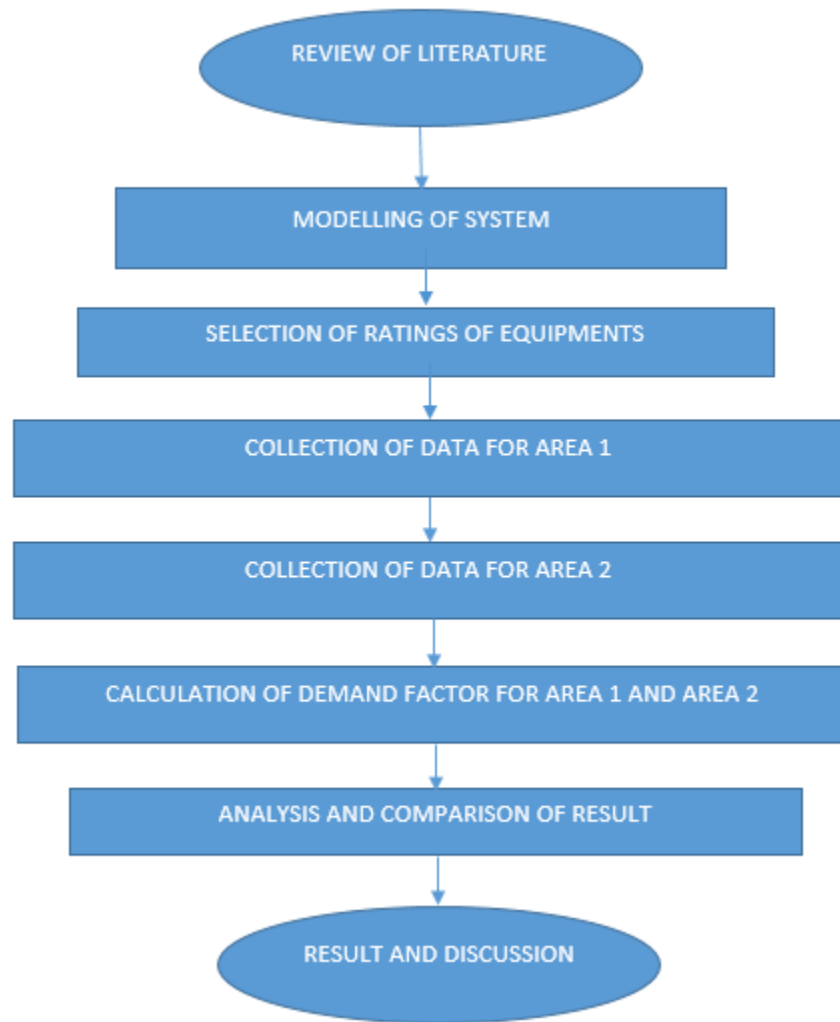
As in “Enhanced the distributions network stability by utilizing distributed generations” author Francisco jurado analyzed the load flow through micro source power supply. Modelling, design and experimentation results of selected system has been done.



## METHODOLOGY

### 1. Design:

The methodology of calculation and analysis of demand factor is shown in Figure 2.



**Figure: 2 Methodology**

### 2. Sample:

The instruments used in this research are at rated calculated value, according to the calculation of demand factor for area 1 and area 2. Above which the equipment may burn. Some measuring instruments are also used for this experiment research. The data of a power plant has been collected to calculate the demand factor, maximum demand and connected load, according to the demand of energy.

### 3. Instrument:

In this Research, data has been collected by survey of areas of generation and distribution of electricity. Analysis has been done by calculation of connected load, demand factor and maximum demand of electricity.

4. Data Collection and Analysis:

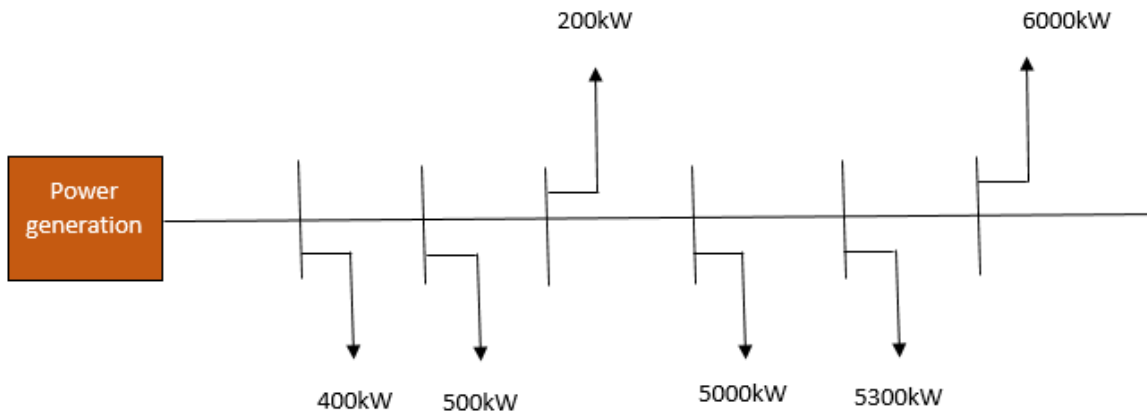


Figure 3: Different load connections of Area 1

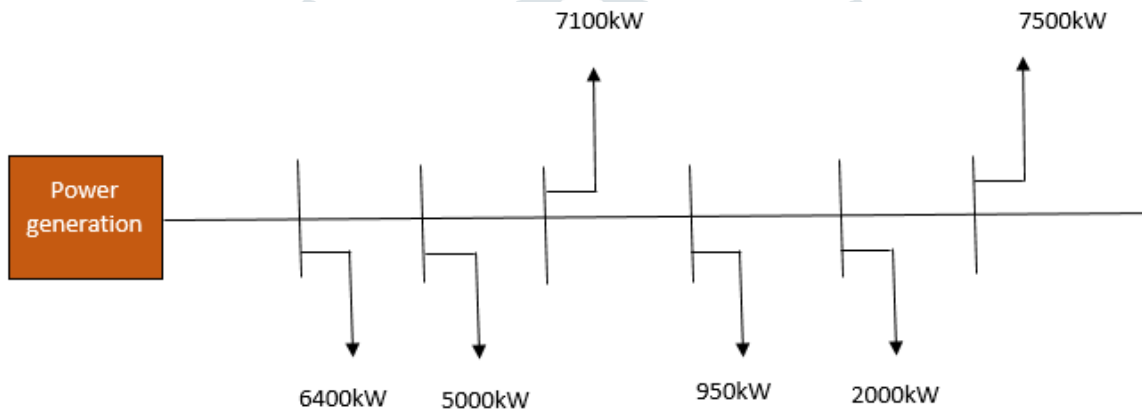


Figure 4: Different load connections of Area 2

Table 1: Collection of data (Area 1)

Consumer 1	Municipal load	400kW
Consumer 2	Private load	500kW
Consumer 3	Agricultural load	200kW
Consumer 4	Residential load	5000kW
Consumer 5	Commercial load	5300kW
Consumer 6	Industrial load	6000kW

Table 2: Collection of data (Area 2)

Consumer 1	Municipal load	6400kW
Consumer 2	Private load	5000kW
Consumer 3	Agricultural load	7100kW
Consumer 4	Residential load	950kW
Consumer 5	Commercial load	2000kW
Consumer 6	Industrial load	7500kW

**Table 3: Maximum demand for different loads**

Maximum demand	In kW
Municipal load	350
Private load	400
Agricultural load	150
Residential load	900
Commercial load	1500
Industrial load	5500

Calculation of demand factor for Area 1

$$\text{Demand factor for municipal load} = \frac{\text{Maximum demand for municipal load}}{\text{Connected load}}$$

$$\text{Demand factor for municipal load} = \frac{350}{400} = 0.87$$

$$\text{Demand factor for private load} = \frac{\text{Maximum demand for private load}}{\text{Connected load}}$$

$$\text{Demand factor for private load} = \frac{400}{500} = 0.80$$

$$\text{Demand factor for agriculture load} = \frac{\text{Maximum demand for agriculture load}}{\text{Connected load}}$$

$$\text{Demand factor for agriculture load} = \frac{150}{200} = 0.75$$

$$\text{Demand factor for residential load} = \frac{\text{Maximum demand for residential load}}{\text{Connected load}}$$

$$\text{Demand factor for residential load} = \frac{900}{5000} = 0.18$$

$$\text{Demand factor for commercial load} = \frac{\text{Maximum demand for commercial load}}{\text{Connected load}}$$

$$\text{Demand factor for commercial load} = \frac{1500}{5300} = 0.28$$

$$\text{Demand factor for industrial load} = \frac{\text{Maximum demand for industrial load}}{\text{Connected load}}$$

$$\text{Demand factor for industrial load} = \frac{5500}{6000} = 0.91$$

Calculation of demand factor for Area 2

$$\text{Demand factor for municipal load} = \frac{\text{Maximum demand for municipal load}}{\text{Connected load}}$$

$$\text{Demand factor for municipal load} = \frac{350}{6400} = 0.054$$

$$\text{Demand factor for private load} = \frac{\text{Maximum demand for private load}}{\text{Connected load}}$$

$$\text{Demand factor for private load} = \frac{400}{5000} = 0.08$$

$$\text{Demand factor for agriculture load} = \frac{\text{Maximum demand for agriculture load}}{\text{Connected load}}$$

$$\text{Demand factor for agriculture load} = \frac{150}{7100} = 0.02$$

$$\text{Demand factor for residential load} = \frac{\text{Maximum demand for residential load}}{\text{Connected load}}$$

$$\text{Demand factor for residential load} = \frac{900}{950} = 0.94$$

$$\text{Demand factor for commercial load} = \frac{\text{Maximum demand for commercial load}}{\text{Connected load}}$$

$$\text{Demand factor for commercial load} = \frac{1500}{2000} = 0.75$$

$$\text{Demand factor for industrial load} = \frac{\text{Maximum demand for industrial load}}{\text{Connected load}}$$

$$\text{Demand factor for industrial load} = \frac{5500}{7500} = 0.73$$

Here in this research paper area 1 and area 2 data has been collected. The area 1 & 2 as show into Figure 3 and Figure 4 where different loads are connected for the distribution of electricity. Load is connected to the system which is working as sink for electricity. By taking maximum power 100MW for both system 1 and system 2 the calculation of load factor has been done. Table 1, Table 2 and Table 3 shows the data collection of different loads [9][10].

## RESULTS & DISCUSSIONS

The calculation and analysis of demand factor for area 1 and area 2 has been done successfully. Where different loads of area 1 and area 2 has been selected are Municipal load, private load, agricultural load, residential load, commercial load and industrial load. For area 1 best utilization of electricity has been done by Municipal load, private load, Agricultural load and industrial load because the demand factor of loads are more. Similarly, for area 2 best utilization of electricity has been done by residential load, commercial load and industrial load because the demand factor of loads is more.

## CONCLUSION

This research analyzed by designing system and calculation approaches. From the above research it is found that the calculation of demand factor has been done for two areas, area 1 and area 2. Result of calculation of demand factor for both the areas is calculated and analyzed that the best utilization of electricity has been done by residential load of area 2, because the demand factor of residential load for area 2 is 0.94, which is nearly one and the worst utilization of electricity has been done by agricultural load of area 2, because the demand factor of agricultural load for area 2 is 0.02. For future scope the demand factor for other systems can be analyzed and different factors which are beneficial for efficient generation of electricity can be calculated and analyzed.

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