

# **Savings in electricity bill without any investments; just by revising the Contract Demand for Bajrang (Railway) Colony in Jabalpur.**

Sandeep Kumar Yadav  
M. Tech (Part Time), Power System Automation  
GGITS, Jabalpur

S.K. Bajpai  
Prof. Electrical Engg.  
GGITS, Jabalpur

Rajeev Chauhan  
HOD Electrical Engg.  
GGITS, Jabalpur

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**Abstract** – In this paper the existing electrical distribution network of Bajrang (Railway) colony in Jabalpur with specific reference to the Contract, Maximum and Billing Demand in colony substation has been critically studied.

It includes proposal of revision in existing contract demand to optimize Load Factor and minimize billing outlay in the electricity supply arrangement of Railway Colony.

Analytical method has been used for calculation.

**Keywords** – kVA rating, Maximum Demand, Contract Demand, Billing Demand, Tariff, Load Factor.

Table – 1 Billing details of Bajrang Colony Substation for the period of Apr 2017 to Mar 2018.

| Month   | Billing demand kVA | MD kV A | Gross amount in ₹ | Units kWh | Load Factor In % | PF   |
|---------|--------------------|---------|-------------------|-----------|------------------|------|
| Apr 17  | 113                | 95      | 328001            | 44467     | 51               | 0.96 |
| May 17  | 113                | 100     | 368912            | 49874     | 56               | 0.95 |
| June 17 | 113                | 103     | 362777            | 49467     | 57               | 0.96 |
| July 17 | 113                | 94      | 297549            | 39667     | 43               | 0.97 |
| Aug 17  | 113                | 93      | 293604            | 39280     | 43               | 0.98 |
| Sep 17  | 113                | 99      | 309989            | 41980     | 47               | 0.98 |
| Oct 17  | 113                | 85      | 220249            | 28353     | 41               | 0.98 |
| Nov 17  | 113                | 103     | 221673            | 28747     | 31               | 0.98 |
| Dec 17  | 113                | 76      | 212763            | 27813     | 31               | 0.99 |
| Jan 18  | 113                | 95      | 225994            | 32166     | 34               | 0.99 |
| Feb 18  | 113                | 101     | 228868            | 30873     | 33               | 0.98 |
| Mar 18  | 113                | 82      | 229151            | 29793     | 36               | 0.96 |

**I. Introduction**

Existing Electrical installation of Bajrang (Railway) colony substation in Jabalpur has been reviewed in this paper.

Discom billing [2] for Bajrang Colony substation in Jabalpur is studied for the period of April 2017 to March 2018 and review of Contract Demand has been suggested for optimum billing to reduce the financial burden.

**II. Existing Billing pattern in Colony.**

**1. Billing in Bajrang Colony Substation :-**

Contract Demand is 125 kVA for Bajrang Colony substation. Billing pattern of Bajrang Colony is as under –

**Bajrang Colony  
Contract Demand vs Maximum Demand  
vs Billing Demand**

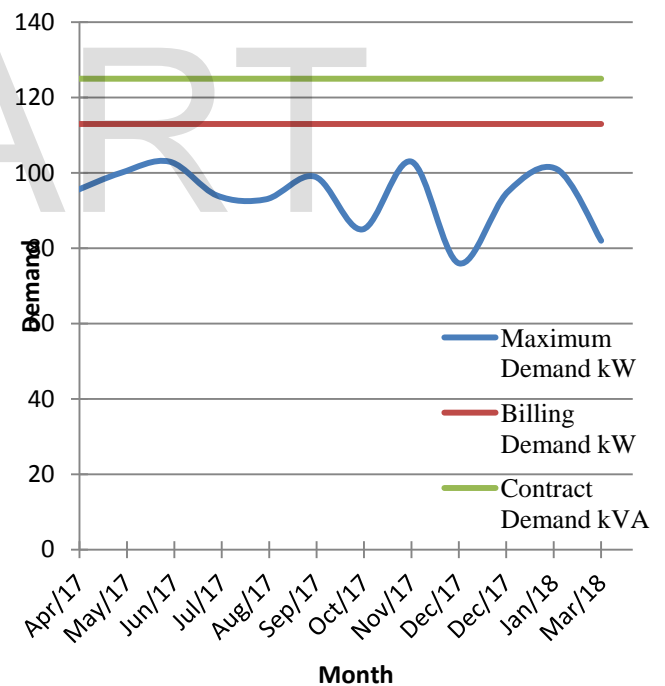


Fig – 1 Graph of Contract Demand, Maximum Demand & Billing Demand of Bajrang Colony Substation for the period April 2017 to Mar 2018.

**III. SHORTCOMINGS IN PRESENT SYSTEM**

**Power Factor Percentage incentive payable on billed energy charges**

From Table-1 it is clear that against contract demand of 125 kVA Colony substation recorded 103 kVA maximum demand.

**1. Tariff<sup>[1]</sup> :**

- Above 95% and up to 96% - 1.0 %
- Above 96% and up to 97% - 2.0 %
- Above 97% and up to 98% - 3.0 %
- Above 98 % up to 99% - 5.0 %
- Above 99 % - 7.0 %

**Table – 2 Madhya Pradesh Tariff for 11 kV HT sub category 6.1 Bulk Residential Users.**

| Sl No. | Category of consumers | Monthly Fixed Charge (Rs. / kVA) of billing demand per month | Energy Charge for consumption up to 50% load factor (paise / unit) | Energy Charge for consumption in excess of 50% load factor (paise / unit) |
|--------|-----------------------|--|--|---|
| 1      | 11 kV supply          | 290  | 585  | 530   |

**Determination of Demand:** The maximum demand of the supply in each month shall be four times the largest number of kilovolt ampere hours delivered at the point of supply during any continuous 15 minutes during the month as per sliding window principle of measurement of demand.

**Billing demand:** The billing demand for the month shall be the actual maximum kVA demand of the consumer during the month or 90% of the contract demand, whichever is higher.

**2. Power Factor Incentive:**

Power factor incentive shall be payable as follows:

**3. Load factor calculation**

The Load Factor shall be calculated as per the following formula:

$$\text{Load Factor (\%)} = \frac{\text{Monthly consumption X 100}}{(\text{No. of hours in the billing month X Demand (KVA) X PF})}$$

i. Monthly consumption shall be units (kWh) consumed in the month excluding those received from sources other than Licensee.

ii. No. of Hours in billing month shall exclude period of scheduled outages in hours.

iii. Demand shall be maximum demand recorded or contract demand whichever is higher.

iv. Power factor shall be 0.9 or actual monthly power factor whichever is higher.

**4. Additional Charges for Excess Demand**

i. The consumer shall at all times restrict their actual maximum demand within the contract demand. In case the actual maximum demand in any month exceeds 115% of the contract demand, the tariffs given in various schedules shall apply to the extent of the 115% of the contract demand only.

The consumer shall be charged for excess demand computed as difference of recorded maximum demand and 115% of contract demand on fixed charges and while doing so, the other terms and conditions of tariff, if any, shall also be applicable on the said excess demand. The excess demand so computed, if any, in any month shall be charged at the following rates from all consumers except Railway Traction.

ii. Energy charges for excess demand: No extra charges are applicable on the energy charges due to the excess demand or excess connected load.

iii. Fixed charges for Excess Demand:  
- These charges shall be billed as per following:

1. Fixed charges for Excess Demand when the recorded maximum demand is up to 130% of the contract demand: Fixed charges for Excess Demand over and above the 115 % of contract demand shall be charged at 1.3 times the normal fixed charges.

2. Fixed charges for Excess Demand when the recorded maximum demand exceeds 130% of contract demand: In addition to fixed charges in 1 above, recorded demand over and above 30 % of the contract demand shall be charged at 2 times the normal fixed charges.

#### **IV Reduction of CD to 90 kVA.**

As per applicable tariff of MPSEB the MD charges are applicable for any recorded MD between 90% to 115% of CD. If the recorded MD is less than 90% of CD then the Billing Demand will be 90% of CD and if the recorded MD exceeds 115% of CD then penalty is levied by additional 30% of Demand Rate. As such in case we so decide to reduce the CD to 90 kVA then normal demand charges @ Rs 290/kVA will be levied for any recorded demand between 81 kVA (90% of CD) and 103.5 kVA (115% of CD). As per records of recorded MD, this

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From bills it is noticed that Recorded Maximum Demand is 103 kVA and power factor gradually improved upto 0.99. Billing demand is 113 kVA.

The electricity tariff provides for two energy charges –

1). Rs 5.85 for consumption upto 50% Load Factor.

2) Rs 5.30 for consumption in excess of 50% Load Factor.

As per meter reading records already discussed, the LF in the prevalent system is less than 50% for 9 months and is above 50% only for 3 months i.e. Apr, May and June. With the reduction in CD the LF will improve and as tabulated hereunder will now be more than 50% in 7 months of the year. As such now reduced per unit charges of Rs 5.30 will be applicable for these months.

As such by revising the contract demand the financial benefits will be two fold, one by way of reduction in demand charge & other by way of reduction in energy charges.

Detailed calculations are indicated in the table below.

reduction to 90 kVA suits the best.

Table – 3 Savings after reduction in contract demand in case of Bajrang Colony Substation for the period of Apr 2017 to Mar 2018.

| Sl. No. | Existing with CD-125 kVA |           |      |           |                  |  | After restructuring with CD-90 kVA |                                     |  |
|---------|--------------------------|-----------|------|-----------|------------------|--|------------------------------------|-------------------------------------|--|
|         | Month                    | MD in kVA | PF   | Units kWh | Load Factor in % | Monthly Fixed cost charges             | Load Factor in %                   | Savings due to LF improvement in Rs | Monthly Fixed cost charges             |
| A       | B                        | C         | D    | E         | F                | H = 290 x BD or MD whichever is higher | I                                  | J = E x 0.55 when F ≤ 50 and I ≥ 51 | K = 290 x BD or MD whichever is higher |
| 1       | Apr 17                   | 95        | 0.96 | 44467     | 51               | 32770                                  | 67                                 | -                                   | 27550                                  |
| 2       | May 17                   | 100       | 0.95 | 49874     | 56               | 32770                                  | 70                                 | -                                   | 29000                                  |
| 3       | June 17                  | 103       | 0.96 | 49467     | 57               | 32770                                  | 69                                 | -                                   | 29870                                  |
| 4       | July 17                  | 94        | 0.97 | 39667     | 43               | 32770                                  | 57                                 | 21816.85                            | 27260                                  |
| 5       | Aug 17                   | 93        | 0.98 | 39280     | 43               | 32770                                  | 57                                 | 21604.00                            | 26970                                  |
| 6       | Sep 17                   | 99        | 0.98 | 41980     | 47               | 32770                                  | 59                                 | 23089.00                            | 28710                                  |
| 7       | Oct 17                   | 85        | 0.98 | 28353     | 41               | 32770                                  | 56                                 | 15594.15                            | 24650                                  |
| 8       | Nov 17                   | 103       | 0.98 | 28747     | 31               | 32770                                  | 37                                 | -                                   | 29870                                  |
| 9       | Dec 17                   | 76        | 0.99 | 27813     | 31               | 32770                                  | 43                                 | -                                   | 23490                                  |
| 10      | Jan 18                   | 95        | 0.99 | 32166     | 34               | 32770                                  | 44                                 | -                                   | 27550                                  |
| 11      | Feb 18                   | 101       | 0.98 | 30873     | 33               | 32770                                  | 40                                 | -                                   | 29290                                  |
| 12      | Mar 18                   | 82        | 0.96 | 29793     | 36               | 32770                                  | 50                                 | -                                   | 23780                                  |
| Total   |                          |           |      |           |                  | 393240                                 |                                    | 82104.00                            | 3,27,990                               |

By reducing CD alone a net saving of  
 (From fixed charges) ₹ 3,93,240/-  
 (-) 3,27,990/-  
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 65,250/-  
 By improvement in Load Factor - ₹ 82,104/-  
 Total ₹ 65,250 + ₹ 82,104 = ₹ 1,47,354/- in a year.

#### IV Conclusion -

Reviewing contract demand of Bajrang colony a substantial amount of revenue saving i.e. ₹ 1,47,354/- in a year on account of billing outlay could be achieved by Railway. It is pertinent to note that these savings are available just by critical analysis of billing data and do not call for any financial investment.

#### REFERENCES -

- 1). “Retail supply tariff order FY 2017-18” by Madhya Pradesh Electricity Regulatory Commission, Bhopal.
- 2). Discoms Bill for the colonies for the period April-17 to March-18.

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