

PUNJAB STATE POWER CORPORATION LIMITED

***REPORT ON EXAMINATION OF IMPLEMENTATION OF
KVAH BASED TARIFF***

SEPTEMBER, 2013

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A1: APPROACH TOWARDS KVAH TARIFF DETERMINATION

Background and Context

- 1.1. In July 2013, PSPCL had submitted a petition to the Hon'ble PSERC for the introduction of kVAh tariff on Large Supply (LS) consumers with a minimum connected load of 100 kW. The Hon'ble Commission had then advised PSPCL to submit a revised petition after including the provision of introducing kVAh tariff for Medium supply category consumers as well as assessing the impact of implementing kVAh tariff on all the said consumers on an annual basis.
- 1.2. In light of the above, this study proposes that kVAh tariff be implemented on the following categories of consumers:
 - Large Supply (LS) Consumers: All sub-categories
 - Medium Supply (MS) Consumers
- 1.3. This report lays out the methodology used for carrying out the analysis for identifying the respective consumption factors and assessing the impact on consumers, as well as findings from the study.

Data Analysis

- 1.4. For assessing the impact of implementation of kVAh tariff on the consumers in the above categories, and estimating the required conversion factor, the billing details from the Meter Reading Download (MRD) files of LS & MS Consumers for the period FY 2012-13 has been considered.
- 1.5. The following parameters which have been extracted from the respective MRD files for the analysis:

Large Supply (LS) billing data:

- Tariff sub-category
- Billing cycle
- Consumer name
- Consumer's connected load
- Energy consumption in kWh
- Current SOP
- Surcharge/rebate due to Power Factor
- Average Power Factor

- Energy consumption in kVAh

Medium Supply (MS) billing data:

- Billing cycle
- Consumer's master key
- Consumer's connected load
- Energy consumption in kWh
- Current SOP
- kVAh meter reading

Approach

- 1.6. In purely mathematical terms, the kVAh recorded by the meter can be correlated to the kWh by the equation as under:

$$\text{KVAH} = \frac{\text{KWH}}{\text{Power Factor}} \quad \text{--- (1)}$$

- 1.7. Considering that power factor is always less than one, the kVAh reading recorded in a meter would always be more than the kWh reading.
- 1.8. For the purpose of implementing kVAh tariff on all LS and MS category consumers in PSPCL, a revenue neutral approach has been adopted wherein the overall revenues/bill for a particular consumer category/sub-category would remain the same as is the case with the current kWh billing system.
- 1.9. Therefore, in order to arrive at the kVAh based tariffs in a revenue neutral scenario, we have used a multiplication/conversion factor, which is normally equal to the desired value of the power factor, and the equation as:

$$\text{Tariff KVAH} = \text{Tariff KWH} \times \text{Conversion Factor} \quad \text{---(2)}$$

- 1.10. For instance, in the event that in the existing scenario the net Power Factor surcharge/rebate for a particular consumer category is nil, the conversion factor (CF) would be equal to the power factor (PF).

Methodology and Assumptions

- 1.11. In case of several consumers, the recorded power factor in the billing database is more than one. Since the tri-vector meters are built on a logic which does not record a leading power factor hence such readings have been attributed to incorrect meter reading and hence have been ignored in the current study.
- 1.12. Billing data comprising of zero SOP or zero power factor have been ignored for the calculations as they would skew the findings of the study.

1.13. LS category consumers:

- 1.13.1. For LS category consumers, except the data sets as mentioned in the above two points, the parameters mentioned in Point No. 1.5 have been used as recorded to determine the current energy bill, net of power factor surcharge/rebate, for all consumers and subsequently the desired revenue neutral Conversion Factor.

1.14. MS category consumers:

- 1.14.1. For MS category consumers the kVAh consumption has not been recorded in the MRD data. Instead a kVAh reading has been recorded for each consumer category. Therefore, the KVAH reading recorded in the previous cycle has been subtracted from the kVAh reading recorded in the current cycle to determine the kVAh consumption.
- 1.14.2. The KVAH consumption so estimated has been utilized to determine the Power Factor of the consumer during the current cycle by using the formula provided at point 1.6.
- 1.14.3. The estimated Power Factor has been used to determine the Power Factor Surcharge / Penalty as per the applicable slab rates:

Table 1: Power Factor penalty/ incentive for MS category consumers

PF	Penalty	Incentive
PF Below 0.80	2%	-
PF Below 0.90	1%	-
PF Above 0.90	-	-0.25%

1.14.4. Consumers with kVAh reading in current cycle less than that in previous cycle have not been considered.

1.14.5. Consumers with KWH consumption as non zero but kVAh consumption in current cycle being equal to that in previous cycle have not been considered.

Achieving Revenue Neutrality

1.15. In order to maintain revenue neutrality by implementation of kVAh tariff for the FY 2012-13, we have taken into consideration only the following four parameters:

- *kWh Consumption (Recorded values for LS and MS)*
- *kVAh Consumption (Recorded values for LS; Determined values for MS)*
- *Revenue from SOP (Recorded values for LS and MS)*
- *PF Surcharge / Rebate (Recorded values for LS; Determined values for MS)*

1.16. The PF surcharge/rebate is added to the revenue from SOP to calculate the 'net bill' payable for each consumer. (Bill attributable to energy consumption and PF)

1.17. The net bill so determined is then divided by the kWh consumption recorded to arrive at the 'net per unit billing rate' of the consumer

1.18. The 'net per unit billing rate' is then multiplied to the 'conversion factor' (as elaborated in point 1.9) to determine the 'per unit KVAH tariff' applicable on the consumer.

1.19. The 'per unit kVAh tariff' so derived is multiplied to the kVAh consumption recorded for each consumer in the billing database to arrive at the revenue from each consumer after implementation of kVAh based billing. This revenue is added up to arrive at the total revenue of PSPCL in case of adoption of kVAh tariff. Then the assumed Conversion Factor (CF) is varied in multiples of 0.001 and the corresponding change in revenue from kVAh tariff observed. The revenue neutral point (where revenue as per current tariff as calculated earlier and revenue at kVAh tariff is equal) is then determined to be the 'Revenue Neutral CF'. This Revenue Neutral CF is subsequently used as the conversion factor for assessing the impact on the individual consumers of that category. This exercise is carried out for all the different consumer categories.

Tariff Categories

1.20. In the billing system of PSPCL, the billing details of the consumer are stored as per their respective tariff codes. The codes of the billing system and for the various categories are given as below:

Table 2: Various tariff categories

Tariff Code	Category
1	Miscellaneous industry like textiles, pharmaceuticals, chemicals etc.
2	Power intensive units (Cutting, casting, forging, furnace, mills etc.)
3	Arc furnace
4	Rice shellers, cotton ginners, oil/ghee mills etc.
5	Sugar mills
8	Cold storage and ice factories
7	Railway traction
6,9	Bulk supply
20,22,23,28,30	NRS consumers
21	DS Consumers
-	Medium Supply (Above 20 kW but less than 100 kW connected load)

1.21. For the purpose of the study, the analysis has been carried out across all the above tariff categories for consumers with connected load above 100 kW and for MS category consumers.

Variations in Power Factor across categories

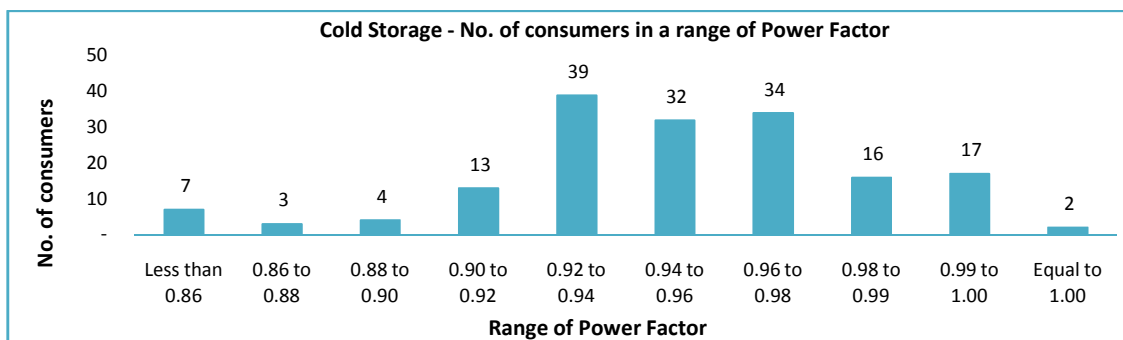
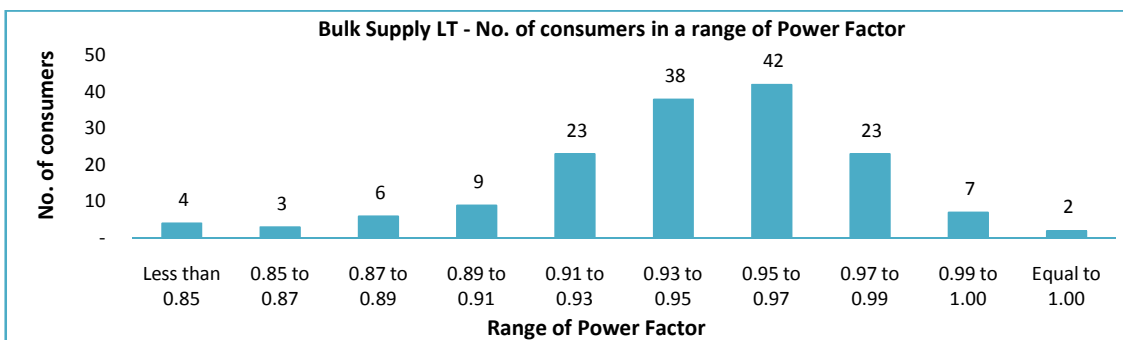
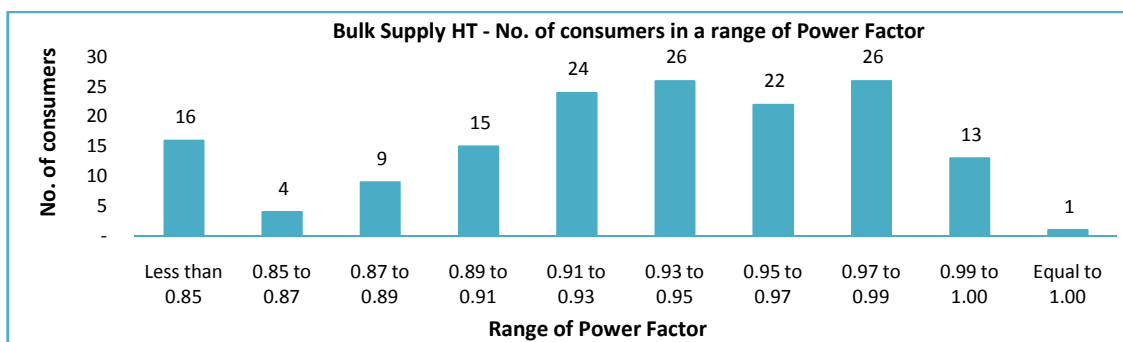
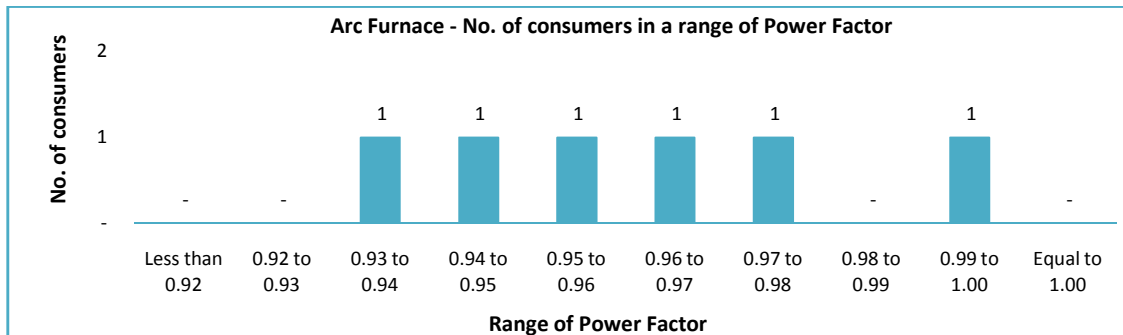
1.22. Although the Hon'ble PSERC's tariff order for FY 2013-14 only differentiates the LS, Railways, NRS, Domestic and MS category consumers on the basis of tariff, we have carried out this study for even the sub-categories within the LS category. The reason for doing this is the presence of huge variations in the Power Factor across categories. The review of Power Factors for all consumers in all the above categories for FY 2012-13 have been captured below.

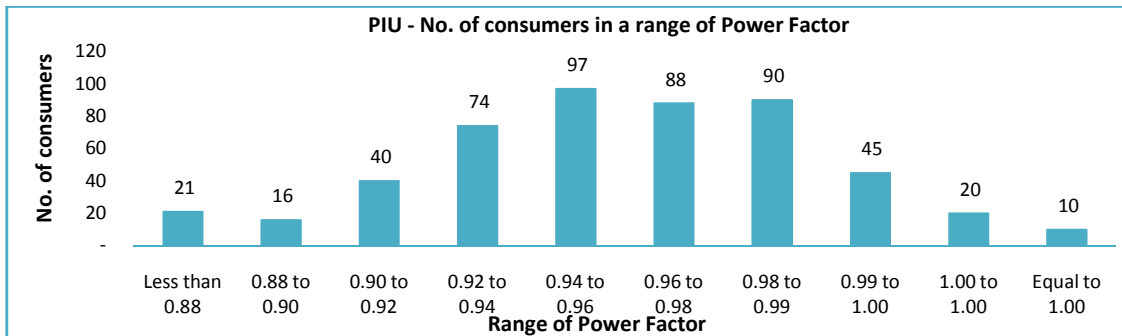
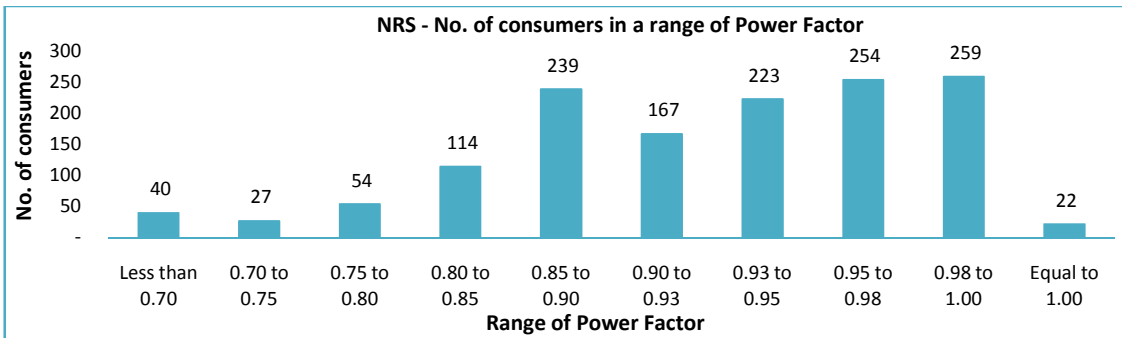
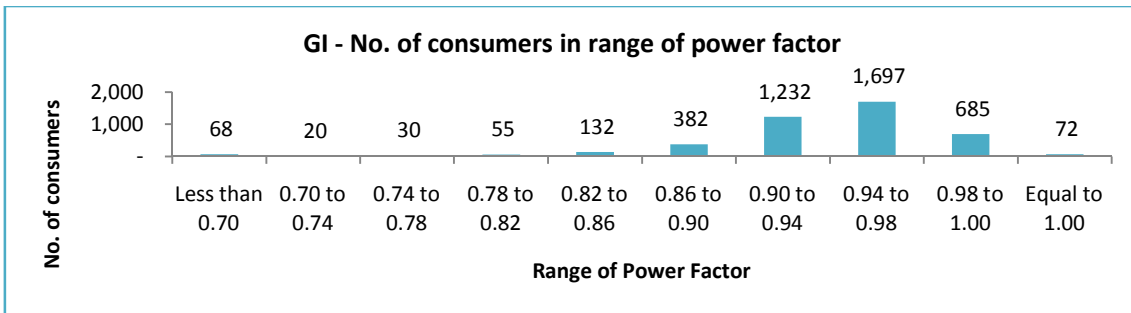
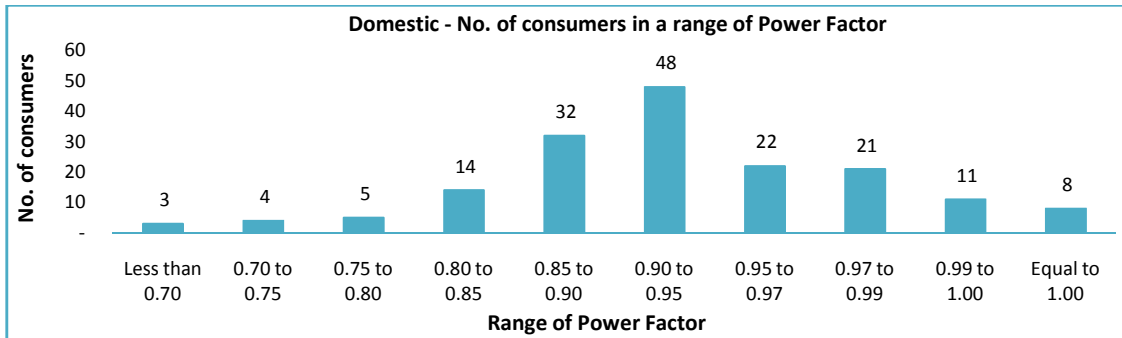
Table 3: Variation in Power Factor across categories: FY 2012-13

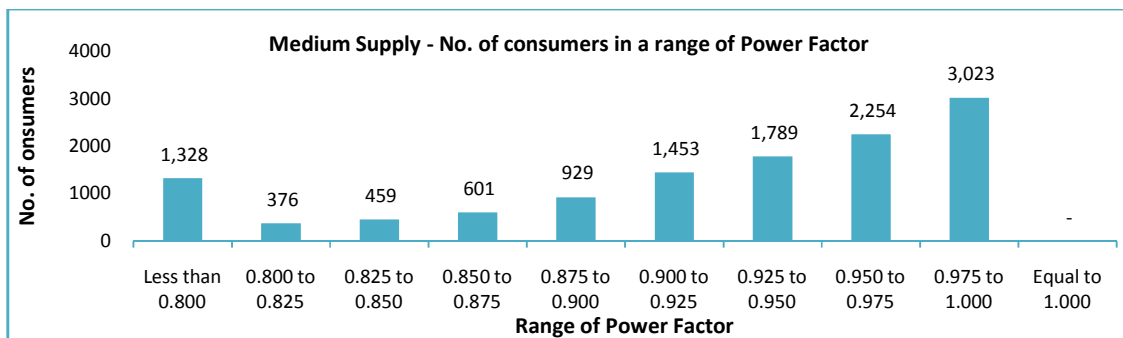
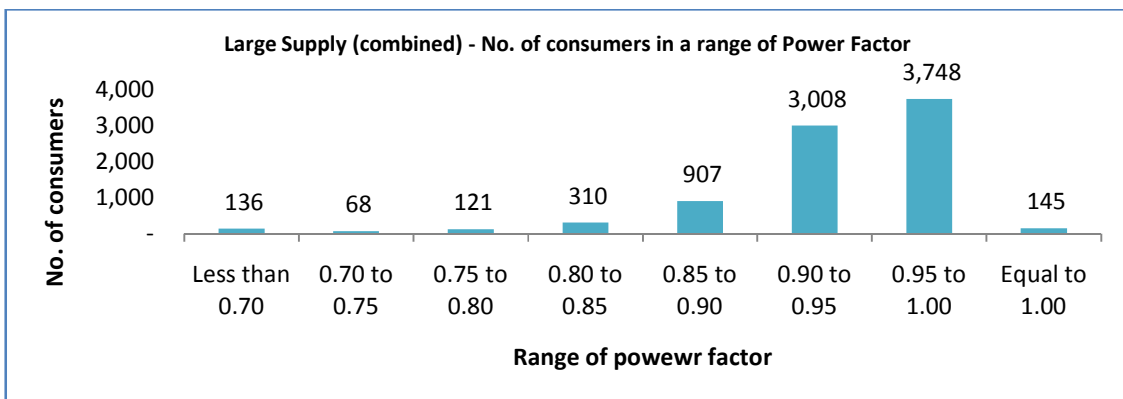
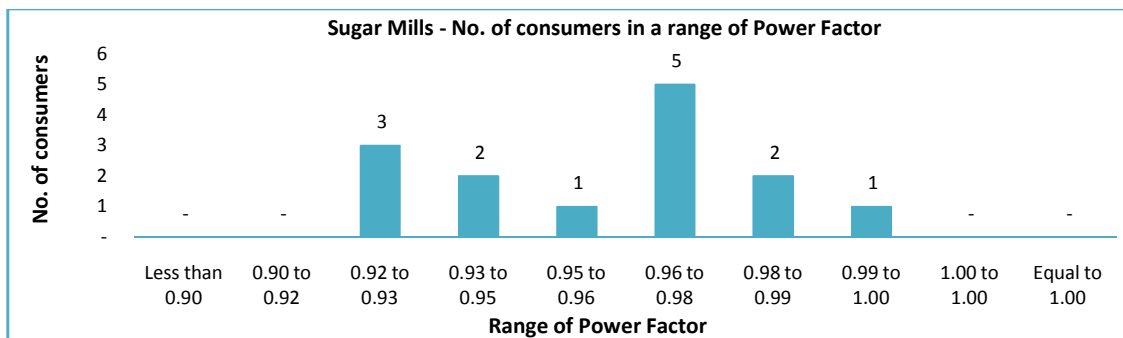
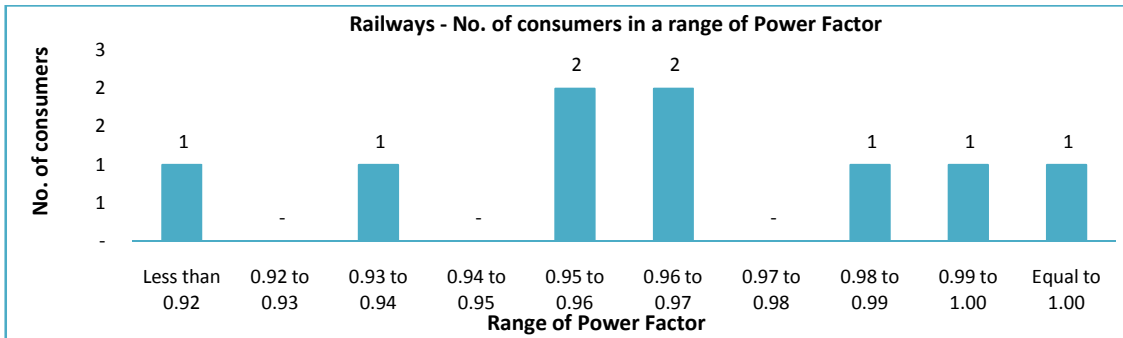
Category	Minimum PF	Maximum PF	Average PF
Arc Furnace	0.939	0.990	0.967
Bulk Supply – HT	0.649	1.000	0.952
Bulk Supply – LT	0.708	1.000	0.944
Cold Storage	0.660	1.000	0.950
Domestic	0.110	1.000	0.922
General Industry	0.160	1.000	0.962
NRS	0.194	1.000	0.935
PIU	0.595	1.000	0.978
Railways	0.918	1.000	0.967
Sugar Mills	0.917	0.991	0.949
Large Supply (combined)	0.188	1.000	0.965
Medium Supply	0.500	1.000	0.916

1.23. The table captures the deviations of the Power Factor from the average within a category, and the variations in the average Power Factor across categories. The Minimum and Maximum PF highlight the average annual PF of the consumers with the lowest and the highest PF in FY 2012-13 respectively, whereas the Average PF has been determined by taking a weighted average of power

factors of all consumers in the category for the year. It is therefore imperative to analyse each category individually while carrying out the study in order to factor in these variations.



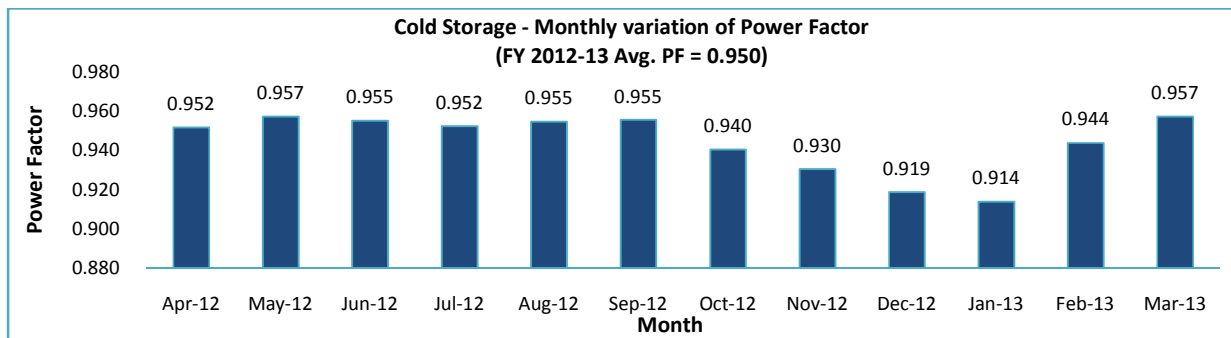
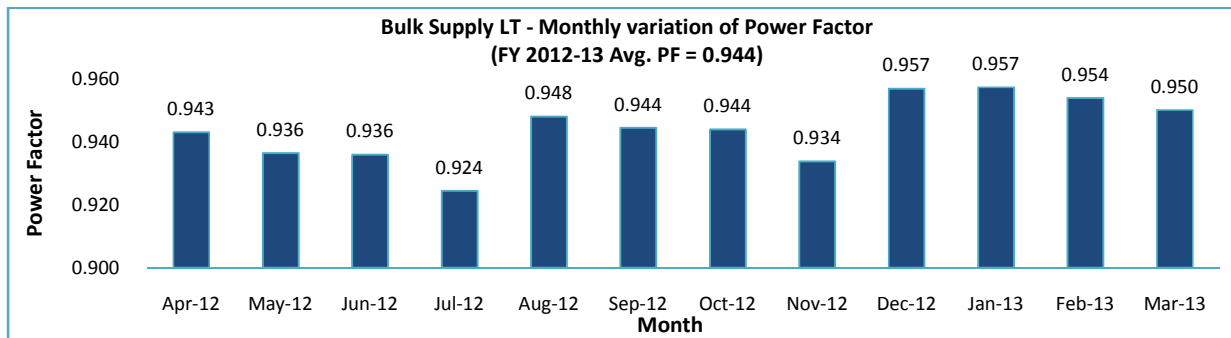
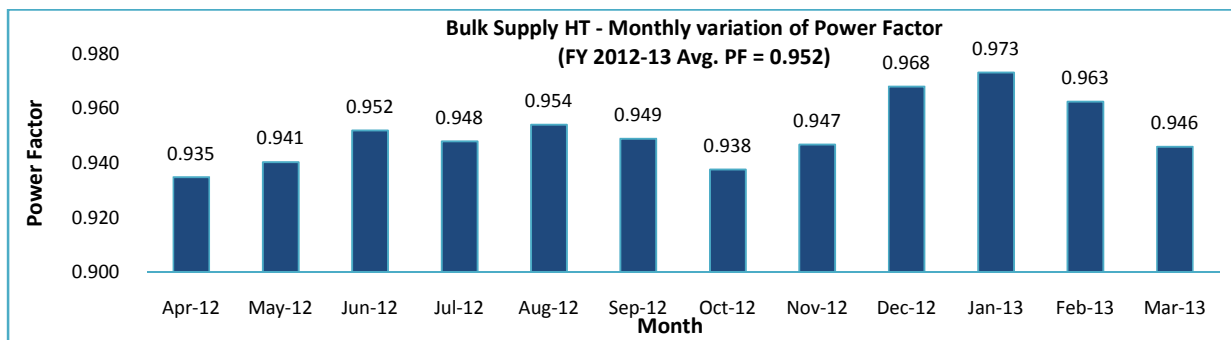
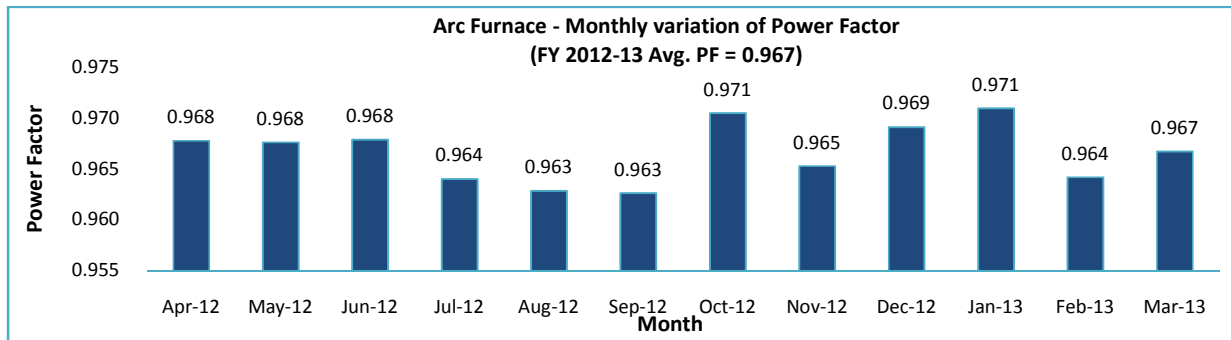


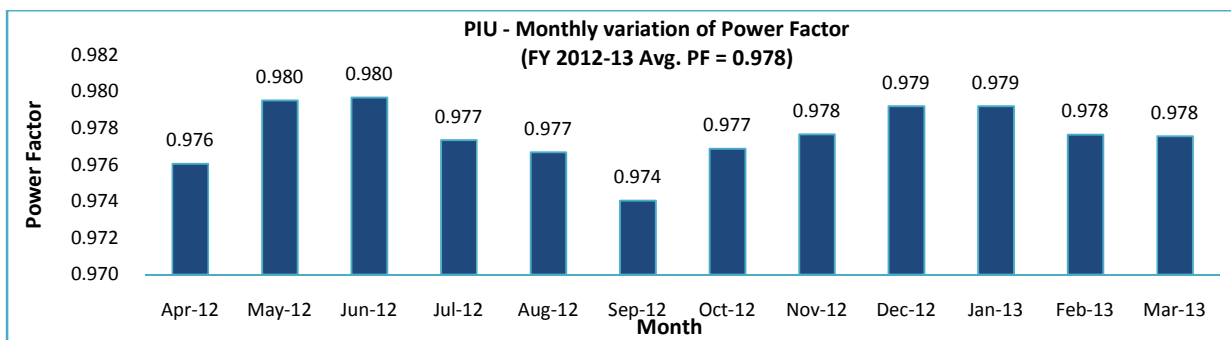
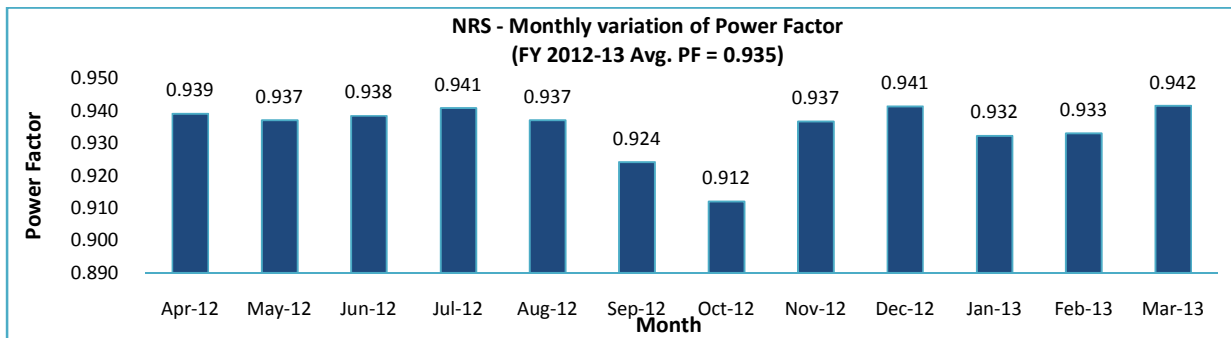
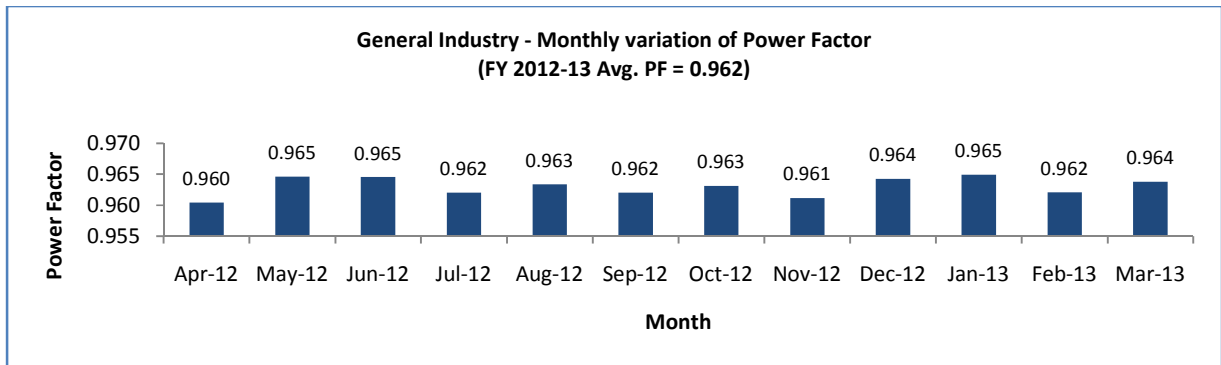
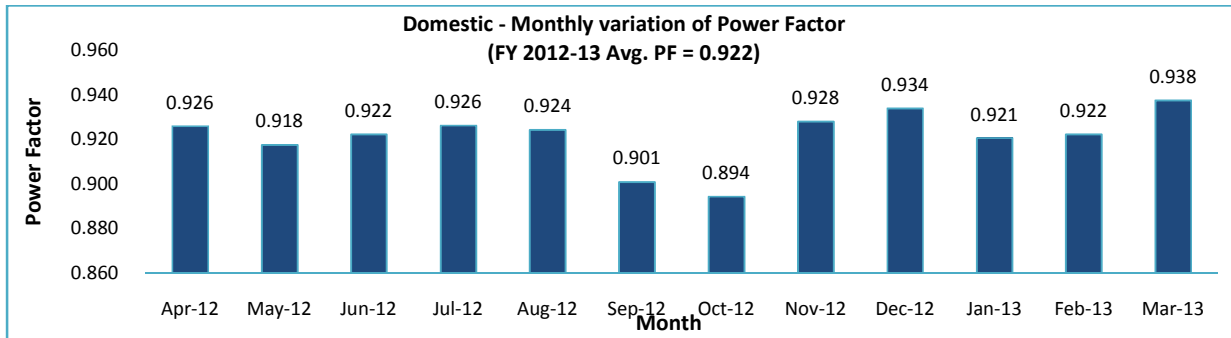


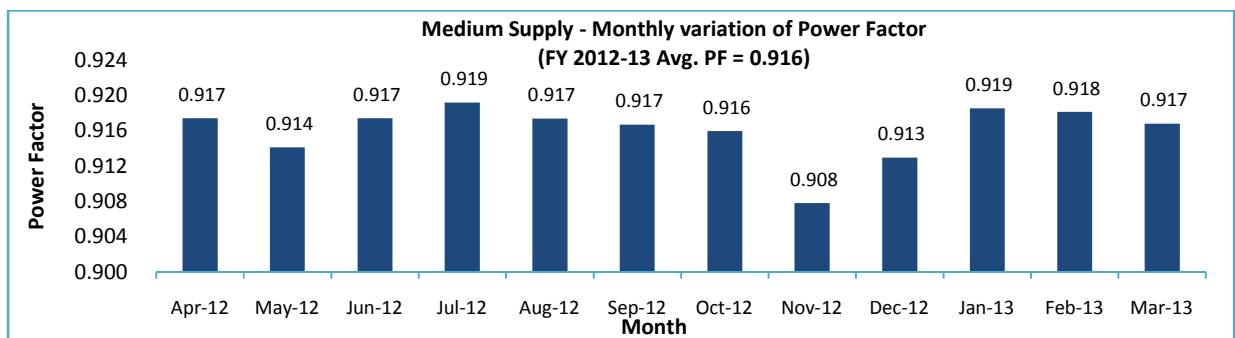
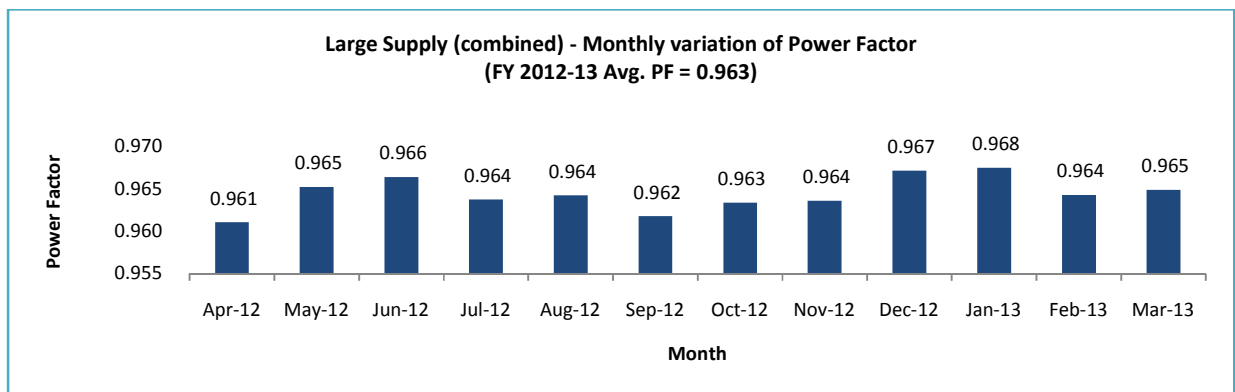
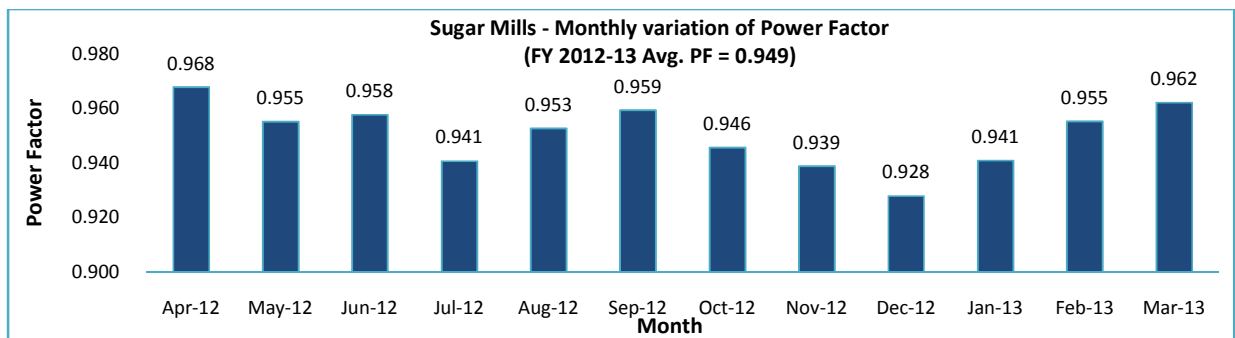
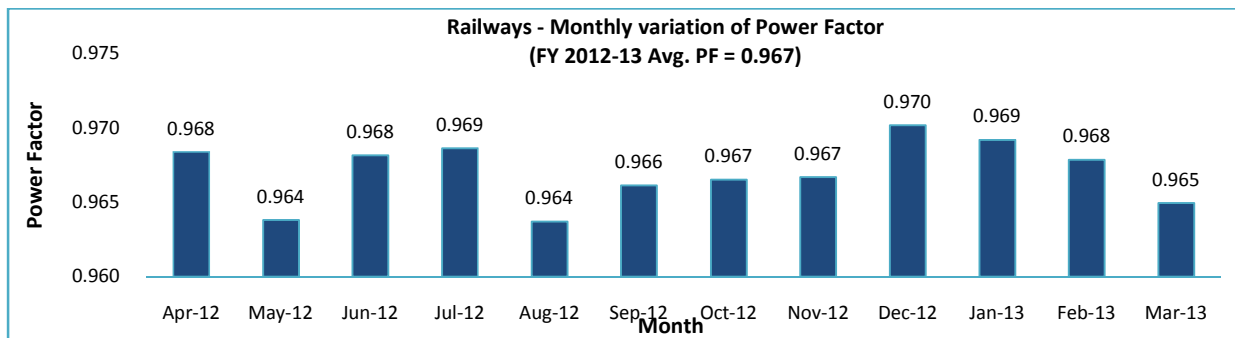
Seasonality of Power Factor

1.24. Apart from variations within a category across consumers, the Power Factor also varies significantly on the account of seasons.

1.25. It was observed that the revenue neutral conversion factor (or power factor) does not remain constant throughout the year and as such varies as per the load pattern from month to month.







1.26. Therefore the common conversion factor determined for the entire year may not provide a revenue neutral tariff for a particular month.

Findings of the study

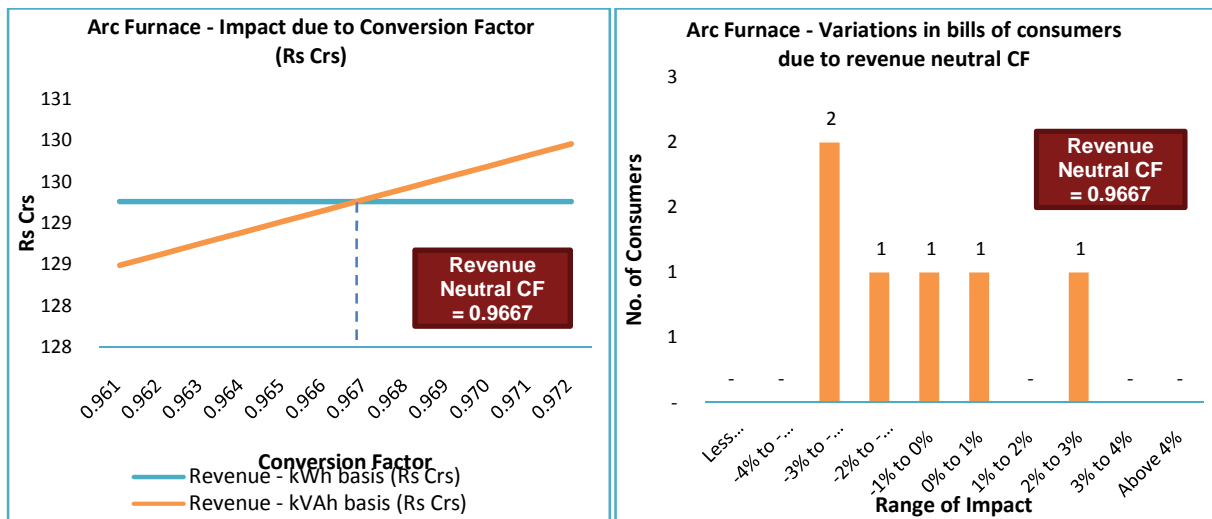
1.27. Based on the approach to attaining revenue neutrality as discussed in Point 1.19 and the consideration of the above factors, the exercise for estimating the Revenue Neutral CF aggregated for FY 2012-13 for all the consumer categories in question independently, has been carried out. Additionally, the Revenue Neutral CF for each month for each category has also been computed in order to capture the variations in monthly impact owing to the seasonal variations in energy consumption and load patterns. The category-wise results based on the data for the entire of FY 2012-13, have been discussed below. The summary of the monthly impact and the overall profile of the individual categories have however been given in the Annexure.

1.27.1. Arc Furnace

- PSPCL had in all, five arc furnace consumers at the end of FY 2012-13, and based on the analysis of their monthly billing data, the following were the findings.

Arc Furnace				
Month	Effective Net Energy Rate (Rs/kWh)	Energy Rate at Annual Revenue Neutral CF (Rs/kVAh)	Revenue Neutral CF for the Month	Power Factor
Apr-12	4.93	4.76	0.968	0.968
May-12	4.93	4.76	0.968	0.968
Jun-12	5.44	5.25	0.968	0.968
Jul-12	5.42	5.23	0.965	0.964
Aug-12	5.59	5.40	0.963	0.963
Sep-12	5.59	5.40	0.963	0.963
Oct-12	5.58	5.40	0.970	0.971
Nov-12	5.59	5.41	0.965	0.965
Dec-12	5.59	5.40	0.969	0.969
Jan-13	5.58	5.40	0.971	0.971
Feb-13	5.59	5.40	0.964	0.964
Mar-13	5.82	5.62	0.967	0.967
FY 2012-13	5.45	5.27	-	0.967
Annual Revenue Neutral CF = 0.967				

- The 'Revenue Neutral CF' for Arc Furnace category is therefore observed to be **0.967**. The summary of the monthly impact and the overall profile of the category have been captured in the Annexure.
- The overall impact on PSPCL due to the sensitivity of this Revenue Neutral CF has been captured below, along with the variations in the annual billing of consumers due to the Revenue Neutral CF.

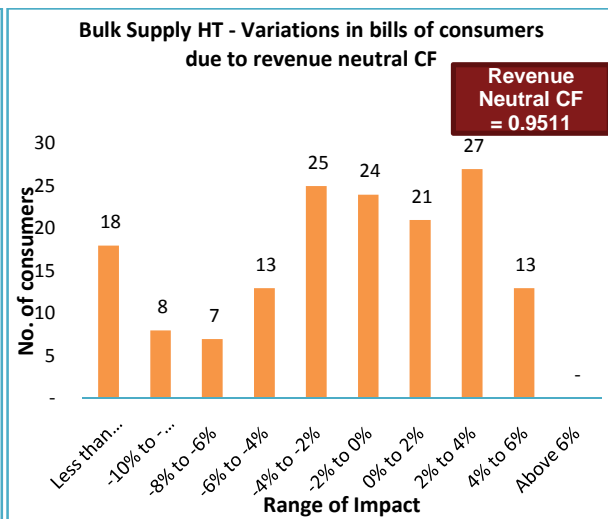
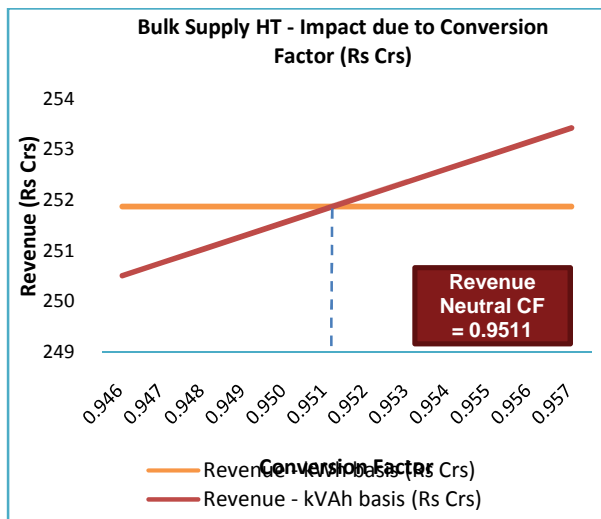


1.27.2. Bulk Supply – HT

- The billing data of 156 PSPCL bulk supply HT consumers was used for FY 2012-13, and based on the analysis of their monthly billing data, the following were the findings.

Bulk Supply – HT				
Month	Effective Net Energy Rate (Rs/kWh)	Energy Rate at Annual Revenue Neutral CF (Rs/kVAh)	Revenue Neutral CF for the Month	Power Factor
Apr-12	4.97	4.74	0.933	0.935
May-12	4.94	4.71	0.940	0.941
Jun-12	5.00	4.76	0.951	0.952
Jul-12	5.54	5.28	0.947	0.948
Aug-12	5.51	5.25	0.953	0.954
Sep-12	5.52	5.26	0.948	0.949
Oct-12	5.58	5.32	0.935	0.938
Nov-12	5.55	5.29	0.945	0.947
Dec-12	5.50	5.24	0.967	0.968
Jan-13	5.49	5.22	0.973	0.973
Feb-13	5.51	5.24	0.962	0.963
Mar-13	5.60	5.33	0.945	0.946
FY 2012-13	5.39	5.14	-	0.952
Annual Revenue Neutral CF = 0.951				

- The 'Revenue Neutral CF' for Bulk Supply – HT category is therefore observed to be **0.951**.

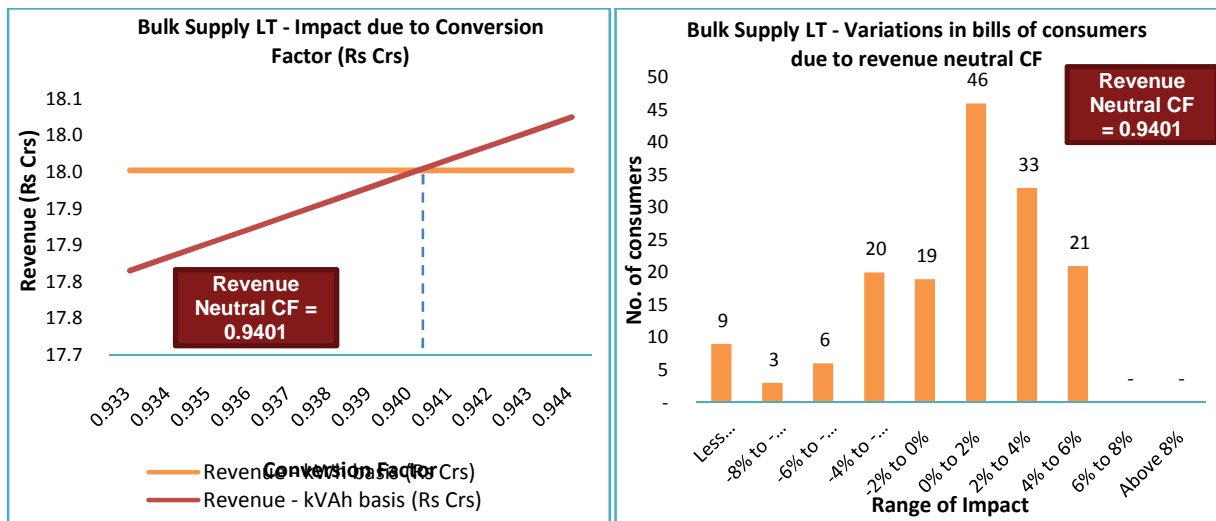


1.27.3. Bulk Supply – LT

- The billing data of 157 PSPCL bulk supply LT consumers was used for FY 2012-13, and based on the analysis of their monthly billing data, the following were the findings.

Bulk Supply – LT				
Month	Effective Net Energy Rate (Rs/kWh)	Energy Rate at Annual Revenue Neutral CF (Rs/kVAh)	Revenue Neutral CF for the Month	Power Factor
Apr-12	5.22	4.91	0.942	0.943
May-12	5.23	4.92	0.935	0.936
Jun-12	5.36	5.06	0.931	0.936
Jul-12	5.93	5.67	0.908	0.924
Aug-12	5.81	5.47	0.947	0.948
Sep-12	5.83	5.50	0.942	0.944
Oct-12	5.82	5.48	0.943	0.944
Nov-12	5.87	5.57	0.925	0.934
Dec-12	5.80	5.45	0.956	0.957
Jan-13	5.80	5.49	0.952	0.957
Feb-13	5.81	5.48	0.951	0.954
Mar-13	5.87	5.54	0.946	0.950
FY 2012-13	5.71	5.39	-	0.944
Annual Revenue Neutral CF = 0.940				

- The ‘Revenue Neutral CF’ for Bulk Supply – LT category is therefore observed to be **0.940**.

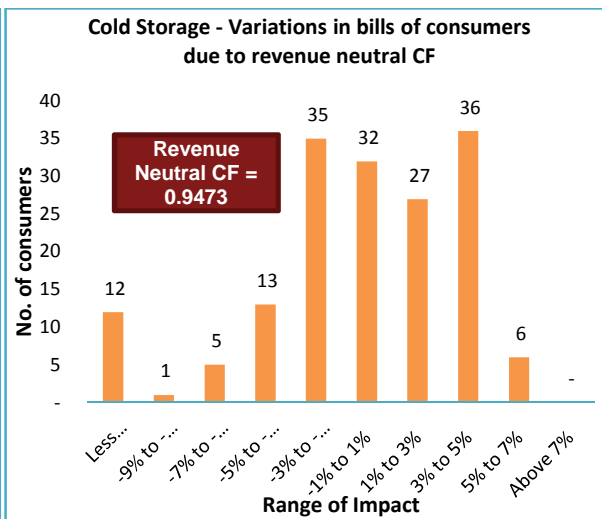
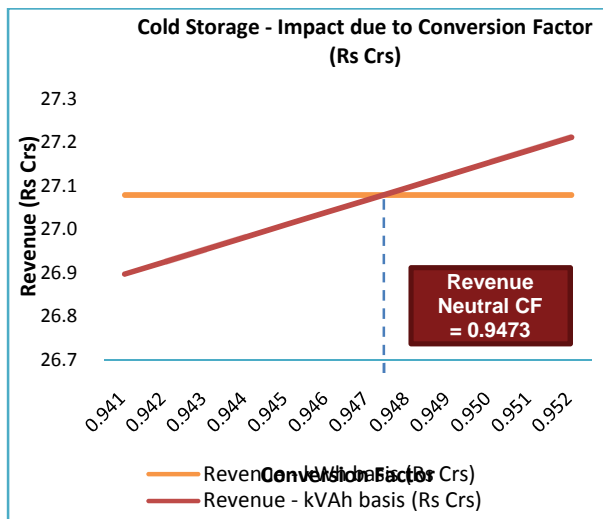


1.27.4. Cold Storage

- The billing data of 167 PSPCL Cold Storage consumers was used for FY 2012-13, and based on the analysis of their monthly billing data, the following were the findings.

Cold Storage				
Month	Effective Net Energy Rate (Rs/kWh)	Energy Rate at Annual Revenue Neutral CF (Rs/kVAh)	Revenue Neutral CF for the Month	Power Factor
Apr-12	4.90	4.65	0.950	0.952
May-12	4.88	4.63	0.957	0.957
Jun-12	5.01	4.75	0.955	0.955
Jul-12	5.50	5.22	0.952	0.952
Aug-12	5.54	5.25	0.954	0.955
Sep-12	5.54	5.26	0.954	0.955
Oct-12	5.59	5.31	0.938	0.940
Nov-12	5.64	5.41	0.919	0.930
Dec-12	5.70	5.57	0.892	0.919
Jan-13	5.69	5.52	0.891	0.914
Feb-13	5.59	5.34	0.937	0.944
Mar-13	5.65	5.35	0.957	0.957
FY 2012-13	5.36	5.09	-	0.950
Annual Revenue Neutral CF = 0.947				

- The 'Revenue Neutral CF' for Cold Storage category is therefore observed to be **0.947**.

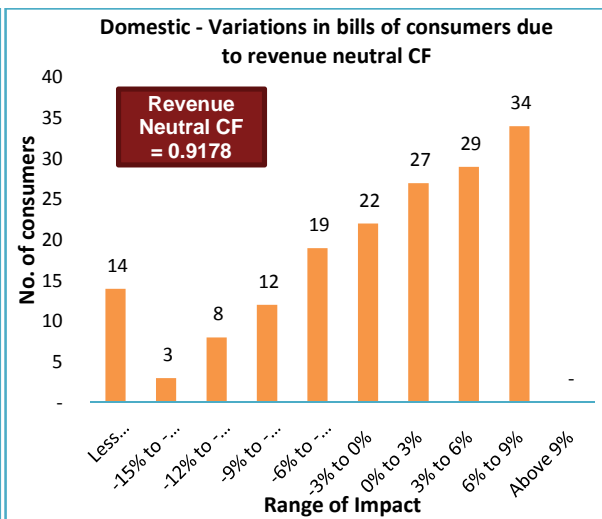
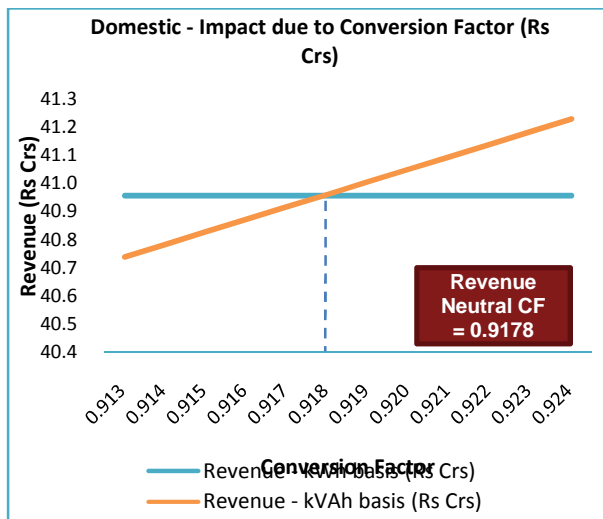


1.27.5. Domestic (Large consumers)

- The billing data of 168 PSPCL Domestic consumers was used for FY 2012-13, and based on the analysis of their monthly billing data, the following were the findings.

Domestic (Large consumers)				
Month	Effective Net Energy Rate (Rs/kWh)	Energy Rate at Annual Revenue Neutral CF (Rs/kVAh)	Revenue Neutral CF for the Month	Power Factor
Apr-12	5.17	4.76	0.923	0.926
May-12	5.38	4.95	0.915	0.918
Jun-12	5.85	5.38	0.919	0.922
Jul-12	5.84	5.37	0.924	0.926
Aug-12	5.83	5.37	0.921	0.924
Sep-12	5.95	5.51	0.894	0.901
Oct-12	5.97	5.52	0.887	0.894
Nov-12	5.85	5.40	0.923	0.928
Dec-12	5.85	5.41	0.928	0.934
Jan-13	5.88	5.43	0.914	0.921
Feb-13	5.96	5.50	0.917	0.922
Mar-13	6.44	5.93	0.934	0.938
FY 2012-13	5.80	5.35	-	0.922
Annual Revenue Neutral CF = 0.918				

- The 'Revenue Neutral CF' for Domestic (with connected load of greater than 100 kW) category is therefore observed to be **0.918**.

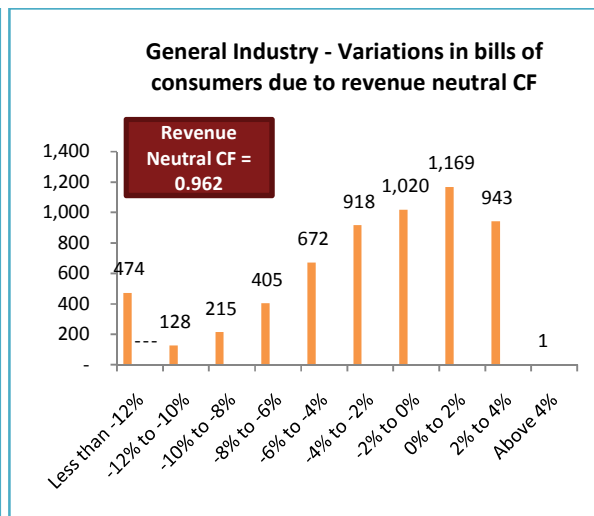
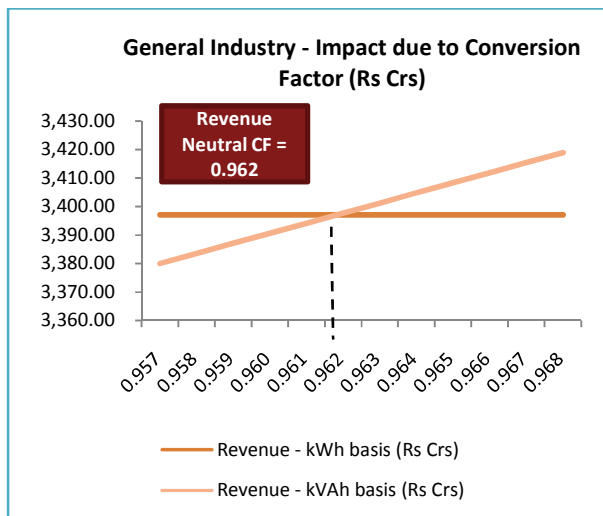


1.27.6. General Industry

- The billing data of 5,945 PSPCL General Industry consumers was used for FY 2012-13, and based on the analysis of their monthly billing data, the following were the findings.

General Industry				
Month	Effective Net Energy Rate (Rs/kWh)	Energy Rate at Annual Revenue Neutral CF (Rs/kVAh)	Revenue Neutral CF for the Month	Power Factor
Apr-12	4.89	4.70	0.959	0.960
May-12	4.88	4.69	0.963	0.965
Jun-12	5.01	4.82	0.964	0.965
Jul-12	5.50	5.29	0.961	0.962
Aug-12	5.52	5.31	0.962	0.963
Sep-12	5.51	5.30	0.961	0.962
Oct-12	5.54	5.32	0.961	0.963
Nov-12	5.56	5.35	0.960	0.961
Dec-12	5.56	5.35	0.963	0.964
Jan-13	5.56	5.35	0.964	0.965
Feb-13	5.56	5.35	0.961	0.962
Mar-13	5.65	5.43	0.962	0.964
FY 2012-13	5.39	5.19	-	0.963
Annual Revenue Neutral CF = 0.962				

- The 'Revenue Neutral CF' for General Industry category is therefore observed to be **0.962**.

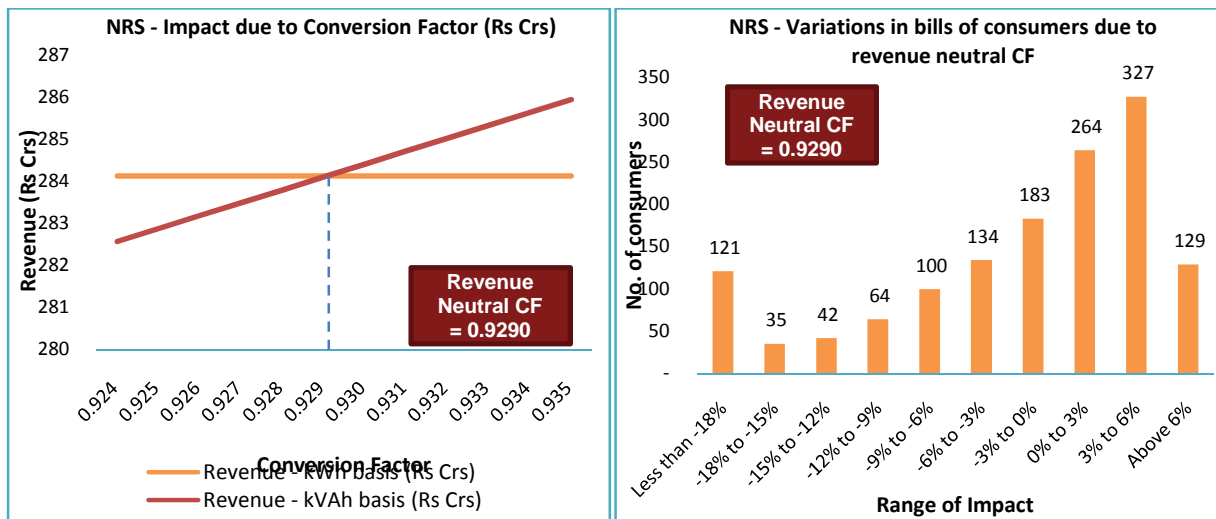


1.27.7. NRS

- The billing data of 1,399 PSPCL NRS consumers was used for FY 2012-13, and based on the analysis of their monthly billing data, the following were the findings.

NRS				
Month	Effective Net Energy Rate (Rs/kWh)	Energy Rate at Annual Revenue Neutral CF (Rs/kVAh)	Revenue Neutral CF for the Month	Power Factor
Apr-12	5.59	5.21	0.935	0.939
May-12	5.72	5.33	0.935	0.937
Jun-12	6.06	5.64	0.936	0.938
Jul-12	6.05	5.64	0.938	0.941
Aug-12	5.99	5.58	0.934	0.937
Sep-12	6.14	5.75	0.916	0.924
Oct-12	6.16	5.90	0.884	0.912
Nov-12	6.11	5.73	0.929	0.937
Dec-12	6.08	5.68	0.936	0.941
Jan-13	6.12	5.74	0.925	0.932
Feb-13	6.19	5.80	0.926	0.933
Mar-13	6.59	6.15	0.938	0.942
FY 2012-13	6.04	5.65	-	0.935
Annual Revenue Neutral CF = 0.929				

- The 'Revenue Neutral CF' for NRS category is therefore observed to be **0.929**.

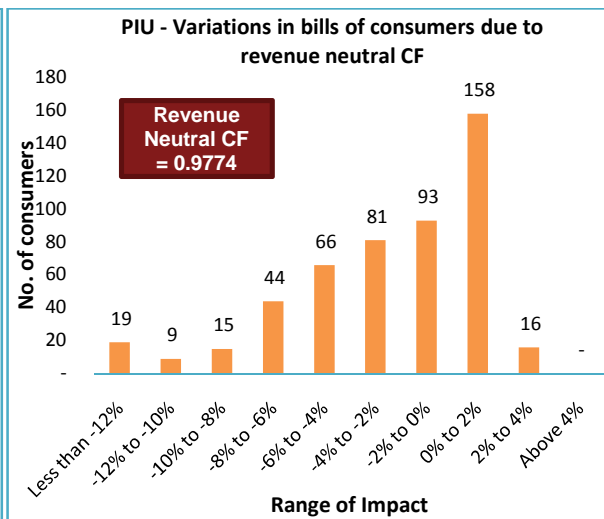
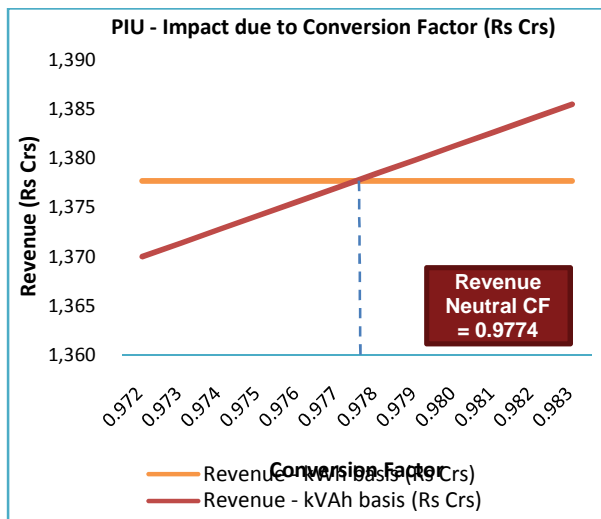


1.27.8. Power Intensive Units (PIU)

- The billing data of 501 PSPCL Power Intensive Units (PIU) consumers was used for FY 2012-13, and based on the analysis of their monthly billing data, the following were the findings.

Power Intensive Units (PIU)				
Month	Effective Net Energy Rate (Rs/kWh)	Energy Rate at Annual Revenue Neutral CF (Rs/kVAh)	Revenue Neutral CF for the Month	Power Factor
Apr-12	4.92	4.81	0.976	0.976
May-12	4.91	4.80	0.979	0.980
Jun-12	4.98	4.87	0.979	0.980
Jul-12	5.37	5.25	0.977	0.977
Aug-12	5.57	5.44	0.977	0.977
Sep-12	5.57	5.44	0.974	0.974
Oct-12	5.57	5.45	0.977	0.977
Nov-12	5.58	5.46	0.977	0.978
Dec-12	5.58	5.46	0.979	0.979
Jan-13	5.58	5.45	0.979	0.979
Feb-13	5.58	5.46	0.977	0.978
Mar-13	5.68	5.55	0.977	0.978
FY 2012-13	5.40	5.28	-	0.978
Annual Revenue Neutral CF = 0.977				

- The 'Revenue Neutral CF' for PIU category is therefore observed to be **0.977**.

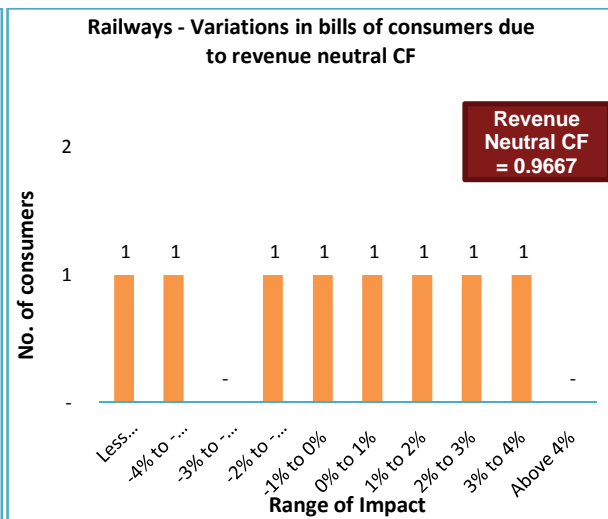
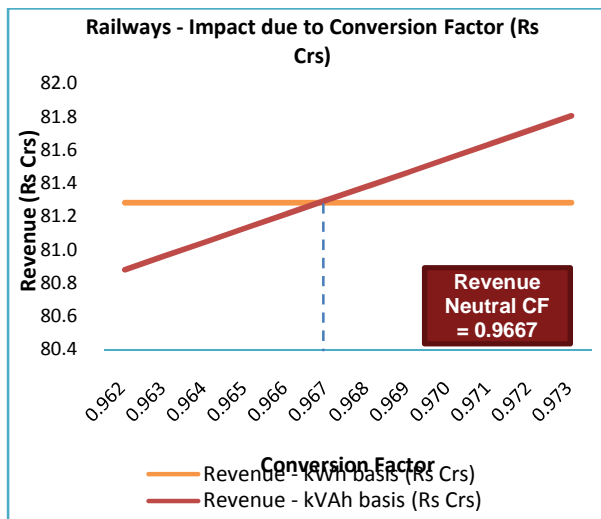


1.27.9. Railways

- The billing data of 9 PSPCL Railways consumers was used for FY 2012-13, and based on the analysis of their monthly billing data, the following were the findings.

Railways				
Month	Effective Net Energy Rate (Rs/kWh)	Energy Rate at Annual Revenue Neutral CF (Rs/kVAh)	Revenue Neutral CF for the Month	Power Factor
Apr-12	5.75	5.56	0.968	0.968
May-12	5.75	5.56	0.964	0.964
Jun-12	5.77	5.58	0.968	0.968
Jul-12	5.99	5.80	0.969	0.969
Aug-12	6.00	5.81	0.963	0.964
Sep-12	6.00	5.80	0.966	0.966
Oct-12	6.00	5.80	0.966	0.967
Nov-12	6.00	5.80	0.967	0.967
Dec-12	6.00	5.80	0.970	0.970
Jan-13	6.00	5.80	0.969	0.969
Feb-13	5.99	5.80	0.968	0.968
Mar-13	6.02	5.82	0.965	0.965
FY 2012-13	5.94	5.74	-	0.967
Annual Revenue Neutral CF = 0.967				

- The 'Revenue Neutral CF' for PIU category is therefore observed to be **0.967**.

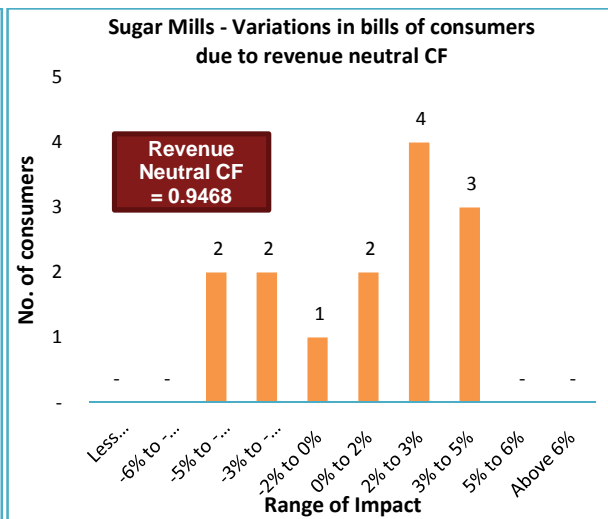
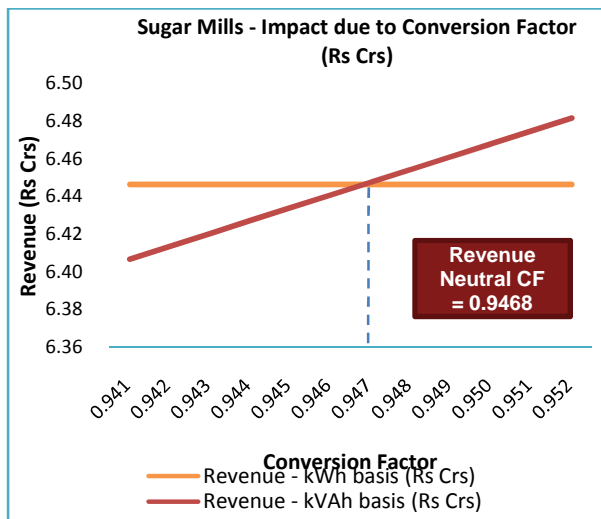


1.27.10. Sugar Mills

- The billing data of 14 PSPCL Sugar Mills consumers was used for FY 2012-13, and based on the analysis of their monthly billing data, the following were the findings.

Sugar Mills				
Month	Effective Net Energy Rate (Rs/kWh)	Energy Rate at Annual Revenue Neutral CF (Rs/kVAh)	Revenue Neutral CF for the Month	Power Factor
Apr-12	4.87	4.61	0.968	0.968
May-12	4.89	4.63	0.955	0.955
Jun-12	4.91	4.66	0.955	0.958
Jul-12	5.61	5.33	0.937	0.941
Aug-12	5.56	5.28	0.951	0.953
Sep-12	5.53	5.24	0.959	0.959
Oct-12	5.63	5.38	0.937	0.946
Nov-12	5.57	5.27	0.938	0.939
Dec-12	5.57	5.28	0.928	0.928
Jan-13	5.56	5.27	0.940	0.941
Feb-13	5.53	5.24	0.955	0.955
Mar-13	5.56	5.27	0.961	0.962
FY 2012-13	5.42	5.14	-	0.949
Annual Revenue Neutral CF = 0.949				

- The 'Revenue Neutral CF' for Sugar Mills category is therefore observed to be **0.949**.

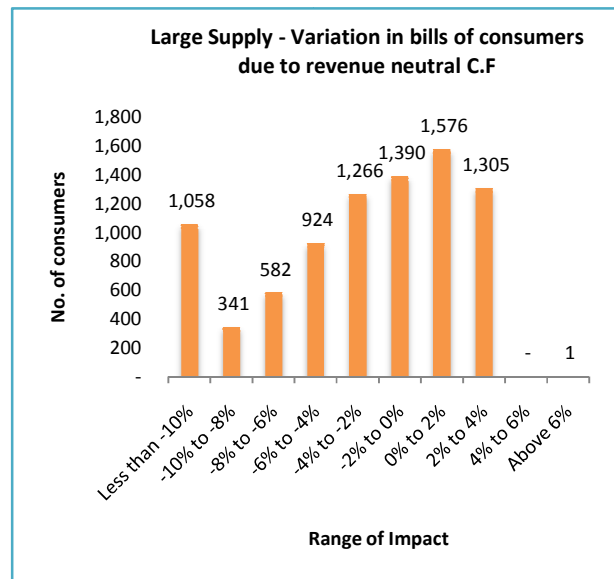
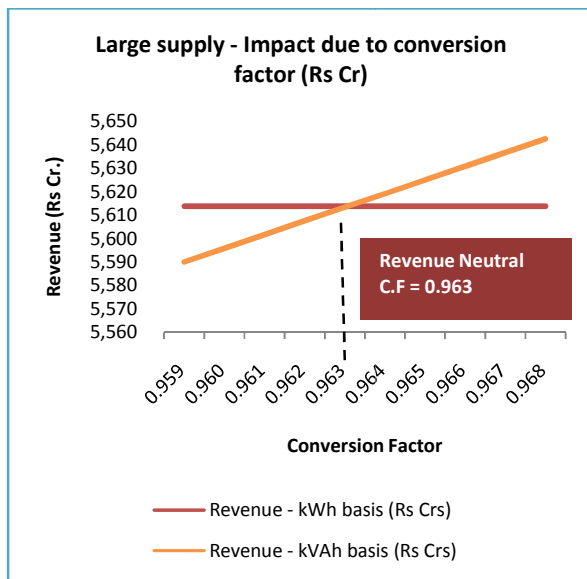


1.27.11. Large Supply (Combined)

- The analysis of Large Supply category as a whole has also been carried out to determine a common conversion factor applicable across sub categories of LS category.
- The billing data of 8443 PSPCL Large Supply consumers was used for FY 2012-13, and based on the analysis of their monthly billing data, the following were the findings.

Large Supply (Combined)				
Month	Effective Net Energy Rate (Rs/kWh)	Energy Rate at Annual Revenue Neutral CF (Rs/kVAh)	Revenue Neutral CF for the Month	Power Factor
Apr-12	4.97	4.79	0.959	0.961
May-12	4.95	4.77	0.964	0.965
Jun-12	5.08	4.90	0.965	0.966
Jul-12	5.50	5.31	0.962	0.964
Aug-12	5.57	5.37	0.963	0.964
Sep-12	5.57	5.37	0.960	0.962
Oct-12	5.58	5.39	0.961	0.963
Nov-12	5.59	5.40	0.962	0.964
Dec-12	5.59	5.39	0.966	0.967
Jan-13	5.59	5.39	0.966	0.968
Feb-13	5.60	5.40	0.963	0.964
Mar-13	5.72	5.51	0.964	0.965
FY 2012-13	5.44	5.24	-	0.965
Annual revenue neutral C.F = 0.963				

- The 'Revenue Neutral CF' for Large Supply category as a whole is therefore observed to be **0.963**.

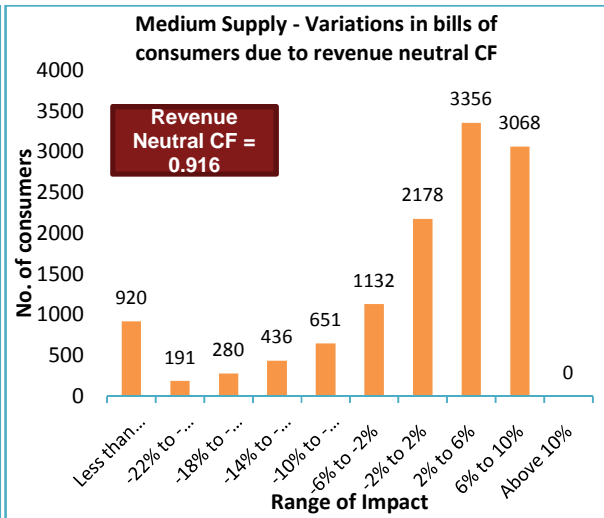
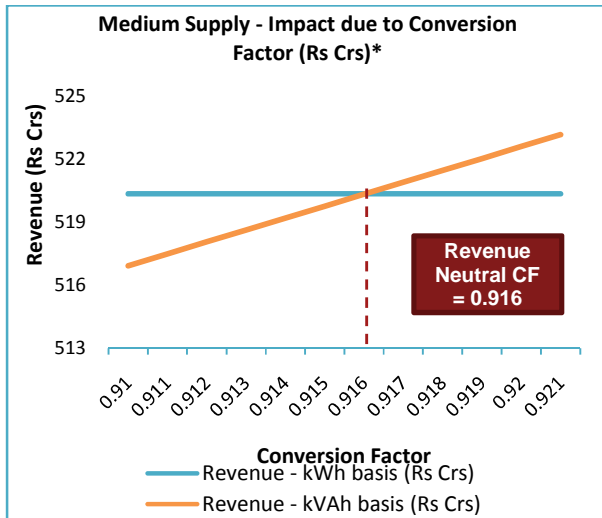


1.27.12. Medium Supply

- The billing data of 12,551 PSPCL Medium Supply consumers for FY 2012-13 was used, and based on the analysis of their monthly billing data, the following were the findings.

Medium Supply				
Month	Effective Net Energy Rate (Rs/kWh)	Energy Rate at Annual Revenue Neutral CF (Rs/kVAh)	Revenue Neutral CF for the Month	Power Factor
Apr-12	5.32	4.87	0.906	0.917
May-12	5.25	4.81	0.906	0.914
Jun-12	5.31	4.86	0.910	0.917
Jul-12	5.61	5.14	0.913	0.919
Aug-12	5.80	5.32	0.911	0.917
Sep-12	5.78	5.30	0.910	0.917
Oct-12	5.80	5.31	0.909	0.916
Nov-12	5.88	5.38	0.900	0.908
Dec-12	5.87	5.38	0.905	0.913
Jan-13	5.85	5.36	0.912	0.919
Feb-13	5.89	5.39	0.911	0.918
Mar-13	5.89	5.40	0.910	0.917
FY 2012-13	5.69	5.21	-	0.916
Annual Revenue Neutral CF = 0.916				

- The 'Revenue Neutral CF' for Medium Supply category is therefore observed to be **0.916**.



*MS Consumers data for the month of July 2012 has been used

Conclusion

1.28. After considering the impact on PSPCL as well as the various consumers due to the shift from kWh billing to kVAh based on various tariff conversion factors, the following conversion factors have been determined for the individual consumer categories in order to maintain a revenue neutral situation. It is therefore prayed in front of the Hon'ble PSERC that the following tariff conversion factors be used for billing on kVAh basis.

Category	Proposed Conversion Factors
Arc Furnace	0.967
Bulk Supply – HT	0.951
Bulk Supply – LT	0.940
Cold Storage	0.947
Domestic	0.918
General Industry	0.962
NRS	0.929
PIU	0.977
Railways	0.967
Sugar Mills	0.947
Large Supply (combined)	0.963
Medium Supply	0.916

A2: ANNEXURE

2.1 Arc Furnace (CF = 0.967)

Month-wise	No. of consumers	Contract load (MW)	Energy consumption (MkWh)	Energy charges (Rs Crs)	PF surcharge/Rebate (Rs Crs)	Net bill (Rs Crs)	Energy consumption (MkVAh)	Revised energy bill (Rs Crs)	Impact (%)
Apr-12	5	140.22	17.29	8.56	(0.04)	8.52	17.87	8.51	0.10%
May-12	5	140.22	28.37	14.05	(0.07)	13.98	29.32	13.97	0.08%
Jun-12	5	140.22	22.70	12.40	(0.06)	12.34	23.45	12.32	0.16%
Jul-12	5	140.22	16.86	9.18	(0.05)	9.13	17.48	9.15	-0.20%
Aug-12	5	140.22	22.02	12.35	(0.05)	12.30	22.87	12.35	-0.42%
Sep-12	5	140.22	17.85	10.02	(0.04)	9.97	18.55	10.02	-0.44%
Oct-12	5	140.22	21.25	11.92	(0.06)	11.86	21.89	11.81	0.38%
Nov-12	5	140.22	19.68	11.06	(0.05)	11.01	20.39	11.02	-0.16%
Dec-12	5	144.59	18.98	10.66	(0.06)	10.60	19.58	10.58	0.24%
Jan-13	5	144.59	18.27	10.26	(0.06)	10.20	18.81	10.16	0.43%
Feb-13	5	144.59	16.10	9.04	(0.04)	9.00	16.70	9.02	-0.27%
Mar-13	5	144.59	17.77	10.39	(0.05)	10.34	18.38	10.34	0.02%
Grand Total			237.14	129.88	(0.63)	129.26	245.31	129.26	0.00%

2.2 Bulk Supply – HT (CF = 0.951)

Month-wise	No. of consumers	Contract load (MW)	Energy consumption (MkWh)	Energy charges (Rs Crs)	PF surcharge/Rebate (Rs Crs)	Net bill (Rs Crs)	Energy consumption (MkVAh)	Revised energy bill (Rs Crs)	Impact (%)
Apr-12	182	238.52	29.62	14.75	(0.03)	14.72	31.69	15.01	-1.95%
May-12	183	248.57	40.04	19.94	(0.14)	19.80	42.58	20.04	-1.22%
Jun-12	179	249.56	43.64	22.08	(0.26)	21.82	45.84	21.82	0.02%
Jul-12	176	247.71	45.85	25.63	(0.23)	25.40	48.36	25.52	-0.47%
Aug-12	173	247.04	45.21	25.21	(0.30)	24.90	47.38	24.85	0.21%
Sep-12	174	247.02	38.98	21.76	(0.23)	21.53	41.07	21.61	-0.36%
Oct-12	175	247.47	32.41	18.12	(0.05)	18.07	34.56	18.38	-1.74%
Nov-12	174	247.33	31.93	17.85	(0.13)	17.72	33.72	17.83	-0.63%
Dec-12	176	247.91	42.36	23.68	(0.38)	23.30	43.75	22.91	1.68%
Jan-13	176	248.36	48.72	27.23	(0.49)	26.75	50.05	26.15	2.24%
Feb-13	178	248.53	36.24	20.26	(0.29)	19.96	37.64	19.74	1.13%
Mar-13	177	247.36	31.97	18.04	(0.14)	17.90	33.79	18.03	-0.69%
Grand Total			466.97	254.55	(2.67)	251.88	490.42	251.88	0.00%

2.3 Bulk Supply – LT (CF = 0.940)

Month-wise	No. of consumers	Contract load (MW)	Energy consumption (MkWh)	Energy charges (Rs Crs)	PF surcharge/Rebate (Rs Crs)	Net bill (Rs Crs)	Energy consumption (MkVAh)	Revised energy bill (Rs Crs)	Impact (%)
Apr-12	224	12.98	2.29	1.21	(0.01)	1.20	2.43	1.19	0.20%
May-12	227	13.20	2.61	1.38	(0.01)	1.37	2.79	1.37	-0.51%
Jun-12	221	12.76	2.37	1.28	(0.01)	1.27	2.53	1.28	-0.97%
Jul-12	221	12.71	2.60	1.52	0.01	1.54	2.81	1.59	-3.56%
Aug-12	219	12.76	2.70	1.58	(0.01)	1.57	2.84	1.56	0.70%
Sep-12	226	12.77	2.65	1.55	(0.01)	1.54	2.80	1.54	0.19%
Oct-12	226	12.99	2.45	1.44	(0.01)	1.43	2.60	1.42	0.30%
Nov-12	231	13.13	2.52	1.48	0.00	1.48	2.70	1.50	-1.62%
Dec-12	232	13.24	2.86	1.68	(0.02)	1.66	2.99	1.63	1.63%
Jan-13	233	13.34	3.26	1.92	(0.02)	1.89	3.41	1.87	1.24%
Feb-13	234	13.36	2.56	1.50	(0.02)	1.49	2.68	1.47	1.14%
Mar-13	238	13.55	2.59	1.54	(0.02)	1.52	2.73	1.51	0.65%
Grand Total			31.47	18.07	(0.12)	17.95	33.32	17.95	0.00%

2.4 Cold Storage (CF = 0.947)

Month-wise	No. of consumers	Contract load (MW)	Energy consumption (MkWh)	Energy charges (Rs Crs)	PF surcharge/Rebate (Rs Crs)	Net bill (Rs Crs)	Energy consumption (MkVAh)	Revised energy bill (Rs Crs)	Impact (%)
Apr-12	157	31.14	5.88	2.91	(0.03)	2.88	6.18	2.87	0.31%
May-12	157	31.02	5.71	2.83	(0.04)	2.79	5.97	2.76	1.00%
Jun-12	156	30.96	5.78	2.93	(0.04)	2.89	6.05	2.87	0.78%
Jul-12	157	31.12	5.83	3.25	(0.04)	3.21	6.12	3.19	0.45%
Aug-12	158	31.37	5.61	3.15	(0.04)	3.11	5.88	3.09	0.69%
Sep-12	158	31.36	5.15	2.89	(0.04)	2.85	5.39	2.83	0.72%
Oct-12	158	31.38	3.94	2.21	(0.01)	2.20	4.19	2.22	-1.02%
Nov-12	157	31.20	2.08	1.16	0.01	1.17	2.23	1.21	-3.11%
Dec-12	158	31.38	1.08	0.61	0.01	0.62	1.18	0.66	-6.22%
Jan-13	160	31.70	1.14	0.64	0.01	0.65	1.25	0.69	-6.29%
Feb-13	161	31.89	2.06	1.16	(0.00)	1.15	2.18	1.17	-1.14%
Mar-13	166	32.80	6.29	3.60	(0.05)	3.55	6.57	3.52	0.99%
Grand Total			50.56	27.34	(0.26)	27.08	53.19	27.08	0.00%

2.5 Domestic – Large consumers (CF = 0.918)

Month-wise	No. of consumers	Contract load (MW)	Energy consumption (MkWh)	Energy charges (Rs Crs)	PF surcharge/Rebate (Rs Crs)	Net bill (Rs Crs)	Energy consumption (MkVAh)	Revised energy bill (Rs Crs)	Impact (%)
Apr-12	169	70.31	7.37	3.82	(0.00)	3.82	7.96	3.79	0.58%
May-12	169	70.07	6.88	3.68	0.02	3.70	7.50	3.71	-0.36%
Jun-12	167	68.21	7.72	4.51	0.00	4.51	8.37	4.51	0.17%
Jul-12	171	68.93	7.64	4.47	(0.01)	4.46	8.25	4.43	0.62%
Aug-12	170	68.82	6.94	4.04	0.00	4.04	7.51	4.03	0.36%
Sep-12	172	69.10	4.76	2.78	0.05	2.84	5.29	2.91	-2.63%
Oct-12	171	68.93	4.30	2.51	0.05	2.56	4.80	2.65	-3.50%
Nov-12	169	68.43	4.51	2.63	0.00	2.64	4.86	2.62	0.59%
Dec-12	173	69.56	5.34	3.12	0.00	3.12	5.71	3.09	1.07%
Jan-13	173	69.57	4.14	2.42	0.01	2.43	4.50	2.44	-0.44%
Feb-13	175	70.18	4.69	2.78	0.01	2.80	5.09	2.80	-0.14%
Mar-13	178	70.76	6.25	4.04	(0.02)	4.03	6.67	3.96	1.76%
Grand Total			70.56	40.82	0.14	40.96	76.52	40.96	0.00%

2.6 General Industry (CF = 0.962)

Months	No. of consumers	Connected Load (kW)	Energy Consumption (MkWh)	Energy charges (Rs Cr)	PF surcharge (Rs Cr)	Net bill (Rs Cr)	Energy consumption (MkVAh)	Revised energy bill (Rs Cr)	Impact (%)
Apr-12	5,649	6,023,457	421.48	208.73	(2.82)	205.9081	438.84	206.5149	-0.29%
May-12	5,668	6,038,536	590.64	292.54	(4.40)	288.1378	612.31	287.6914	0.15%
Jun-12	5,473	5,942,456	572.59	291.31	(4.39)	286.9143	593.64	286.3937	0.18%
Jul-12	5,479	5,959,341	541.36	301.80	(4.25)	297.556	562.75	297.8939	-0.11%
Aug-12	5,478	5,965,007	519.62	291.14	(4.18)	286.9612	539.37	286.902	0.02%
Sep-12	5,529	5,960,308	457.49	255.80	(3.54)	252.2619	475.55	252.5633	-0.12%
Oct-12	5,569	6,009,823	575.65	323.13	(4.44)	318.6915	597.69	318.8109	-0.04%
Nov-12	5,652	6,029,159	528.67	298.06	(3.96)	294.0981	550.04	294.7773	-0.23%
Dec-12	5,692	5,998,973	566.20	319.60	(4.73)	314.8684	587.18	314.4286	0.14%
Jan-13	5,718	6,094,124	552.67	311.88	(4.62)	307.2582	572.77	306.6411	0.20%
Feb-13	5,721	6,060,291	457.56	258.02	(3.63)	254.3891	475.58	254.6222	-0.09%
Mar-13	5,755	6,080,653	513.63	294.20	(4.16)	290.0491	532.94	289.8543	0.07%

Months	No. of consumers	Connected Load (kW)	Energy Consumption (MkWh)	Energy charges (Rs Cr)	PF surcharge (Rs Cr)	Net bill (Rs Cr)	Energy consumption (MkVAh)	Revised energy bill (Rs Cr)	Impact (%)
Grand Total			6297.57	3446.23	(49.13)	3397.094	6538.66	3397.094	0.00%

2.7 NRS (CF = 0.929)

Month-wise	No. of consumers	Contract load (MW)	Energy consumption (MkWh)	Energy charges (Rs Crs)	PF surcharge/Rebate (Rs Crs)	Net bill (Rs Crs)	Energy consumption (MkVAh)	Revised energy bill (Rs Crs)	Impact (%)
Apr-12	1,435	513.43	53.58	30.02	(0.09)	29.93	57.05	29.73	0.66%
May-12	1,367	474.91	48.00	27.54	(0.08)	27.46	51.22	27.29	0.60%
Jun-12	1,357	464.29	46.71	28.39	(0.10)	28.28	49.77	28.06	0.77%
Jul-12	1,366	466.02	48.82	29.67	(0.12)	29.55	51.89	29.27	0.96%
Aug-12	1,372	473.74	46.28	27.77	(0.05)	27.72	49.39	27.58	0.51%
Sep-12	1,371	473.37	36.23	22.02	0.21	22.23	39.21	22.54	-1.38%
Oct-12	1,372	471.61	30.32	18.42	0.25	18.67	33.25	19.62	-5.08%
Nov-12	1,385	479.31	28.81	17.54	0.07	17.61	30.76	17.61	-0.02%
Dec-12	1,393	482.39	30.26	18.39	(0.00)	18.39	32.14	18.25	0.73%
Jan-13	1,392	482.88	26.95	16.41	0.10	16.51	28.91	16.59	-0.48%
Feb-13	1,401	486.47	32.62	20.09	0.10	20.19	34.96	20.26	-0.36%
Mar-13	1,414	487.77	41.85	27.65	(0.06)	27.59	44.45	27.32	0.97%
Grand Total			470.44	283.90	0.23	284.13	503.00	284.13	0.00%

2.8 PIU (CF = 0.977)

Month-wise	No. of consumers	Contract load (MW)	Energy consumption (MkWh)	Energy charges (Rs Crs)	PF surcharge/Rebate (Rs Crs)	Net bill (Rs Crs)	Energy consumption (MkVAh)	Revised energy bill (Rs Crs)	Impact (%)
Apr-12	446	1,020.53	165.77	82.07	(0.58)	81.49	169.83	81.64	-0.18%
May-12	448	1,002.91	228.52	113.13	(0.89)	112.24	233.29	112.04	0.18%
Jun-12	446	1,001.56	270.59	135.93	(1.06)	134.87	276.20	134.60	0.20%
Jul-12	446	999.39	245.50	132.85	(0.97)	131.89	251.19	131.95	-0.05%
Aug-12	451	1,007.60	216.42	121.34	(0.89)	120.45	221.58	120.56	-0.09%
Sep-12	453	1,013.32	176.61	99.01	(0.66)	98.35	181.32	98.72	-0.38%

Month-wise	No. of consumers	Contract load (MW)	Energy consumption (MkWh)	Energy charges (Rs Crs)	PF surcharge/Rebate (Rs Crs)	Net bill (Rs Crs)	Energy consumption (MkVAh)	Revised energy bill (Rs Crs)	Impact (%)
Oct-12	457	1,013.67	223.50	125.39	(0.88)	124.51	228.79	124.63	-0.10%
Nov-12	457	1,013.49	213.44	120.00	(0.89)	119.11	218.32	119.11	0.00%
Dec-12	459	1,014.46	223.56	125.75	(0.99)	124.75	228.30	124.55	0.16%
Jan-13	454	1,001.80	210.60	118.38	(0.92)	117.46	215.07	117.28	0.16%
Feb-13	452	995.29	180.33	101.39	(0.74)	100.65	184.45	100.66	0.00%
Mar-13	472	1,006.24	197.19	112.74	(0.81)	111.93	201.71	111.98	-0.04%
Grand Total			2,552.01	1,387.98	(10.27)	1,377.71	2,610.05	1,377.71	0.00%

2.9 Railways (CF = 0.967)

Month-wise	No. of consumers	Contract load (MW)	Energy consumption (MkWh)	Energy charges (Rs Crs)	PF surcharge/Rebate (Rs Crs)	Net bill (Rs Crs)	Energy consumption (MkVAh)	Revised energy bill (Rs Crs)	Impact (%)
Apr-12	7	72.87	11.63	6.72	(0.04)	6.69	12.01	6.68	0.15%
May-12	7	72.87	12.56	7.26	(0.03)	7.23	13.03	7.25	-0.32%
Jun-12	7	72.87	11.12	6.45	(0.04)	6.42	11.48	6.41	0.10%
Jul-12	7	72.87	11.74	7.08	(0.04)	7.04	12.12	7.02	0.18%
Aug-12	7	72.87	11.85	7.15	(0.03)	7.11	12.30	7.14	-0.34%
Sep-12	7	72.87	11.21	6.76	(0.04)	6.73	11.61	6.73	-0.08%
Oct-12	7	72.87	11.82	7.13	(0.04)	7.09	12.23	7.09	-0.04%
Nov-12	7	72.87	11.60	7.00	(0.04)	6.96	12.00	6.96	-0.03%
Dec-12	7	72.87	10.47	6.31	(0.04)	6.28	10.79	6.26	0.34%
Jan-13	8	75.51	11.54	6.96	(0.04)	6.92	11.90	6.90	0.24%
Feb-13	8	75.51	9.77	5.89	(0.03)	5.86	10.10	5.85	0.10%
Mar-13	8	75.51	11.58	7.00	(0.03)	6.97	12.00	6.98	-0.22%
Grand Total			136.89	81.71	(0.43)	81.28	141.57	81.28	0.00%

2.10 Sugar Mills (CF = 0.947)

Month-wise	No. of consumers	Contract load (MW)	Energy consumption (MkWh)	Energy charges (Rs Crs)	PF surcharge/Rebate (Rs Crs)	Net bill (Rs Crs)	Energy consumption (MkVAh)	Revised energy bill (Rs Crs)	Impact (%)
Apr-12	13	11.04	0.87	0.43	(0.01)	0.42	0.90	0.41	2.16%
May-12	14	11.39	0.85	0.42	(0.01)	0.42	0.89	0.41	0.82%

Month-wise	No. of consumers	Contract load (MW)	Energy consumption (MkWh)	Energy charges (Rs Crs)	PF surcharge/Rebate (Rs Crs)	Net bill (Rs Crs)	Energy consumption (MkVAh)	Revised energy bill (Rs Crs)	Impact (%)
Jun-12	14	11.39	0.77	0.38	(0.00)	0.38	0.81	0.38	0.88%
Jul-12	14	11.39	0.77	0.43	0.00	0.43	0.82	0.44	-1.02%
Aug-12	14	11.39	0.75	0.42	(0.00)	0.42	0.79	0.41	0.48%
Sep-12	14	11.39	0.87	0.49	(0.01)	0.48	0.90	0.47	1.28%
Oct-12	13	11.04	0.71	0.40	0.00	0.40	0.75	0.41	-1.00%
Nov-12	14	11.39	1.16	0.65	(0.01)	0.64	1.23	0.65	-0.89%
Dec-12	14	11.39	1.42	0.80	(0.01)	0.79	1.53	0.81	-2.07%
Jan-13	14	11.39	1.63	0.92	(0.01)	0.91	1.73	0.91	-0.69%
Feb-13	14	11.39	1.27	0.71	(0.01)	0.70	1.33	0.69	0.88%
Mar-13	13	10.92	0.82	0.46	(0.01)	0.46	0.85	0.45	1.47%
Grand Total			11.89	6.50	(0.06)	6.45	12.53	6.45	0.00%

2.11 *Large Supply {combined} (C.F = 0.963)*

Month-wise	No. of consumers	Contract load (MW)	Energy consumption (MkWh)	Energy charges (Rs Crs)	PF surcharge/Rebate (Rs Crs)	Net bill (Rs Crs)	Energy consumption (MkVAh)	Revised energy bill (Rs Crs)	Impact (%)
Apr-12	8,287	8,134,488	715.8	359	(4)	356	745	357	-0.38%
May-12	8,245	8,103,701	964.2	483	(6)	477	999	477	0.08%
Jun-12	8,025	7,994,277	984.0	506	(6)	500	1,018	499	0.23%
Jul-12	8,042	8,009,700	927.0	516	(6)	510	962	511	-0.07%
Aug-12	8,047	8,030,800	877.4	494	(6)	489	910	489	-0.01%
Sep-12	8,109	8,031,716	751.8	423	(4)	419	782	420	-0.31%
Oct-12	8,153	8,080,005	906.3	511	(5)	505	941	507	-0.25%
Nov-12	8,251	8,106,528	844.4	477	(5)	472	876	473	-0.10%
Dec-12	8,309	8,086,765	902.5	511	(6)	504	933	503	0.30%
Jan-13	8,333	8,173,260	878.9	497	(6)	491	908	489	0.33%
Feb-13	8,349	8,137,492	743.2	421	(5)	416	771	416	-0.02%
Mar-13	8,426	8,170,156	830.0	480	(5)	474	860	474	0.04%
Grand Total		97,058,889	10,325.5	5,677	(63)	5,614	10,705	5,614	0.00%

2.12 *Medium Supply (CF = 0.916)*

Month-wise	No. of consumers	Contract load (MW)	Energy consumption (MkWh)	Energy charges (Rs Crs)	PF surcharge/Rebate (Rs Crs)	Net bill (Rs Crs)	Energy consumption (MkVAh)	Revised energy bill (Rs Crs)	Impact (%)
Apr-12	12,729	740.47	77.41	40.67	0.51	41.18	84.37	41.12	0.15%
May-12	12,660	746.21	72.57	37.65	0.47	38.12	79.38	38.20	-0.21%
Jun-12	12,605	740.47	77.41	40.67	0.41	41.08	84.37	41.02	0.15%
Jul-12	12,551	736.34	73.73	41.02	0.32	41.35	80.22	41.20	0.34%
Aug-12	12,575	738.62	72.65	41.80	0.37	42.17	79.19	42.11	0.15%
Sep-12	12,634	740.73	76.41	43.78	0.39	44.17	83.36	44.14	0.07%
Oct-12	12,704	745.53	76.53	43.97	0.43	44.40	83.55	44.40	-0.01%
Nov-12	12,889	760.26	75.44	43.68	0.64	44.32	83.10	44.73	-0.91%
Dec-12	12,900	762.19	77.43	44.95	0.52	45.47	84.81	45.62	-0.33%
Jan-13	12,930	765.24	81.26	47.14	0.41	47.55	88.46	47.42	0.28%
Feb-13	12,937	766.15	78.68	45.88	0.44	46.32	85.69	46.21	0.23%
Mar-13	12,864	763.03	75.04	43.75	0.46	44.22	81.85	44.18	0.08%
Grand Total			914.56	514.96	5.38	520.34	998.36	520.34	0.00%