POWER FACTOR REBATE-BOLD DECISION FROM REGULATOR

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Abstract: *Power factor rebate was started to return to industry part of the heavily charged tariff. In lieu industry/consumer were informed to provide reactive support to system. The power factor then was ranging between 0.8-0.9 & therefore through incentive in form of rebate, system power factor was brought up above 0.95. After the implementation of the "Electricity Act2003", "Inter & Intra state ABT", now all the consumers are expected to maintain the power factor near to unity even if the power factor rebate gets removed. This paper presents the cost benefit analysis of power factor rebate to utility & HT industries carried out by M/s Electrical Research & Development Association for power factor ranging from leading to lagging and unity for sample 10 HT industries.*

Index Terms- *Power factor, Power factor rebate*

I. INTRODUCTION

Majority of the loads in the industries are highly inductive in nature such as induction motors, transformers, AC/DC drives, welding machines, arc furnaces etc. There may be a few resistive loads for heaters, boilers and incandescent lamps. Very rare industries may have capacitive loads such as synchronous motors & power electronic controller. Net industrial load is highly inductive causing a very poor lagging power factor. Poor power factor results in:

- ❖ System voltage regulation suffers and additional voltage regulating equipment may be required for satisfactory operation of the equipment.
- ❖ Inefficient utilization of the transmission equipment since more current flow per unit of real power transmitted is necessary due to reactive power, also carried in power lines. If the current necessary to satisfy reactive power could be reduced, more useful power could be transmitted through the system.
- ❖ Cost of the increased power loss in transmission lines. The increased power loss is due to the unnecessary reactive power which is in the system. The reactive power losses vary as the square of the reactive current or as the inverse of the power factor squared. Also higher current causes rise in higher conductor temperature. Hence, the life of the insulation also gets reduced

Hence, improvement in power factor is needed to

- ❖ Improve the voltage profile of the system
- ❖ Avoid system losses and
- ❖ Avoid inefficient utilization of system capacity

Non-improvement of power factor can not only lead to continuation of higher level of energy losses, poor voltage profile but also de-motivate consumers from undertaking efficiency improvement. Hence, long back, power factor rebate was introduced by the utilities to improve power factor and voltage profile of the system. To earn the benefit of power factor rebate, the consumers governed by two part tariff (one part for capacity or demand drawn and the second part for the actual energy drawn during the billing cycle) have started adding reactive compensation devices at their end, resulted into improvement in power factor and voltage profile. This shows one aspect of the introduction of power factor rebate on the system.

However, the second aspect reveals that to earn the benefit of power factor rebate, bulk consumers have started adding more and more reactive compensation devices at their end, without seeing the actual requirement of their load. Some of the loads, like steel furnaces require maximum reactive energy only at the time of producing heat for melting iron and not at other times. Under such circumstances, if the capacitors are not switched off, they would start exporting reactive energy to grid.

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Now as the inter-state and intra-state ABT have started monitoring of power sector in 15 minutes time blocks, utilities have to pay reactive energy charges while drawing reactive energy during low voltage conditions as well as while feeding reactive energy in the system during high voltage conditions under the ABT regime. Hence the introduction of the power factor rebate shows both the negative and positive impact on the system.

M/s Electrical Research & Development Association (ERDA) have gathered various system data of selected 10 HT industries and that of the utility and carried out cost benefit analysis due to power factor rebate to HT industries and utility.

II. OBJECTIVES

The main objectives of the study were:

1) To determine the effect on system under lagging, unity and leading power factor and carry out cost benefit (techno-economic) analysis both for industry and utility
2) Calculation of payback period for the installation of reactive compensation device (capacitor) and operational and maintenance cost for maintaining it

III. IDENTIFICATION OF INDUSTRIAL UNITS FOR SURVEY

The above mentioned study was carried out for 10 selected HT industries receiving power factor rebate and

a) Having significant weightage on the overall power factor rebate
b) Receiving supply at 11kV, 66kV and 132kV express and normal feeders having more than one consumers
c) Having different tariff rates like HTP-I, HTP-IV, traction
d) Having different types in nature like steel, plastic, mineral oil & petroleum, chemical, engineering, railway

IV. RESULTS & DISCUSSION

Techno-economic analysis was carried out by MIPOWER software package using following options:

1. Considering the existing position (ON/OFF) of capacitors at consumer end and hence existing power factor.
2. Switching OFF all capacitors connected at consumer end through software package
3. Creating lagging power factor of 0.95 through software package
4. Creating unity power factor through software package
5. Creating leading power factor of 0.95 through software package

The techno-economic analysis is carried out:

a) Considering benefits to utility and benefits to consumers.

Benefits to utility:

- Decrease in I^2R losses
- Increase in billing
- Increase in surplus system capacity

Benefits to consumers:

- Decrease in kVA demand
- Power factor rebate above 0.95

b) Power factor rebate is considered as per the tariff i.e. if the average power factor of the consumer's installation in any month is above 95%, the consumer is entitled to a rebate at the rate of 0.5% (half percent) in excess of 95% power factor on the total amount of electricity bill for that month under the head "Demand charges" and "Energy charges" for every 1% rise or part thereof in the average power factor during the month above 95%.
c) The analysis is also carried out replacing present rate of power factor rebate as 0.5% with 0.3 / 0.2 / 0.16 / 0.1% for power factor above 0.95 & also that of without power factor rebate i.e. 0% rate (TABLE-1).
d) Similar exercise is carried out replacing present rate of power factor rebate as 0.5% with 0.534 / 0.3135 / 0.3 / 0.2 / 0.15 / 0.1% for power factor above 0.96 (TABLE-2), 0.97 (TABLE-3), 0.98 & also that of without power factor rebate i.e. 0% rate.

   The techno-economic analysis with different rates and different power factor limits is necessary to carry out as it gives the scenario of benefit versus loss to utility by giving power factor rebate against the benefit earned from the consumers after installing reactive compensation devices at their end.
e) Payback period is also carried out for all above cases as payback analysis is required for the industry to determine how long it will take to re-coup the investment in the improvement. Industrial consumers are typically looking for a 1 to 4 year payback. Under leading condition, payback period is more than that of unity and even it will be much higher if the utility withdraw to give power factor rebate to consumers.

TABLE-1: POWER FACTOR REBATE LIMIT=0.95

1	2	3	4	5	6	7	8	9	10	11	12
	0.95	1.69L	3.21L	0.6	0.6	-1.52L	-1.52L	-1.52L	-1.52L	-1.52L	-1.52L
	0.998*	4.60L	7.20L	0.5	1	-2.60L	-1.10L	-36154	-9154	38401	1.13L
	1	4.84L	7.35L	0.5	1	-2.52L	-96368	-18705	9420	58957	1.37L
A	-0.95	7.73L	6.94L	1.3	2.9	79629	2.35L	3.13L	3.41L	3.90L	4.68L
	0.95	2.92L	6.24L	1.6	1.6	-3.33L	-3.33L	-3.33L	-3.33L	-3.33L	-3.33L
	0.98*	4.02L	10.65L	1.4	1.9	-6.63L	-5.51L	-4.94L	-4.74L	-4.38L	-3.82L
	1	5.61L	13.13L	1.5	2.3	-7.53L	-5.64L	-4.70L	-4.35L	-3.75L	-2.81L
B	-0.95	6.99L	5.96L	4.9	23.4	1.04L	2.92L	3.87L	4.21L	4.81L	5.75L
	0.95	10.39L	2.70L	0.6	0.6	7.69L	7.69L	7.69L	7.69L	7.69L	7.69L
	1*	12.94L	5.86L	0.5	0.9	7.08L	8.11L	8.63L	8.82L	9.15L	9.67L
C	-0.95	15.07L	5.07L	0.8	1.6	10.01L	11.05L	11.56L	11.75L	12.08L	12.5L
	0.95	1.42L	43512	2.8	2.8	98602	98602	98602	98602	98602	98602
	0.999*	3.12L	3.81L	0.7	4	-68119	57773	1.21L	1.44L	1.84L	2.47L
	1	3.79L	3.87L	0.7	4.1	-7461	1.21L	1.85L	2.08L	2.49L	3.14L
D	-0.95	8.07L	3.61L	1.1	10.3	4.46L	5.74L	6.39L	6.62L	7.03L	7.67L
	0.95	13.23L	12.13L	1.2	1.2	1.11L	1.11L	1.11L	1.11L	1.11L	1.11L
	0.974*	15.10L	20.75L	0.8	1.3	-5.65L	-2.63L	-1.12L	-57332	38958	1.90L
	1	18.82L	30.00L	0.6	1.4	-11.18L	-4.90L	-1.76L	-62259	1.38L	4.52L
E	-0.95	19.04L	27.50L	1	2.3	-8.47L	-2.19L	95241	2.09L	4.09L	7.23L
	0.95	51429	35076	0.8	0.8	16353	16353	16353	16353	16353	16353
	0.958*	92744	83924	0.6	1.3	8820	26007	34601	37713	43194	51788
	1	2.44L	3.28L	0.7	3.8	-84699	23888	78181	97843	1.32L	1.87L
F	-0.95	3.98L	2.97L	1.3	15.6	1.01L	2.09L	2.63L	2.83L	3.18L	3.72L
	0.95	1.04L	2352	2.4	2.4	1.01L	1.01L	1.01L	1.01L	1.01L	1.01L
	0.996*	1.79L	22965	0.7	3.6	1.56L	1.64L	1.67L	1.69L	1.71L	1.74L
	1	2.47L	24557	0.8	4.4	2.22L	2.30L	2.34L	2.36L	2.38L	2.42L
G	-0.95	3.96L	22205	1.5	14.6	3.74L	3.82L	3.86L	3.88L	3.90L	3.94L
	0.95	2.08L	4704	5.8	5.8	2.04L	2.04L	2.04	2.04L	2.04L	2.04L
	1*	3.24L	1.57L	0.5	5.2	1.68L	2.24L	2.52L	2.62L	2.80L	3.08L
H	-0.95	5.38L	1.45L	1.1	34.3	3.93L	4.49L	4.77L	4.87L	5.05L	5.33L
	0.95	1.82L	1.35L	3.5	3.5	46569	46569	46569	46569	46569	46569
	0.992*	3.73L	3.09L	1.6	3.3	63997	1.28L	1.60L	1.71L	1.91L	2.23L
	1	4.02L	3.45L	1.6	3.6	56969	1.33L	1.71L	1.85L	2.09L	2.47L
I	-0.95	4.88L	2.02L	4.3	73.5	2.86L	3.62L	3.99L	4.14L	4.38L	4.76L
	0.95	14.39L	22.83L	1.5	1.5	-8.43L	-8.43L	-8.43L	-8.43L	-8.43L	-8.43L
	0.96*	14.89L	31.34L	1.2	1.6	-16.45L	-13.35L	-11.81L	-11.25L	-10.26L	-8.70L
	1	16.73L	65.22L	0.8	2	-48.49L	-33.04L	-25.32L	-22.52L	-17.59L	-9.87L
J	-0.95	14.39L	61.45L	1.2	3.2	-47.06L	-31.61L	-23.88L	-21.09L	-16.16L	-8.43L
	0.95 (A - J)	49.51L	49.32L			18597	18597	18597	18597	18597	18597
	*** (A - J)**	64.38L	85.34L			-20. 96 L	-8.49L	-2.26L	**7**	3.98L	10.21L
	1 (A - J)	74.90L	133.99L			-59.09L	-29.11L	-14.12L	-8.69L	86565	15.85L
	-0.95 (A - J)	89.50L	117.19L			-27.69L	2.29L	17.28L	22.71L	32.27L	47.25L

* Existing power factor

1: HT industries
- A =Plastic industry
- B, E =Steel industry
- C=Mineral oil & petroleum industry
- D, I=Chemical industry
- F, G, H=Engineering industry
- J=Traction

2: Power factor with capacitor

3: Total advantages to utility (Rs/-)

4: Total advantages to consumer (Rs/-)

5: Payback period in year with power factor rebate

6: Payback period in year without power factor rebate

7, 8, 9, 10, 11, 12: **Net benefit to utility @** 0.5%, 0.3%, 0.2%, **0.16%,** 0.1%, 0% rebate

TABLE-2: POWER FACTOR REBATE LIMIT=0.96

1	2	3	4	5	6	7	8	9	10	11	12
	0.95	1.69L	3.21L	0.6	0.6	-1.52L	-1.52L	-1.52L	-1.52L	-1.52L	-1.52L
	0.998*	4.60L	6.42L	0.5	1	-1.82L	-72102	-64113	-5090	53934	1.13L
	1	4.84L	6.58L	0.6	1	-1.74L	-58179	-49770	12360	74489	1.37L
A	-0.95	7.73L	6.16L	1.4	2.9	1.57L	2.73L	2.82L	3.44L	4.06L	4.68L
	0.95	2.92L	6.24L	1.6	1.6	-3.33L	-3.33L	-3.33L	-3.33L	-3.33L	-3.33L
	0.98*	4.02L	9.72L	1.5	1.9	-5.69L	-4.99L	-4.94L	-4.57L	-4.19L	-3.82L
	1	5.61L	12.19L	1.6	2.3	-6.58L	-5.18L	-5.07L	-4.32L	-3.56L	-2.81L
B	-0.95	6.99L	5.01L	5.8	23.4	1.98L	3.39L	3.49L	4.24L	4.99L	5.75L
	0.95	10.39L	2.70L	0.6	0.6	7.69L	7.69L	7.69L	7.69L	7.69L	7.69L
	1*	12.94L	5.35L	0.5	0.9	7.60L	8.37L	8.42L	8.84L	9.25L	9.67L
C	-0.95	15.08L	4.55L	0.9	1.6	10.53L	11.30L	11.36L	11.77L	12.18L	12.60L
	0.95	1.42L	43512	2.8	2.8	98602	98602	98602	98602	98602	98602
	0.999*	3.12L	3.16L	0.8	4	-3888	89531	96312	1.46L	1.97L	2.47L
	1	3.80L	3.23L	0.8	4.1	56770	1.53L	1.59L	2.11L	2.62L	3.14L
D	-0.95	8.07L	2.97L	1.4	10.3	5.10L	6.06L	6.13L	6.64L	7.16L	7.67L
	0.95	13.24L	12.13L	1.2	1.2	1.11L	1.11L	1.11L	1.11L	1.11L	1.11L
	0.974*	15.10L	17.61L	0.9	1.3	-2.50L	-86181	-74262	13798	1.02L	1.90L
	1	18.82L	26.86L	0.7	1.4	-8.04L	-3.36L	-3.02L	-50373	2.01L	4.52L
E	-0.95	19.04L	24.37L	1.1	2.3	-5.33L	-64373	-30370	2.21L	4.72L	7.23L
	0.95	51429	35076	0.8	0.8	16353	16353	16353	16353	16353	16353
	0.958*	92744	40956	1.3	1.3	51788	51788	51788	51788	51788	51788
	1	2.44L	2.75L	0.8	3.8	-30406	50585	56464	99898	1.43L	1.87L
F	-0.95	3.98L	2.43L	1.6	15.6	1.55L	2.36L	2.42L	2.85L	3.29L	3.72L
	0.95	1.04L	2352	2.4	2.4	1.01L	1.01L	1.01L	1.01L	1.01L	1.01L
	0.996*	1.79L	18995	0.9	3.6	1.60L	1.67L	1.66L	1.69L	1.72L	1.75L
	1	2.47L	20586	1	4.4	2.26L	2.32L	2.33L	2.36L	2.39L	2.42L
G	-0.95	3.96L	18234	1.9	14.6	3.78L	3.84L	3.85L	3.88L	3.91L	3.94L
	0.95	2.08L	4704	5.8	5.8	2.04L	2.04L	2.04L	2.04L	2.04L	2.04L
	1*	3.25L	1.29L	0.7	5.2	1.96L	2.38L	2.41L	2.63L	2.86L	3.08L
H	-0.95	5.38L	1.17L	1.4	34.3	4.21L	4.63L	4.66L	4.88L	5.11L	5.33L
	0.95	1.82L	1.35L	3.5	3.5	46569	46569	46569	46569	46569	46569
	0.992*	3.73L	2.71L	1.8	3.3	1.02L	1.47L	1.50L	1.75L	1.99L	2.23L
	1	4.02L	3.07L	1.8	3.6	94964	1.52L	1.56L	1.86L	2.17L	2.47L
I	-0.95	4.88L	1.64L	5.2	73.5	3.24L	3.81L	3.85L	4.15L	4.46L	4.76L
	0.95	14.39L	22.83L	1.5	1.5	-8.43L	-8.43L	-8.43L	-8.43L	-8.43L	-8.43L
	0.96*	14.89L	23.60L	1.6	1.6	-8.71L	-8.71L	-8.71L	-8.71L	-8.71L	-8.71L
	1	16.73L	57.49L	0.9	2	-40.77L	-29.24L	-28.41L	-22.23L	-16.05L	-9.87L
J	-0.95	14.39L	53.73L	1.4	3.2	-39.33L	-27.81L	-26.97L	-20.79L	-14.61L	-8.43L
	0.95 (A – J)	49.51L	49.32L			18597	18597	18597	18597	18597	18597
	*** (A – J)**	64.38L	70.45L			-6.07L	**2**	44085	3.70L	6.95L	10.21L
	1 (A – J)	74.90L	119.00L			-44.10L	-21.74L	-20.12L	-8.13L	3.86L	15.85L
	-0.95(A – J)	89.51L	102.21L			-12.70L	9.66L	11.28L	23.27L	35.26L	47.25L

*Existing power factor
1: HT industries
A =Plastic industry
B, E =Steel industry
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D, I=Chemical industry
F, G, H=Engineering industry
J= Traction

2: Power factor with capacitor
3: Total advantages to utility (Rs/-)
4: Total advantages to consumer (Rs/-)
5: Payback period in year with power factor rebate
6: Payback period in year without power factor rebate
7, 8, 9, 10, 11, 12: **Net benefit to utility @** 0.5%, **0.3135%,** 0.3%, 0.2%, 0.1%, 0% rebate

TABLE-3: POWER FACTOR REBATE LIMIT=0.97

1	2	3	4	5	6	7	8	9	10	11	12
	0.95	1.69L	3.21L	0.6	0.6	-1.52L	-1.52L	-1.52L	-1.52L	-1.52L	-1.52L
	0.998*	4.60L	5.64L	0.6	1	-1.19L	-1.04L	-17516	25975	47721	1.13L
	1	4.84L	5.80L	0.6	1	-1.12L	-96368	-3173	43424	66723	1.37L
A	-0.95	7.73L	5.39L	1.6	2.9	2.19L	2.35L	3.28L	3.75L	3.98L	4.68L
	0.95	2.92L	6.24L	1.6	1.6	-3.33L	-3.33L	-3.33L	-3.33L	-3.33L	-3.33L
	0.98*	4.02L	8.78L	1.7	1.9	-4.82L	-4.75L	-4.38L	-4.19L	-4.10L	-3.82L
	1	5.61L	11.24L	1.7	2.3	-5.83L	-5.64L	-4.51L	-3.94L	-3.66L	-2.81L
B	-0.95	6.99L	4.07L	7.1	23.4	2.73L	2.92L	4.06L	4.62L	4.91L	5.75L
	0.95	10.39L	2.70L	0.6	0.6	7.69L	7.69L	7.69L	7.69L	7.69L	7.69L
	1*	12.94L	4.83L	0.6	0.9	8.01L	8.11L	8.74L	9.05L	9.20L	9.67L
C	-0.95	15.08L	4.03L	1	1.6	10.94L	11.05L	11.67L	11.98L	12.13L	12.60L
	0.95	1.42L	43512	2.8	2.8	98602	98602	98602	98602	98602	98602
	0.999*	3.12L	2.52L	1	4	47755	60343	1.35L	1.72L	1.91L	2.47L
	1	3.80L	2.59L	1	4.1	1.08L	1.21L	1.98L	2.37L	2.56L	3.14L
D	-0.95	8.07L	2.33L	1.8	10.3	5.61L	5.74L	6.52L	6.90L	7.09L	7.67L
	0.95	13.24L	12.13L	1.2	1.2	1.11L	1.11L	1.11L	1.11L	1.11L	1.11L
	0.974*	15.10L	14.46L	1.2	1.3	55617	64119	1.14L	1.40L	1.52L	1.90L
	1	18.82L	23.72L	0.8	1.4	-5.54L	-4.90L	-1.13L	75238	1.69L	4.52L
E	-0.95	19.04L	21.23L	1.3	2.3	-2.82L	-2.19L	1.58L	3.46L	4.41L	7.23L
	0.95	51429	35076	0.8	0.8	16353	16353	16353	16353	16353	16353
	0.958*	92744	40956	1.3	1.3	51788	51788	51788	51788	51788	51788
	1	2.44L	2.20L	1	3.8	12881	23888	89040	1.22L	1.38L	1.87L
F	-0.95	3.98L	1.89L	2.1	15.6	1.98L	2.09L	2.74L	3.07L	3.23L	3.72L
	0.95	1.04L	2352	2.4	2.4	1.01L	1.01L	1.01L	1.01L	1.01L	1.01L
	0.996*	1.79L	15026	1.1	3.6	1.64L	1.64L	1.68L	1.70L	1.71L	1.75L
	1	2.47L	16616	1.2	4.4	2.29L	2.30L	2.35L	2.37L	2.38L	2.42L
G	-0.95	3.96L	14264	2.4	14.6	3.81L	3.82L	3.87L	3.89L	3.90L	3.94L
	0.95	2.08L	4704	5.8	5.8	2.04L	2.04L	2.04L	2.04L	2.04L	2.04L
	1*	3.25L	1.01L	0.9	5.2	2.18L	2.24L	2.58L	2.74L	2.83L	3.08L
H	-0.95	5.38L	88910	1.8	34.3	4.43L	4.49L	4.83L	4.99L	5.08L	5.33L
	0.95	1.82L	1.35L	3.5	3.5	46569	46569	46569	46569	46569	46569
	0.992*	3.73L	2.34L	2.1	3.3	1.34L	1.40L	1.73L	1.90L	1.98L	2.23L
	1	4.02L	2.69L	2.1	3.6	1.25L	1.33L	1.79L	2.01L	2.13L	2.47L
I	-0.95	4.88L	1.26L	6.8	73.5	3.54L	3.62L	4.08L	4.30L	4.42L	4.76L
	0.95	14.39L	22.83L	1.5	1.5	-8.43L	-8.43L	-8.43L	-8.43L	-8.43L	-8.43L
	0.96*	14.89L	23.60L	1.6	1.6	-8.71L	-8.71L	-8.71L	-8.71L	-8.71L	-8.71L
	1	16.73L	49.77L	1.1	2	-34.61L	-33.04L	-23.77L	-19.14L	-16.82L	-9.87L
J	-0.95	14.39L	46.00L	1.6	3.2	-33.18L	-31.61L	-22.34L	-17.70L	-15.39L	-8.43L
	0.95 (A – J)	49.51L	49.32L			18597	18597	18597	18597	18597	18597
	*** (A – J)**	64.38L	63.73L			**19**	64658	4.47L	6.39L	7.34L	10.21L
	1 (A – J)	74.90L	104.01L			-32.15L	-29.11L	-11.12L	-2.13L	2.36L	15.85L
	-0.95(A – J)	89.51L	87.22L			-74814	2.29L	20.28L	29.27L	33.77L	47.25L

*Existing power factor

1: HT industries
- A =Plastic industry
- B, E =Steel industry
- C=Mineral oil & petroleum industry
- D, I=Chemical industry
- F, G, H=Engineering industry
- J= Traction

2: Power factor with capacitor

3: Total advantages to utility (Rs/-)

4: Total advantages to consumer (Rs/-)

5: Payback period in year with power factor rebate

6: Payback period in year without power factor rebate

7, 8, 9, 10, 11, 12: **Net benefit to utility @ 0.53379%,** 0.5%, 0.3%, 0.2%, 0.15%, 0% rebate

V. CONCLUSIONS

1) The techno-economic study is carried out for sample 10 HT industries
   - ❖ Considering present power factor rebate rate i.e. at the rate of 0.5% per 1% improvement in power factor above 0.95.
   - ❖ Replacing present rate of 0.5% with 0.534/0.3135/0.3/0.2/0.16/0.15/0.1 & 0% for power factor above 0.95, 0.96, 0.97& 0.98.
2) Sum total of net benefit to utility for existing situation reveal that power factor rebate can be reduced to 0.1637% (in place of 0.5%) to avoid any loss to utility.
3) With the advent of new technologies in last two decades, power factor improvement has now become automotive and can be easily maintained to 0.98-1.00
4) Therefore the cut-off limit for eligibility to claim rebate can be raised to 0.98 at least. Here, the present rebate limit of 0.5% can continue. Moreover, the penalty on power factor is applicable below 0.90 at present. This limit can be raised to 0.95.
5) The % age figure of rebated in bill can be worked out based on cut-off limit decided. The recommended values are listed below.

Limit for power factor rebate	**%age rebate on electricity bill for avoiding loss to utility**
0.95	0.163785
0.96	0.313535
0.97	>0.5
0.98	>0.5

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