

THE ELECTRICITY CONSUMER GRID

A quarterly information bulletin

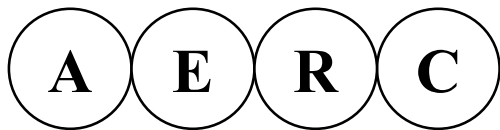
Volume VI, No. 1 of 2007

- *Open Access of Electricity – A Discussion*
- *Important Electrical Term – Power Factor*
- *MTI Presentation on Efficient Lighting System*
- *Meters – Types and Technology*
- *Consumer Complaint Resolution Procedure & time limits for different categories.*

And More.....



Consumer Advocacy Cell, Assam Electricity Regulatory Commission, ASEB Complex, Dwarandhar, Six Mile, Guwahati-781 022, Phone: (0361) 2234442, email: aerc_ghy@hotmail.com



PREFACE

Chairperson

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Shri Jadab Prasad Saikia

Member

Shri Himadri Dutta

Secretary

Smti Neelima Dewri Dutta

Joint Director (Tariff)

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Deputy Director (Engg)

Shri Anuj Goswami

Deputy Director (Finance)

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(Consumer Advocacy)

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P.S. to Chairperson

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(Outside)

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The Assam State Electricity Board and its successor companies have submitted to the Commission multiyear tariff petitions for FY 2007-08, 2008-09 and 2009-2010. **After admission by the Commission, the summary of these petitions will be widely publicized through newspapers and the petitions will also be available in the website of the Commission.**

As in earlier cases, the Commission will finalise the power tariff only after taking into account the views of cross sections of people including organisations representing the industries and individuals. The consumers particularly members of the empanelled consumer groups of Consumer Advocacy Cell may submit response petitions within 30 days after public notice to dispute any unwarranted increase in tariff for these years. A write up on the procedure to file response petitions is available in the Volume III of the Consumer Grid.

The Distribution Companies have set up the Consumer Grievance Redressal Forums and Grievance Redressal Cells as per the AERC Guidelines for Redressal of Consumer Grievances, 2004. The officers and members of these bodies as reported are incorporated in this issue of the bulletin.

We have also incorporated in this issue a discussion on Open Access of Electricity in the power sector. A write up on different types of electric meters is also added along with the presentation by MTI division of utilities during the 3rd Consumer Awareness Meet on efficient lighting system. The complaint resolution procedure and time limits for different categories as in the Guidelines for Redressal of Consumer grievances are also included. So, please read on.....

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“Efficiency is doing better what is already being done.” – Peter F. Drucker.

“It's best to have failure happen early in life. It wakes up the Phoenix bird in you so you rise from the ashes.” – Anne Baxter, American Actress

"They that envy others are their inferiors."- A. Graham Bell

FROM THE CHAIRPERSON'S DESK

Assam's generating capacity falls far short of its demand and it has to rely heavily on the allocated power from the Central Sector Generating Stations of NEEPCO and NHPC in the northeastern states. Most of these central generating units are hydro stations which are run on river types and a failure of monsoons in the north eastern states adversely affects their power generation with the result that the power availability in the state gets drastically reduced. The recent commissioning of the 100 MW Karbi Langpi Hydroelectric Project should definitely help to mitigate power shortage to some extent provided the region receives normal rainfall.

While the efforts to improve power generation by tapping all the available and viable options including non-conventional sources should continue, it is apparent that there cannot be a dramatic change of scenario immediately as generation cannot improve suddenly. It is worthwhile in this context to take serious note of the need of curtailment of the demand of power. This may be achieved by the use of less power consuming / power efficient electric products which are easily available in the markets nowadays. However, high price of these electrical equipments often becomes a deterrent for use by common people. According to information received from Discom sources, it is learnt that effort is being made to provide CFLs (low power consuming bulbs) to the consumers in Assam at a low price to encourage their use. It is hoped that the measure when implemented will get good response from the consumers.

Sd/-

(P.K. Bora)

News Briefs

Third Consumer Awareness Meet held.

The 3rd Consumer Awareness Meet organized by the Consumer Advocacy Cell of AERC was held on 15th December 2006. The meeting was presided over by Shri P.K. Bora, Chairperson AERC. Shri J.P. Meena, IAS, Commissioner & Secretary, Power, Government of Assam and Shri A.K. Sachan, IAS, MD, LAEDCL & CAEDCL and Member (Finance) of ASEB graced the occasion as guest speakers. Shri D.K. Dutta, MD UAEDCL also participated in the meet. Field level officers of Discoms handling consumer grievances also participated as invitees to make the occasion an effective one with direct interaction between representatives of consumer and suppliers. The meeting was attended by representatives of six empanelled consumer groups from Guwahati, Nalbari, Goalpara and Dibrugarh.

There was a presentation on the need for energy conservation from the Cell. The presentation stressed on the use of Compact Fluorescent Lamps (CFLs) instead of ordinary lamps to reduce power consumption and overcome shortage of power during the peak hours. It also proposed that in order to encourage use of CFLs by the common consumers, Discoms may initiate a scheme of “Buy one CFL bulb, get one free” in their consumer care centres. This presentation was followed by another presentation by officers from the MTI Wing of the utilities on efficient lighting systems and a live demonstration with meters.

There was an interactive session between the supplier, government and consumer representatives where different matters on the power sector in Assam were discussed.

Transco to generate power from garbage

(Source: The Hindu, January 27 2007)

It is an ambitious project aimed at solving Delhi's twin problems of power shortage and garbage disposal. The proposal to generate electricity from garbage will not only provide the city an additional 30 MW of electricity but also offer a solution to the problem of shrinking space for landfills, says the Principal Secretary Power cum Managing Director of Delhi Transco Limited, Rakesh Mehta.

Promoted by DTL, the project is a joint venture between the Infrastructure Leasing and Financial Services Limited and the Andhra Pradesh Technical Development Corporation.

“Two companies have been set up, the Timarpur-Okhla Waste Management Company and the Ghazipur Waste Management Company, to collect waste for the project from South Delhi and East Delhi. They will invite bids from private institutions to set up two power plants for converting garbage into power”, said Mr. Mehta.

The two power plants will consume 3000 metric tones of garbage a day, which is 50 percent of what Delhi generates. The process of inviting bids for setting up the power plants will start soon. As per the contract, the plants will be set up within 18 months of inviting bids. Power generation should start sometime in June 2008. While the land for setting up the power plants has been identified, the Municipal Corporation of Delhi has agreed to supply garbage free of charge. The Delhi Electricity Regulatory Commission has also fixed Rs 3.50 per unit for sale of power generated from these plants to the power distribution companies.

Project report on 110MW Namrup plant ready

(Source: The Assam Tribune, February 19 2007)

The detailed project report (DPR) of the 110MW **Namrup Thermal Replacement Project** is now ready and the approval from the Public Investment Board (PIB) to it is awaited. Tender for its implementation-related work will be floated as soon as the PIB approval to the project is obtained, Assam State Electricity Board (ASEB) sources here said. The project is undertaken to replace the age-old units of the Namrup thermal project, which were commissioned in 1965. The capacity of the old units was 133.5MW. These units were the first gas turbine units of the country. But their efficiency is low. They need more gas to generate power. These units are now sought to be replaced with the more efficient modern machines, said the sources.

Meanwhile, the civil work for the 37MW **Lakwa Waste Heat Project** is under progress. The Bharat Heavy Electricals Ltd (BHEL) has been awarded the contract for supplying the equipment for the project. Manufacturing of the equipment is under process at various BHEL units. With the phases of the civil construction over, installation of the equipment will also be done simultaneously in phases, said the sources. Chief Minister Tarun Gogoi, in his New Year announcement on January 1 last, said that the Lakwa project would be commissioned in June 2009. The total cost for the project is estimated at Rs 236 crore.

The Chief Minister had also said on that day that the work for the Namrup Thermal Replacement Project would start in the current year and its total cost was estimated at Rs 440 crore. The projects are expected to help the power-starved State generate 147MW of power steadily.

(With the commissioning of the 100MW Karbi Langpi Hydroelectric Power Project (KLHEP), the generation capacity of the State will go up to about 230 MW. Meanwhile, the ASEB and the Assam Power Generation Company has been working on five new hydel projects, which will enhance the generating capacity of the State by another 285MW after their commissioning by the 12th Five Year Plan).

Plan to transfer power from North East*(Source: The Assam Tribune, March 19 2007)*

The Central Electricity Authority (CEA) and Power Grid Corporation of India Limited (PGCIL) have proposed to launch a critical project to evacuate power from North-East and Bhutan for transmission and distribution in rest of the country. In a Rajya Sabha reply to a question, Union Power Minister, Sushil Kumar Shinde said that CEA and PGCIL have planned a scheme for evacuation and transmission of power to be generated in the new power projects in the North-East, Sikkim and Bhutan to Northern and Western Regions. The Schemes envisages 800KV HVDC bipole of 6000 MW capacity, he added. The States of Northern and Western Regions, including Delhi would be the beneficiaries of this transmission project, Shinde said.

Gogoi opens Karbi Langpi Project*(Source: The Assam Tribune, April 7 2007)*

Chief Minister Tarun Gogoi today formally declared open the 2x50 MW Karbi Langpi Hydro-electric Project on the Borpani river at Hatidubi, about 10 km from here and 160 km from Diphu, the district headquarters. Later addressing a public meeting at Longri, Gogoi said that it was a memorable day for the people of the State, as it marked the fulfillment of a long-cherished dream. The Karbi Langpi project was started way back in 1979 but was almost abandoned for two decades before works started again in 2004.

“With the commissioning of the project today, a long-cherished dream has become a reality and would usher in a new era of progress in the State,” Gogoi said.

Asserting that the project would go a long way in improving the State’s power situation, Gogoi said that the State Government accorded top priority to power generation. “Power is a pre-requisite for development, and is essential for ensuring food, shelter and employment for the people,” he said, adding that lack of power had long been a deterrent for the State’s development. “This is the beginning, and we are committed to harnessing the power generation potential of the State,” he added. The Chief Minister also urged the Karbi Anglong Autonomous Council (KKAC) to go for small hydro-electric projects, as projects up to 25 MW capacity required no permission under the new North East Industrial Policy. He said that the KAAC should try to rope in private investment in the sector. Member of Parliament Biren Singh Ingti, in his speech, said that a part of the power generated from the project be left for the people of Karbi Anglong. State Power Minister Pradyut Bordoloi, who presided over the function, lauded the “tireless efforts” of the Assam State Electricity Board (ASEB) in making the project see the light of the day. “The decision to revive the dying project was taken on August 19, 2004, and the ASEB engineers and other staff showed remarkable dedication and commitment in completing the job in two-and-a-half years,” he said. Bordoloi also called for developing small hydro-electric projects as the Union Ministry of Renewable Energy bears 90 per cent costs of projects up to 25 MW. The Karbi Langpi

project was sanctioned vide a notification 26 (7)/3/7a-PE dated September 2, 1979 at an estimated cost of Rs 36.36 crore, and was scheduled to be commissioned in 1986. The cost now has escalated to Rs 546.78 crore.

Committee for curbing Power Thefts in state

(Source: Advertisement in The Assam Tribune, April 24 2007)

The Government of Assam has constituted a committee “to examine the existing laws relating to the power theft in the state, the role of ASEB/Discom field officials in curbing power theft and suggest measures to make them more accountable”. The committee consists of Shri Bhaskar Barua, I.A.S (Retd) as Chairman and Shri Nishi Nath Changkakoti, I.P.S. (Retd) as Member. In order to assist the Committee in discharging its functions and fulfilling its objectives, suggestions/advice are solicited from all electricity consumers by the utilities. An advertisement seeking written suggestions and advice in this respect was published by the Assam State Electricity Board. As per the advertisement the suggestions/advice may be sent to the following address within a month from the publication of the advertisement.

Shri B.K. Sarma

Chief General Manager (Com)

ASEB, Bijulee Bhawan,

Paltan Bazar, Guwahati – 781 001

Email: acecomr@rediffmail.com

The Assam Electricity Regulatory Commission after giving previous notice of 21 days inviting suggestions/objections etc, for amendment of the AERC (Supply Code and Related Matters) Regulations 2004 for the purpose of specific incorporation of provisions dealing with the theft of electricity has finalized the amendment of the said regulations. The AERC (Supply Code and Related Matters) Regulations 2004, First Amendment 2007 has been sent to the Government of Assam for publication in the official gazette.

OPEN ACCESS OF ELECTRICITY – A DISCUSSION

Simply with the enactment of The Electricity Act 2003, the average domestic consumer is neither going to witness a significant improvement in the quality of power supply nor a reduction in the *brown outs* in the short run. Among many new provisions incorporated in the Act, a first step towards improvement on both counts would require the implementation of the 'open access' scheme proposed in the Act.

The term "Open Access" has been defined in section 2 (47) of the Electricity Act, 2003 as "the non-discriminatory provision for the use of transmission lines or distribution system or associated facilities with such lines or system by any licensee or consumer or a person engaged in generation in accordance with the regulations specified by the Appropriate Commission".

This means that a large individual consumer/group of consumers get together (bulk consumers) and exercise their choice to purchase power either directly from the generation company or intermediaries such as traders or distribution companies. This choice will induce competition, and hence, help drive down power costs and improve services.

Open Access in transmission means freedom to the licensees to procure power from any source. Such Open Access enables the licensees (Distribution licensees and traders) and generating companies the right to use the transmission system without any discrimination.

Unlike in transmission, open access in distribution is a complex task because of the involvement of many users. Until recently, bulk consumers could not choose their power source and were forced to purchase it from the State Electricity Board or its successor distribution licensees.

The Open Access scheme is to be implemented through the regulator. The regulator is supposed to set a surcharge on open access transactions to offset existing cross subsidies as well as the costs being met (infrastructure costs like substations, etc.) by the existing distribution licensee in providing power supply as an obligation (Universal Service Obligation). The issue of open access surcharge is very crucial and implementation of the provision of open access depends on the judicious determination of surcharge by the State Commissions.

The Open Access Scheme will be of great benefit to captive generation units. The Electricity Act 2003 allows industry to set up captive units to power their plants and also offer the excess power to retail consumers through the grid, subject to regulatory terms. Such excess power would be treated on the same terms as power from any other generation unit.

In earlier occasions in States, captive units were forced to sell their excess power to the electricity board. Being the lone buyer of power in the State, it forces its terms of remuneration on power purchased from the captive unit, which is often not attractive or reasonable. Also, the captive industry is mandated to consume 51 per cent of power from the power plant in order to qualify as a captive unit.

To facilitate open access in distribution in Assam, the Commission has already notified the AERC (Terms & Conditions for Open Access) Regulations 2005 indicating a roadmap for open access facilities to be provided by Discoms. No application for open access in distribution has been received so far. In the Tariff Order for 2006-07 the Commission has notified the following charges applicable for open access consumers:

1. Transmission Charges: Rs 6404/MW/Day or Rs 0.5366/unit plus energy loss in kind at 6.5%
2. SLDC Charges: Rs 94/MW/Day or paise 0.78/unit.
3. Wheeling Charges: (Rs/kWh)

LAEDCL	CAEDCL	UAEDCL	All Discoms
1.12	1.52	1.07	1.21

4. Cross Subsidy Surcharge

<u>Category</u>	<u>Cross subsidy Surcharge</u> <u>Rs/kWh</u>
LT General Supply	1.53
Public Water Works	1.69
Bulk Government	0.63
Educational Institution	
Other Bulk Supply	0.47
HT Industries I	0.42
HT Industries II	0.40
Tea Coffee & Rubber	1.50
Oil & Coal	0.81
HT Irrigation	0.12

Phasing out/ Eligibility for Open Access in the States of India (Courtesy: The Indian Regulatory Review: September – October, 2006)

State	Phase I	Phase II	Phase III	Phase IV	Phase V, Vi & VII
Andhra Pradesh	Consumers availing of power from NCE developers irrespective of the quantum of contracted capacity & Contracted capacity being greater than 5 MW	Contracted capacity being greater than 2 MW September, 2006	Contracted capacity being greater than 1 MW April, 2008.		
Assam	Consumers with connected load of 10 MW and above from 1 April 2006	Consumers with a connected load of 7.5 MW and above from 1 April 2007	Consumers with a connected load of 3 MW and above 1 April 2008		
Chattisgarh	Users requiring 10 MW or above, 1 April 2006	Users requiring 5MW and above, 1 April 2008	Users Requiring 2 MW and above 1 October 2007	Users requiring 1 MW and above, 1 April 2008	
Delhi	Consumers with the connected load of 5 MW and above, 1 July 2007	Consumers with the connected load of 3 MW and above, 1 January 2008	Consumers with the connected load of 1 MW and above, 1 July 2008		
Gujrat	Load of 5MW and above. After Intra State ABT is put in place or 1 January 2006 whichever is later.	Load of 1 MW and above 2 Yrs after introduction of the one above.			
Haryana	15 MVA and above October 1, 2006.	3 MVA and above October 1 2007	3 MVA and above April 1 2008		
Himachal Pradesh	5 MVA and above From 10 th June 2005.	Above 2 MVA but not exceeding 5 MVA from 1 st April 2006.	Above 1 MVA but not exceeding 2 MVA from 1 st April 2007.		
Jharkhand	Above 2 MVA but not exceeding 5 MVA	1 st April 2006	1 MW or more, April 1 2008.		

State	Phase I	Phase II	Phase III	Phase IV	Phase V, Vi & VII
Karnataka	Above 1 MVA but not exceeding 2 MVA	1 st April 2007	All HT installations with Contract Demand of 3 MW & above and with voltage level 11 KV and above. 1 st April 2007	All HT installations with Contract Demand of 1 MW & above 1 st April 2008	
Kerela	10 MW and above. From 1 st December 2005	5 MW and above. From 1 st December 2006	3 MW and above. From 1 st December 2007	1 MW and above. From 1 st December 2008	
Madhya Pradesh	Users requiring 10 MW and above at voltage 132 KV or above situated anywhere in State. From the date of coming into effect of these regulations.	Users requiring 5 MW or above at voltage 33 KV or above situated in industrial growth centres notified by the State Government or having independent 33 KV feeders from EHV substation. From the date of coming into effect of these regulations.	Users requiring 2 MW or above at voltage 33 KV or above situated in industrial growth centres notified by the State Government. October 1 2005	Users requiring 5 MW or above and situated anywhere in the State. April 1 2006	Phase V: Users requiring 1 MW or above situated in industrial growth centres notified by the State Government. Oct 1 2006 Phase VI: Users requiring 2 MW or above and situated anywhere in the State. April 1 2007. Phase VII: Users requiring 1 MW or above and situated anywhere in the State. April 1 2007
Maharashtra	Not less than 5 MVA date of publication of regulations in the Official Gazette	Not less than 2 MVA but less than 5 MVA April 1 2006	Not less than 1 MVA. April 1 2007		

State	Phase I	Phase II	Phase III	Phase IV	Phase V, Vi & VII
Orissa	Requiring power exceeding 5 MW April 1 2008	Requiring power exceeding 2 MW October 1 2008	Requiring power exceeding 1 MW January 1 2009	For consumers seeking open access to the distribution and/or intra state transmission systems to avail supply of electricity from any licensee other than the distribution licensee of their respective area of supply, the nodal agency shall permit open access strictly in accordance with the following phases ->	Phase I: Requiring power exceeding 5 MW August 1 2005 Phase II: Requiring power exceeding 2 MW April 1 2006 Phase III: Requiring power exceeding 1 MW April 1 2008.
Punjab	Consumers with demand of 15 MW and above From January 1, 2006	Consumers with demand of 3 MW and above From April 1, 2006	Consumers with demand of 1 MW and above From April 1, 2008		
Rajasthan	Consumers with contract demand of 15 MVA and above From April 1, 2005	Consumers with contract demand of 5 MVA and above From April 1, 2006	Consumers with contract demand of 1.5 MVA and above From April 1, 2007	Consumers with contract demand of 1 MVA and above From April 1, 2008	
Tamil Nadu	All existing and new HT consumers with a load of 10 MW and above before six months from the date of commencement of these regulations	All existing and new HT consumers with a load of 5 MW and above but before eighteen months from the date of commencement of these regulations	All existing and new HT consumers with a load of 1 MW and above but after eighteen months but before 30 th December 2008.		

State	Phase I	Phase II	Phase III	Phase IV	Phase V, Vi & VII
Uttaranchal	5 MW and above from December 31, 2005.	3 MW and above from December 31, 2007.	1 MW and above from December 31, 2008.		
Uttar Pradesh	Consumers with demand of 20 MW and above and connected at voltage levels of 33 KV and above From July 1, 2005	Consumers with demand of 10 MW and above and connected at voltage levels of 33 KV and above From April 1, 2006	Consumers with demand of 5 MW and above and connected at voltage levels of 11 KV and above From April 1, 2007	Consumers with demand of 1 MW and above April 1, 2008.	

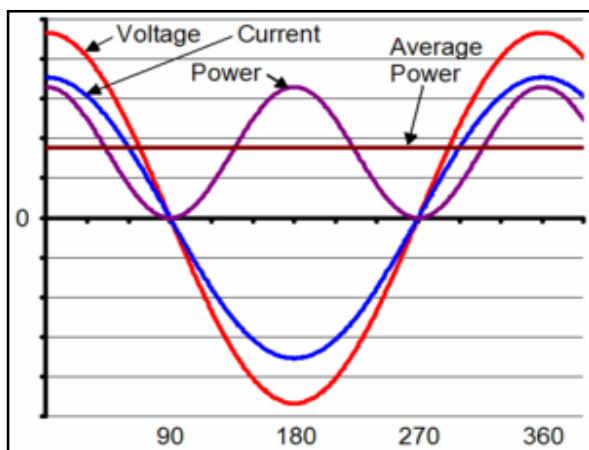
Life before computer: An application was for employment A program was a TV show A cursor used profanity A keyboard was a piano! Memory was something that you lost with age A CD was a bank account And if you had a 3 ½ inch floppy You hoped nobody found out! Compress was something you did to garbage Not something you did to a file And if you unzipped anything in public You'd be in jail for awhile!	Log on was adding wood to a fire Hard drive was a long trip on the road A mouse pad was where a mouse lived And a backup happened to your commode! Cut - you did with a pocket knife Paste you did with glue A web was a spider's home And a virus was the flu! I guess I'll stick to my pad and paper And the memory in my head I hear nobody's been killed in a computer crash But when it happens they wish they were dead! <i>(Downloaded from the internet).</i>
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Important Electrical Terms

Responding to the request of members from the empanelled consumer groups during the third Electricity Consumers' Awareness Meet on 15th December 2006, we have incorporated a write-up on the subject of Power Factor below. Also, the detailed and informative presentation made by the MTI officials of utilities during the Meet is incorporated for benefit of our readers.

POWER FACTOR:

The **power factor** of an AC electric power system is defined as the ratio of the real power to the apparent power, and is a number between 0 to 1 inclusive. Real power is the capacity of the circuit for performing work in a particular time. Apparent power is the product of the current and voltage of the circuit. Due to energy stored in the connected load and returned to the source, or due to a non-linear load that distorts the wave shape of the current drawn from the source, the apparent power will be equal to or greater than the real power. Low power factor loads increase losses in a power distribution system and results in increased cost for electrical energy use.



Instantaneous and average power calculated from AC voltage and current with a unity power factor ($\phi=0$, $\cos\phi=1$)

In a purely resistive AC circuit, voltage and current waveforms are in step, changing polarity at the same instant in each cycle. Where reactive loads are present, such as with capacitors or inductors, energy storage in the loads result in a time difference between the current and voltage waveforms. This stored energy returns to the source and is not

available to do work at the load. A circuit with a low power factor will have thus higher currents to transfer a given quantity of power than a circuit with a high power factor.

Circuits containing only heating elements (filament lamps, strip heaters, cooking stoves, etc.) have a power factor of 1.0. Circuits containing inductive or capacitive elements (lamp ballasts, motors, etc.) often have a power factor below 1.0. For example, in electric lighting circuits, normal power factor ballasts (NPF) typically have a value of (0.4) - (0.6). Inductive with a power factor greater than (0.9) are considered high power factor ballasts (HPF) (commonly known as electronic choke).

The significance of power factor lies in the fact that utility companies supply customers with volt-amperes, but bill them for watts. Power factors below 1.0 require a utility to generate more than the minimum volt-amperes necessary to supply the real power (watts). This increases generation and transmission costs. Good power factor is considered to be greater than 0.85 or 85%. Utilities may charge additional costs to customers who have a power factor below some limit.

AC power flow has the three components: real power (P), measured in watts (W); apparent power (S), measured in volt-amperes (VA); and reactive power (Q), measured in reactive volt-amperes (VAr).

The power factor is defined as:

$$\frac{P}{S}.$$

In the case of a perfectly sinusoidal waveform, P, Q and S can be expressed as vectors that form a vector triangle such that:

$$S^2 = P^2 + Q^2$$

If ϕ is the phase angle between the current and voltage, then the power factor is equal to $|\cos \phi|$, and:

$$P = S |\cos \phi|$$

By definition, the power factor is a dimensionless number between 0 and 1. When power factor is equal to 0, the energy flow is entirely reactive, and stored energy in the load returns to the source on each cycle. When the power factor is 1, all the energy supplied

by the source is consumed by the load. Power factors are usually stated as "leading" or "lagging" to show the sign of the phase angle.

If a purely resistive load is connected to a power supply, current and voltage will change polarity in step, the power factor will be unity (1), and the electrical energy flows in a single direction across the network in each cycle. Inductive loads such as transformers and motors (any type of wound coil) generate reactive power with current waveform lagging the voltage. Capacitive loads such as capacitor banks or buried cable generate reactive power with current phase leading the voltage. Both types of loads will absorb energy during part of the AC cycle, which is stored in the device's magnetic or electric field, only to return this energy back to the source during the rest of the cycle.

For example, to get 1 kW of real power if the power factor is unity, 1 kVA of apparent power needs to be transferred ($1 \text{ kW} \div 1 = 1 \text{ kVA}$). At low values of power factor, more apparent power needs to be transferred to get the same real power. To get 1 kW of real power at 0.2 power factor 5 kVA of apparent power needs to be transferred ($1 \text{ kW} \div 0.2 = 5 \text{ kVA}$).

It is often possible to adjust the power factor of a system to very near unity. This practice is known as *power factor correction* and is achieved by switching in or out banks of inductors or capacitors. For example the inductive effect of motor loads may be offset by locally connected capacitors.

Energy losses in transmission lines increase with increasing current. Where a load has a power factor lower than 1, more current is required to deliver the same amount of useful energy. Power companies therefore require that industrial and commercial customers maintain the power factors of their respective loads within specified limits or be subject to additional charges. Engineers are often interested in the power factor of a load as one of the factors that affect the efficiency of power transmission.

PRESENTATION BY MTI ON EFFICIENT LIGHTING SYSTEMS

**Demand Side Management
-Efficient Lighting System**

**By MTI Division
Guwahati**

Efficient Lighting System:-

- Use of different lighting system have different effects.
- Efficient & energy saving lights are available in the markets
- However all such claimed products do not have the efficiency as declared.

Effect of Use of Spurious products -

- Spurious products (Low cost) available in the market often misled consumers.
- These equipment may appear to be useful / efficient to the users in the short run.
- However such products affects the consumers in the long run due to excess loading on his wiring network
- Such equipments also affects the distribution network of the power utilities.

Cost Benefit analysis of CFL

	Items Parameters	Incandescent Lamp (100+60+40+25+15)= 240 Watt	Branded CFL (18+11+8+8+5) = 50 Watt
1	Voltage	246 Volt	246 Volt
2	Current	1.06 Amp	0.25 Amp
3	Load	0.26 kw	0.05 kw
4	PF	0.99 Lead	0.85 Lead
5	Consumption / Hour	0.26 kwh	0.05 kwh
6	Consumption / Day (5 hours)	1.3 kwh	0.25 kwh
7	Consumption / Month	39 Units	7.5 Units
8	Consumption / Year	468 Units	90 Units
9	Energy Cost @ Rs 3.00/unit	Rs. 1404.00	Rs. 270.00
10	Bulb Costs	Rs. 50.00	Rs. 520.00
11	Total Cost	Rs. 1454.00	Rs. 790.00

Note:- Net Savings over one year period is Rs (1454 – 790) = Rs 664.00

Cost Benefit analysis of CFL

1	Electronic Retrofit CFL	20 W	15 W	
2	Replaces Incandescent bulb	100 W	60 W	
3	Savings in Electricity Consumption over 6000 hours (2-1) x 6000/1000	480 kwh	270 kwh	
4	Savings in electricity bills per lamp @ 3.0/kwh	Rs 1440	Rs 810	
5	Cost of CFL	Rs 150	Rs 120	
6	Cost of 6 Incandescent bulb	Rs 66	Rs 66	
7	Net Savings per bulb (4-5+6)	Rs 1356	Rs 756	

Note:-1 Savings in CFL over a lifetime of 6000 burning hours

2. Replacement of 1million bulbs of 100 W to CFL of 20 W reduces 80 MW in peak load

Benefit to the Power Utility:-

- Less Loading on the distribution transformers – leads to more life for the transformer.
- Less loading on the distribution system as a whole – leads to lower distribution loss.
- Lowers overall maintenance cost of the distribution network.
- Lowers the Peak Demand of the system.

Benefit to the Users

- Low consumption – hence low energy cost.
- Instant switching operation.
- Operates even at low voltages.
- Less loading in the wiring network – leads to more lifetime of the wiring system due to lower depreciation.
- Better Power Factor.

Branded CFL vs Spurious CFL

	Items→ Parameters→	Unbranded CFL 8 W x 5 nos = 40 Watt	Branded CFL 4 Bulbs = 39 Watt
1	Voltage	250 Volt	250 Volt
2	Current	0.22 Amp	0.20 Amp
3	Load	0.04 kw	0.04 kw
4	PF	0.78 Lead	0.82 Lead
5	Consumption / Hour	0.04 kwh	0.04 kwh
6	Consumption / Day (5 hours)	0.20 kwh	0.20 kwh
7	Consumption / Month	6 Units	6 Units
8	Consumption / Year	72 Units	72 Units
9	Energy Cost @ Rs 3.00/unit	Rs. 216.00	Rs. 216.00
10	Bulb Costs	Rs. 125.00	Rs. 410.00
11	Brightness	Low	High
12	Warranty	Nil	6 to 12 months

Note:- Costing of branded CFL is higher by about 3.28 times

Benefits of Branded CFL:-

- For the same wattage & same consumption brighter lighting is available.
- Luminosity of ordinary CFL also diminishes quickly as compared to branded CFL.
- Warranted product.
- However for temporary lighting purposes ordinary CFL may be more cost effective.

Cost Benefit analysis of Electronic Choke

	Items → Parameters →	40 watt tube with Inductive Coil Choke	40 watt tube with Electronic Choke
1	Voltage	246 Volt	246 Volt
2	Current	0.39 Amp	0.12 Amp
3	Load	0.04 kw	0.03 kw
4	PF	0.50 Lag	0.99 Lead
5	Consumption / Hour	0.04 kwh	0.03 kwh
6	Consumption / Day (5 hours)	0.2 kwh	0.15 kwh
7	Consumption / Month	6 Units	4.5 Units
8	Consumption / Year	72 Units	54 Units
9	Energy Cost @ Rs 3.00/unit	Rs. 216.00	Rs. 162.00
10	Bulb Costs	Rs. 246.00	Rs. 246.00
11	Total Cost	Rs. 462.00	Rs. 408.00
12	KVA Loading	0.1 kva	0.03 kva

Note:- 1. Net Savings in 1 year in 1 set is Rs (462 – 408) = Rs 54.00

2. 167 nos of electronic choke tubes against 50 inductive choke tubes can be connected in a 5 kva transformer/generator.

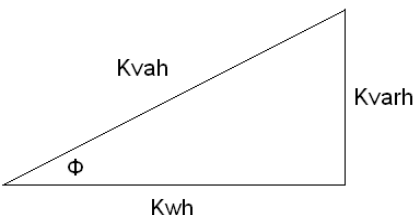
Benefit to the Users

- Low consumption – hence low energy cost.
- Instant switching operation.
- Operates even at low voltages.
- Less loading in the wiring network – leads to more lifetime of the wiring system due to lower depreciation.
- Better Power Factor.

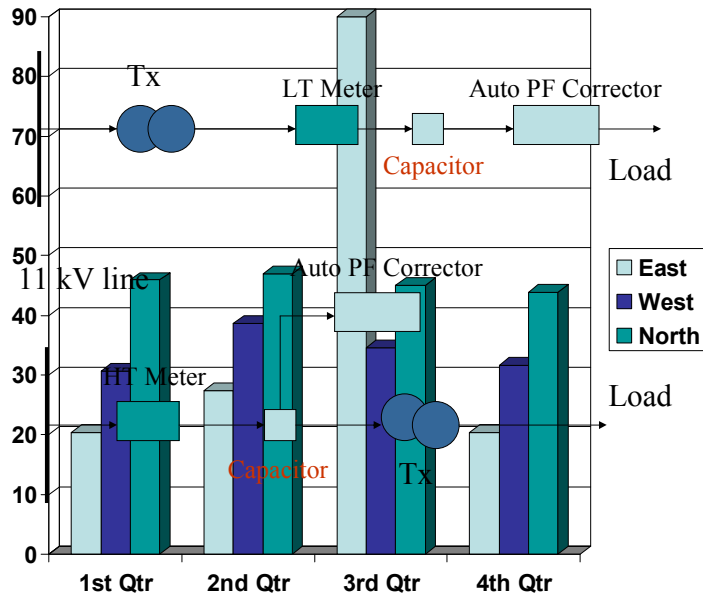
Benefits to the Power Utility

- Less Loading on the distribution transformers – leads to more life for the transformer.
- Less loading on the distribution system as a whole – leads to lower distribution loss
- Lowers overall maintenance cost of the distribution network.
- Lowers the Peak Demand of the system due to better PF.
- Lower drop in voltage leading better voltage at consumer end.

A Word On Power Factor Improvement

$PF = Kwh / Kvah = \cos\Phi$ 	High PF leads to higher efficiency • It is in the interest of the power utility & industrial consumer that the entire electric system operates at high efficiency. • Higher efficiency can be achieved through high power factor. • Higher efficiency through high PF results in – Reduced losses – Better voltage levels – Released capacity • PF can be improved with power capacitors.
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Some Concerns with Power Factor:- • EM Meters : - No average power factor recording • Static Meters :- Average Power factor recording is possible • Capacitor continuously in circuit irrespective of load conditions • Static meters calculate Average PF on lag+lead principle	• Power Factor improvement solutions are sought from us • Auto power factor corrective measures • Procedure adopted for HT & LT metered consumers can be different.
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Improving Power Factor

- Capacitors act as reactive power generators and provide the needed reactive power to accomplish the KW of work.
- This reduces the amount of reactive power of the network and thus the total power generated by the utilities

An Example of PF Improvement

- A chemical industry had installed a 1500 kVA transformer. The initial demand of the plant was 1160 kVA with power factor of 0.70. The % loading of transformer was about 78% ($1160/1500 = 77.3\%$).
- To improve the power factor and to avoid the penalty, the unit had added about 410 kVAR in motor load end. This improved the power factor to 0.89, and reduced the required kVA to 913, which is the vector sum of kW and kVAR

Power Factor Improvement

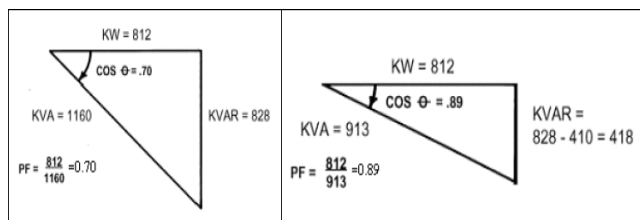


Figure 1.8 Power factor before and after Improvement

After improvement the plant had avoided penalty and the 1500 kVA transformer now loaded only to 60% of capacity. This will allow the addition of more load in the future to be supplied by the transformer.

Advantages of PF improvement by capacitor addition

- a) Reactive component of the network is reduced and so also the total current in the system from the source end.
- b) I²R power losses are reduced in the system because of reduction in current.
- c) Voltage level at the load end is increased.
- d) kVA loading on the source generators as also on the transformers and lines up to the capacitors reduces giving capacity relief. A high power factor can help in utilizing the full capacity of the electrical system.

Cost benefits of PF improvement

1. Reduced Maximum demand charges in utility bill
2. Reduced distribution losses (KWH) within the plant network
3. Better voltage at motor terminals and improved performance of motors
4. A high power factor eliminates penalty charges imposed when operating with a low power factor
5. Investment on system facilities such as transformers, cables, switchgears etc for delivering load is reduced.

THANK YOU

ELECTRIC METERS: TYPES & TECHNOLOGY

An **electric meter** or **energy meter** is a device that measures the amount of electrical energy supplied to a residence or business. These are customers of an electric company.

The most common type is more properly known as a (kilo)watt-hour meter or a joule meter. Utilities record the values measured by these meters to generate an invoice for the electricity. They may also record other variables including the time when the electricity was used.

UNITS OF MEASUREMENT:

The most common unit of measurement on the electricity meter is the kilowatt-hour which is equal to the amount of energy used by a load of one kilowatt over a period of one hour, or 3,600,000 joules. Some electricity companies use the SI megajoule instead.

Demand is normally measured in watts, but averaged over a period, most often a quarter or half hour.

Reactive power is measured as "Volt-amperes reactive", (VARh) in kilovars-hours. It may help to think of reactive power as power that is "reflected" from a load, because the load cannot immediately use all the power provided by the distribution system. A "lagging" or "inductive" load such as a motor will have positive reactive power. A "leading" or "capacitive" load will have negative reactive power.

Volt-amperes measures all power passed through the distribution network, whether reactive or actual. This is equal to the product of root-mean-square volts and amperes. Alternatively, it is the square-root of the sum of the squares of watts and VAR.

Distortion of the electric current by loads is measured in several ways. Power factor is the ratio of resistive (or real power) to volt-amperes. A negative value is a capacitive load, a positive is inductive. A purely resistive load (such as a filament lamp, heater or kettle) exhibits a power factor of 1. Current harmonics are a measure of distortion of the wave form. For example, electronic loads such as computer power supplies draw their current at the peak of the voltage to fill their internal storage elements. This flattening causes odd harmonics which are not permissible as it is not only wasteful but may interfere with the operation of other equipment. Harmonic emissions are mandated by law to fall within certain limits. Harmonics are also often caused by tampering with meters

Other units of measurement

In addition to metering based on the amount of energy used, other types of metering are available.

Meters which measure the amount of charge (coulombs) used, known as ampere-hour meters, were used in the early days of electrification. These were dependent upon the supply voltage remaining constant for accurate measurement of energy usage which is not a likely circumstance with most supplies.

Some meters measured only the length of time for which current flowed, with no measurement of the magnitude of voltage or current being made. These were only suited for constant load applications.

Neither type is likely to be found in electricity retail use today.

Meters for measuring single phase energy is also available. It also provides capabilities like Maximum demand with date & time kWh Backups

TYPES OF METERS:

Modern electricity meters operate by continuously measuring the instantaneous voltage (volts) and current (amperes) and finding the product of these to give instantaneous electrical power (watts) which is then integrated against time to give energy used (joules, kilowatt-hours etc). The meters fall into two basic categories, electromechanical and electronic.

Electromechanical meters

The most common type of electricity meter is the electromechanical induction meter.

Technology



Mechanism of electromechanical induction meter. (1) - Voltage coil - many turns of fine wire encased in plastic, connected in parallel with load. (2) - Current coil - three turns of thick wire, connected in series with load. (3) - Stator - concentrates and confines magnetic field. (4) - Aluminium rotor disc. (5) - rotor brake magnets. (6) - spindle with worm gear. (7) - display dials - note that the 1/10, 10 and 1000 dials rotate clockwise while the 1, 100 and 10000 dials rotate counter-clockwise. Some modern meters employ a *cyclometer*, an odometer-like display that is easy to read

Diagram: Three-phase electromechanical induction meter, metering 100 A 230/400 V supply. Horizontal aluminium rotor disc is visible in centre of meter.



The electromechanical induction meter operates by counting the revolutions of an aluminium disc which is made to rotate at a speed proportional to the power. The number of revolutions is thus proportional to the energy usage. The rotating disc in this type of meter is, in fact, an electric motor of a type called a reluctance motor or eddy current motor. It consumes a small amount of power, typically around 2 watts.

The metallic disc is acted upon by two coils. One coil is connected in such a way that it produces a magnetic flux in proportion to the voltage and the other produces a magnetic flux in proportion to the current. This produces eddy currents in the disc and the effect is such that a force is exerted on the disc in proportion to the product of the instantaneous current and voltage. A permanent magnet exerts an opposing force proportional to the speed of rotation of the disc - this acts as a brake which causes the disc to stop spinning when power stops being drawn rather than allowing it to spin faster and faster. This causes the disc to rotate at a speed proportional to the power being used.

The type of meter described above is used on a single-phase AC supply. Different phase configurations use additional voltage and current coils.

Most domestic electricity meters must be read manually, whether by a representative of the power company or by the customer. In countries where the customer reads the meter, the reading may be supplied to the power company by telephone, post or over the internet. The electricity company will normally require a visit by a company representative at least annually in order to verify customer-supplied readings and to make a basic safety check of the meter.

Solid state meters



Solid state electricity meter.

Some newer electricity meters are solid state and display the power used on an LCD, while newer electronic meters can be read automatically.

In addition to measuring electricity used, solid state meters can also record other parameters of the load and supply such as maximum demand, power factor and reactive

power used etc. They can also include electronic clock mechanisms to compute a value, rather than an amount, of electricity consumed, with the pricing varying of by the time of day, day of week, and seasonally.

Automatic reading

AMR (Automatic Meter Reading) and *RMR* (Remote Meter Reading) describe various systems that allow meters to be checked by without the need to send a meter reader out. This can be effectively achieved using off-site metering, that is an electronic meter is placed at the junction point where all the connections originate, inaccessible to the end-user, and it relays the readings via the AMR technology to the utility.

Multiple tariff (variable rate) meters

Electricity retailers may wish to charge customers different tariffs at different times of the day. This is because there is generally a surplus of electrical generation capacity at times of low demand, such as during the night

Some multiple tariff meters use different tariffs for different amounts of demand. These are usually industrial meters.

Domestic usage

Domestic variable-rate meters normally only permit two tariffs ("peak" and "off-peak") and in such installations a simple electromechanical time switch may be used. They are commonly used in conjunction with electrical storage heaters. Multiple tariffs are made easier by time of use (TOU) meters which incorporate or are connected to a time switch and which have multiple registers.

Switching between the tariffs may happen via a radio-activated switch rather than a time switch to prevent the possibility of the user tampering with a sealed time switch to obtain cheaper electricity.

Commercial usage

Large commercial and industrial premises may use electronic meters which record power usage in blocks of half an hour or less. This is because most electricity grids have demand surges throughout the day, and the power company may wish to give incentives to large customers to reduce demand at these times. These demand surges often corresponding to meal times or, famously, to advertisements in popular television programmes.

The multiple tariff rates may also be dependent on frequency, also known as availability based tariff (ABT), deployed in Grid substations and inter-utility transfer points for bulk

transfer of energy. This is based on the premise that the system frequency is inversely proportional to the current load. This also causes self-regulation because the rates are higher when the system frequency is low, eventually bringing down the demand.

Latest Technologies:

Smart meters

Smart meters go a step further than simple AMR (automated meter reading). They offer additional functionality including a real-time or near real-time reads, power outage notification, and power quality monitoring. They allow price setting agencies to introduce different prices for consumption based on the time of day and the season.

These price differences can be used to reduce peaks in demand (load shifting), reducing the need for additional power plants and in particular the higher polluting and costly to operate natural gas powered peaker plants. The feedback they provide to consumers has also been shown to cut overall energy consumption.

Prepayment meters



Prepayment meter and magnetic stripe tokens.

The standard business model of electricity retailing involves the electricity company billing the customer for the amount of energy used in the previous month or quarter. In some countries, if the retailer believes that the customer may for whatever reason not pay the bill, a prepayment meter may be installed. This requires the customer to make advance payment before electricity can be used. If the available credit is exhausted then the supply of electricity is cut off by a relay.

In the UK, mechanical prepayment meters used to be common in rented accommodation. Disadvantages of these included the need for regular visits to remove cash, risk of theft of the cash in the meter and the lack of a means of applying a standing charge is there.

Modern solid-state electricity meters, in conjunction with smart card technology, have removed these disadvantages and such meters are commonly used for customers considered to be a poor credit risk. In the UK, one system is the PayPoint network, where

rechargeable tokens (Quantum cards for natural gas, or plastic "keys" for electricity) can be loaded with whatever money the customer has available.



Diagram: Prepayment key

A similar system, with 2 way communication smart cards, has been used for more than 1 million meters by Elektromed in Turkey. Around the world, experiments are going on, especially in developing countries, to test pre-payment systems. In some cases, a lack of social acceptance has led to non-implementation of this technology.

There are various groups, such as the Standard Transfer Specification (STS) association, which promote common standards for prepayment metering systems across manufacturers.

Time of use metering

Time of Usage (TOU) metering involves dividing the day, month and year into tariff slots and with higher rates at peak load periods and low tariff rates at off-peak load periods. While this can be used to automatically control usage on the part of the customer (resulting in automatic load control), it is often simply the customers responsibility to control his own usage, or pay accordingly (voluntary load control). This also allows the utilities to plan their transmission infrastructure appropriately.

Power export metering

Many electricity customers abroad, are installing their own electricity generating equipment, whether for reasons of economy, redundancy or environmental reasons. When a customer is generating more electricity than required for his own use, the surplus may be exported back to the power grid.

This exported energy may be accounted for in the simplest case by the meter running backwards during periods of net export, thus reducing the customer's recorded energy usage by the amount exported. More sophisticated meters permit such exported energy to be recorded and accounted for separately and be paid by different prices (higher for exported). In common use are Green renewable sources (wind turbines and photovoltaic cells). Also are Gas turbines.

Other upload source is the plug-in hybrids' car or baset trailer batteries (vehicle-to-grid power systems). For this is used smart grid, that includes high-tech meters that measure electricity via remote control and give customers timing and pricing options. The vehicle-to-grid systems would be installed at workplace parking lots and garages and at transit station lots and could help drivers charge their batteries at home at night when off-peak power prices are cheaper and receive bill crediting for selling excess electricity back to the grid during high-demand hours

Redressal of Consumer Grievances

1. Ombudsman

In exercise of powers conferred, on the Commission, by Sub-section (6) of Section 42 of the Electricity Act, 2003, the Commission has designated Smti. Neelima Dewri Dutta, Secretary, Assam Electricity Regulatory Commission, as Electricity Ombudsman, in addition to her own duties.

2. Forums for Redressal of Consumer Grievances

The AERC Guidelines for Redressal of Consumer Grievances 2004 directs the distribution companies to establish a Forum for Redressal of Grievance of the consumers in accordance with the provisions of these regulations. Accordingly, Forums for Redressal of Consumer Grievances have been set up by all the three Discoms comprising of the following members:

LOWER ASSAM ELECTRICITY DISTRIBUTION COMPANY LIMITED (LAEDCL) CONSUMER GRIEVANCE REDRESSAL FORUM

Chairman	Shri Utpal Kumar Sharma, General Manager (ACE), Guwahati Zone, LAEDCL
Member (Accounts)	Shri Joy Bharat Saikia, Manager (A/c), LAEDCL
Member	Smti. Lili Das, Former President, Grahak Suraksha Sanstha
Address	Bijulee Bhavan, Paltan Bazaar, Guwahati - 781 001.

CENTRAL ASSAM ELECTRICITY DISTRIBUTION COMPANY LIMITED (CAEDCL) CONSUMER GRIEVANCE REDRESSAL FORUM

Chairman	Shri Ranjit Kr. Sinha, Deputy General Manager (SE), CAEDCL
Member (Accounts)	Shri Joy Bharat Saikia, Manager (A/c), LAEDCL
Member	Shri Jibon Borah, President Sonitpur Zila Grahak Surakshya Samity, Tezpur – 784 001
Address	Bijulee Bhavan, Paltan Bazaar, Guwahati - 781 001.

UPPER ASSAM ELECTRICITY DISTRIBUTION COMPANY LIMITED (UAEDCL) CONSUMER GRIEVANCE REDRESSAL FORUM

Chairman	Shri Sibnath Saha, Deputy General Manager (SE), UAEDCL
Member (Accounts)	Shri P.C. Barua, Deputy Manager (A/c), LAEDCL
Member	Shri Ananda Bora, president Bidyut Grahak Surakshya Samittee, Narayanpur, Bihpuria.
Address	Bijulee Bhavan, Paltan Bazaar, Guwahati - 781 001.

3. Complaint Resolution Procedure and Time Limits For Different Categories (See AERC Guidelines For Redressal Of Consumer Grievances)

1. Interruption in power supply (Fuse-off call, etc.)

- 1.1 In case of interruption of power supply for LT consumers, the complaint shall be registered with the Fuse-off Call Center / Fault Call Center/ Central Complaint Center / Junior Engineer of the Distribution Licensee along with name, address, consumer number, and a brief description of the complaint. The HT consumer complaints will be registered with the Junior Engineer / Assistant Engineer of the Distribution Licensee.
- 1.2 The complaint may be made by telephone or personally and the concerned officer of the Distribution Licensee shall ensure prompt response and action. The official immediately on receiving the complaint shall register it and issue a Complaint Number.
- 1.3 The Table 1A below outlines the normal time limit for resolution of complaints:
- 1.4 Adherence of time limit for rendering the services under various nature of complaint mentioned below is subjected to the condition that Distribution Licensee is not prevented from doing so due to extraordinary situations like cyclone, flood, storm or any such occurrences not attributable to the Board/Licensee

Table 1A

S. No.	Type of Service	Time Limit for Rendering the Service
1	(a) Fuse-off /Fault Calls:	
	Cities/Towns	4 working hours
	Rural Areas	24 hours
	(b) Line Breakdowns:	
	Cities/Towns	i) Where replacement of pole is not required : 24 Hrs. ii) Where replacement of pole is required : 48 Hrs.

S. No.	Type of Service	Time Limit for Rendering the Service
	Rural Areas	I) Where replacement of pole is not required: 24 Hrs. II) Where replacement of pole is required : 72 Hrs.
	(c) Street Lights:	
	i. Rectification of line fault	24 hours
	ii. Replacement of fused or defective units	2 days (subject to the materials to be made available by the local bodies)
	(d) Replacement of failed Distribution Transformer:	
	Cities/Towns	1 day
	Rural Areas	5 days
	(e) Replacement of damaged service line:	
	i. In case of damage to service wire due to consumer's fault	3 days from the date of payment of cost of service-wire by the consumer or alternately consumer can get the work done through licensed contractor
	ii. In case of damage to service wire on account of normal wear and tear or reasons not attributable to the consumer (service wire to be supplied by the Board / Licensee free of cost)	3 days from the date of receipt of complaint

Procedure for resolution of complaint

- 1.5 In case of non-resolution or unsatisfactory resolution of the complaint at Level I, officers mentioned in Para 1.1 above, the consumer may take his/her complaint to the officer at Level II mentioned in Table 1B below. Immediately on receipt of any complaint the officer shall not only take action to ensure restoration of supply on the same day, he will also investigate the reason of delay in providing service at level 1. Table 1B presents the procedure for lodging the complaints:

Table 1B

S. No.	Category of Consumers	Where to lodge complaint - Level I (Office of)	Next higher level for complaint – Level II (Office of)
1	Fuse-off calls, Line breakdowns, transformer failure, etc. of all LT consumers	Fuse off Call Centre / Fault Call Centre / Complaint Booth/ Central complaint centre / Junior Engineer	Assistant Engineer/ Assistant Executive Engineer/ Executive Engineer
2	HT consumers (all complaints)	Complaint Booth/ Central Complaint Centre	Executive Engineer/ Area Manager / Superintending Engineer

2. Voltage related complaints

- 2.1 In case of low / high or erratic voltage condition for LT consumers, the complaint may be registered with the Fuse-off Call Center / Central Complaint Center / Junior Engineer of the Distribution Licensee along with name, address, consumer number, and a brief description of the complaint. The HT consumer complaints will be registered with the Junior Engineer / Assistant Engineer.
- 2.2 The complaint may be made by telephone, by post or personally and the Distribution Licensee shall ensure prompt response and action. The official receiving the complaint shall register it in Form 1 and issue a Complaint Number. For postal complaints, the receipt shall be dispatched by the next working day.
- 2.3 The Table 2A below outlines the time limit for resolution of complaints:

Table 2A

S. No.	Type of Service	Time Limit for Rendering the Service
1.	In case high voltage is reported by consumer	6 hrs.
2.	In other cases	
	(i) If no work is involved and only maintenance of line is required.	

S. No.	Type of Service	Time Limit for Rendering the Service
	Cities/ Towns Rural areas	7 days 10 days
	(ii) If augmentation of system is required	120 days (Applicable only when the transmission voltage is within the prescribed limit)

Procedure for resolution of complaint

- 2.4 In case the problem is local in nature, the problem shall be resolved within 7 days in case of cities/ towns and 10 days in case of rural areas. In case of need for augmentation of the distribution line, transformer capacity or installation of capacitor, the timeframe for resolution shall be 120 days; the consumer shall be informed of the same in writing by the Junior Engineer / Assistant Engineer.
- 2.5 In case of non-resolution, the consumer may take his complaint to the officer (level 2) as mentioned in the Table 2B below in form 2. The officer shall take immediate action on the same and shall inform the consumers about the reasons of delay and the time required to solve the problem. The officer shall provide this information to the consumer, in writing, within 7 days of receipt of complaint.

Table 2B

S. No.	Category of Consumers	Where to lodge complaint – Level 1 (Office of)	Next higher level for complaint – Level 2 (Office of)
1	LT consumers	Fuse off call center / Centralized complaint center / Junior Engineer	Assistant Engineer / Assistant Executive Engineer/ Executive Engineer
2	HT consumers	Junior Engineer / Assistant Engineer/ Fuse Call Centre/ Centralised Computer Centre	Executive Engineer / Assistant Executive Engineer/Superintending Engineer

3. Load shedding /scheduled outage

- 3.1 In case of load shedding or scheduled power cuts exceeding 12 hours of duration in a day or power cuts exceeds 25 hours in a week, the LT consumer may lodge a complaint with the Junior Engineer / Assistant Engineer of the Distribution Licensee. The HT consumer shall register his complaint with the Assistant Engineer

- / Executive Engineer.
- 3.2 The complaint may be made by telephone, by post or personally for which a Complaint Number shall be provided. For postal complaints, the receipt shall be dispatched by the next working day. The concerned officer of the Distribution Licensee shall ensure prompt response and action and also ensure non-recurrence.
- 3.3 For scheduled power cuts, the consumers must be intimated at least 24 hours in advance through the print media, public address, electronic media and/or through telephone. The timing for the scheduled power cut must also be displayed on the notice board of the Distribution Center and the Fuse-off Call Center for the information of the consumer.
- 3.4 The duration of scheduled power cut must never exceed 12 hours, and supply should normally be restored before sun set.
- 3.5 The licensee should submit its plan of scheduled regular outages to the Commission for information..
- 3.6 Load shedding/scheduled outage: Load shedding arising out of forced outage of transmission/ distribution line and due to system contingencies may have to continue beyond sun set in a day under exceptional circumstances.

Procedure for resolution of complaint

- 3.7 In case of non-resolution or unsatisfactory resolution of complaints the consumer may lodge a complaint with the officer at Level 2 as mentioned in the Table 3 below. The office, after investigating the case, shall intimate the consumer, in writing, the reason of delay, within 24 hours of receipt of complaint and take steps to correct the situation.

Table 3

S. No.	Category of Consumers	Where to lodge complaint – Level 1 (Office of)	Next higher level for complaint – Level 2 (Office of)
1	LT consumers	Junior Engineer / Assistant Engineer	Assistant Engineer / Assistant Executive Engineer/ Executive Engineer
2	HT consumers	Assistant Executive Engineer / Executive Engineer	Superintending Engineer

4. Meter related complaints

- 4.1 If the consumer suspects that his meter is faulty, he may record his complaint with the Junior Engineer / Assistant Engineer in case of LT connection and with the Assistant Executive Engineer / Executive Engineer in case of HT connection. The complaint may be made over the telephone, by post or in person. The officer receiving the complaint must immediately issue a Complaint Number. For postal complaints, the receipt shall be dispatched by the next working day.
- 4.2 On receipt of the complaint, the initial inspection shall be done within 7 days of the complaint. The meter inspection shall be carried out on chargeable basis. The amount shall be payable by the consumer in the next energy bill. If the meter is found to be defective, the Distribution Licensee shall immediately undertake replacement as per time limit in Table 4A.
- 4.3 If on inspection, the Distribution Licensee finds that the meter is not defective and a replacement is not required, but the consumer is not satisfied with the finding, he may pay Meter Testing Charge and have the meter tested in the ASEB/Licensee laboratory in his presence. Alternately, the Distribution Licensee may install a check-meter in the consumer premises to check its accuracy.
- 4.4 The Table 4A below also provides the time limit for replacement of burnt meters. However, during inspection if it is found that the burning is a result of tampering of the meter or attached equipment, or if the seal is found broken, action will be taken against the consumer as per rules.

Table 4A

S. No.	Type of Service	Time Limit for Rendering the Service
1	LT Consumers	
	a) Preliminary checking of meter on receipt of consumer complaint Cities/ Towns Rural Area	7 days. 15 days.
	b) Replacement of Stopped/defective meters	Within 15 days in urban areas & within 30 days in rural areas
	c) Replacement of Burnt meters: • Cities/ Towns :	

S. No.	Type of Service	Time Limit for Rendering the Service
	(i) Where the burnt meter is not attributable due to tampering by the consumers	7 days
	(ii) Where the cost of the meter is recoverable from the consumer, written notice is to be given immediately but not later than 7 days of receipt of complaint.	15 days after the receipt of payment.
	iii) Where the consumer is required to supply the metering equipment.	15 days after supply of metering equipment.
	• Rural Area :	
	(i) Where the burnt meter is not attributable due to tampering by the consumers	15 days
	(ii) Where the cost of the meter is recoverable from the consumer, written notice is to be given immediately but not later than 7 days of receipt of complaint.	30 days after the receipt of payment.
	iii) Where the consumer is required to supply the metering equipment.	30 days after supply of metering equipment.
2	H.T. Consumers	
	(i) Replacement of stopped/defective meter or related equipments	7 days after receipt of complaint (Subject to availability of equipment/ material. If procurement of meter is required, the meter should be arranged and installed within a period of three months)

S. No.	Type of Service	Time Limit for Rendering the Service
	(ii) Where the cost of the meter is recoverable from the consumer, written notice is to be given immediately but not later than 7 days of receipt of complaint	15 days after the receipt of payment (Subject to availability of equipment/ material. If procurement of meter is required, the meter should be arranged and installed within a period of three months)
	iii) Where the consumer is required to supply the meter/equipment	30 days after delivery of metering equipment to Board/ Licensee's office.

Procedure for resolution of complaint

- 4.5 In case of non-resolution or unsatisfactory resolution of complaints within the timeframe mentioned above, the consumer may lodge a complaint with the Level 2 Officer mentioned in Table 4B below. The office, after investigating the case, shall intimate the consumer, in writing, the reason of delay, within the next working day and take steps to correct the situation in the next 10 days.

Table 4B

S. No.	Category of Consumers	Where to lodge complaint – Level 1 (Office of)	Next higher level for complaint – Level 2 (Office of)
1	LT consumers	Junior Engineer/Assistant Engineer	Assistant Executive Engineer / Executive Engineer
2	HT consumers	Assistant Engineer/Executive Engineer	Executive Engineer / Superintending Engineer

5. Electricity bill related complaints

Incorrect Bill

- 5.1 In case of errors in the bill, the consumer may register his complaint in Form 1 with Junior Engineer / Assistant Engineer in case of LT connection and Area Manager/ Superintendent Engineer in case of HT connection. The complaints may be made over the telephone, in person, or by post. For all complaints a Complaint Number with date of receipt of complaint will be issued and in case of postal

complaints, the receipt shall be issued by the next working day.

- 5.2 The time limit for resolution of above complaints is provided in Table 5A. In such cases where an inspection of the meter is not required, the time limit presented in the Table 5A below shall apply.

Table 5A

S. No.	Type of Service	Time Limit for Rendering the Service
1.	1. In case any additional information is not required to be collected In case any additional information is required to be collected: Urban areas Rural areas	Immediately (On the spot) 3 days 7 days

The check readings taken during redressal of bill related complaints and replacement of meter should be posted correctly in the meter-reading card.

The same procedure shall be applicable for the cases of conversion of categories.

5.3 Non receipt / delayed receipt of bill

The Distribution Licensee shall intimate the consumer of the due date on which he will receive his energy bill and also the due date for payment of his bills. This will normally be the due date for all billing cycles for that consumer. In case the due date falls on a holiday in any month, the next working day shall be the due date for that month.

- 5.4 If a consumer wishes to have his bill sent to him by a mode other than the regular mode adopted by the Distribution Licensee he might intimate his desire to the Distribution Licensee, who will then ensure that bills are sent to the consumer by that mode. In such cases the additional charges will be borne by the consumer.
- 5.5 In case of non-receipt or delayed receipt of bill, the Consumer/Licensee shall take the following steps:

In case of non-receipt of bill within the due date (of receipt of bill) or 15 days of reading of meter, the consumer may contact the bill issuing office to collect the duplicate bill and arrange payment before the due date of payment. In case the licensee is not in a position to provide duplicate bill, the consumer shall pay on the basis of past average bill amount. In the

event of non receipt of the bill the responsibility of the licensee and the consumers are summarized as below:

S. No.	Responsibility of the consumer	Responsibility of the licensee
1	In case of non-receipt of bill within the due date (of receipt of bill) or 15 days of reading of meter, the consumer may contact the bill issuing office to collect the duplicate bill and arrange payment before the due date of payment.	The licensee shall issue a duplicate bill promptly, free of charge. The licensee shall investigate the cause of non-receipt of bill and take suitable steps to ensure that the consumer receives his electricity bills regularly thereafter.
2	In case the licensee is not in a position to provide duplicate bill, the consumer shall pay on the basis of past average bill amount. The consumer, however, will be liable to pay delayed payment surcharge to the extent the amount paid is lesser than the actual billed amount.	Licensee shall accept payment on the basis of the past average.

5.6 Those consumers who repeatedly experience non receipt or delayed receipt of bills, may register their complaint of non-receipt/delayed receipt in Form 1 with Junior Engineer / Assistant Engineer in case of LT connection and Area Manager / Superintendent Engineer in case of HT connection. Normally such complaints may be made only after outstanding dues are cleared.

5.7 The complaints may be made over the telephone, in person, or by post. For all complaints a Complaint Number will be issued and in case of postal complaints, the receipt shall be issued by the next working day.

Procedure for resolution of complaint

5.8 In case of non-resolution or unsatisfactory resolution of complaints within the time limit mentioned above, the consumer may lodge a complaint with the Level 2 officers mentioned in Table 5B below. The office, after investigating the case, shall intimate the consumer, in writing, the reason of delay, within the next working day and take steps to correct the situation in the next 7 days.

Table 5B

S. No.	Category of Consumers	Where to lodge complaint – Level 1 (Office of)	Next higher level for complaint – Level 2 (Office of)
1	All LT consumers	Junior Engineer / Assistant Engineer	Assistant Engineer / Assistant Manager (Revenue) / Executive Engineer
2	All HT consumers	Area Manager / Superintending Engineer	Chief Engineer

6. Disconnection and Reconnection of power supply

- 6.1 When a consumer fails in payment of any bill in full, without the approval of the authorized officer, by the due date, the service connection of the consumer will be liable to be disconnected on temporary basis as per section 56 of the Electricity Act 2003 (36 of 2003). Before disconnection of a consumer's installation, the licensee would serve a separate notice of fifteen clear days. Effort should be made that before disconnecting a domestic connection; an adult member of the family should be informed. If the proof of payment of dues is produced to the satisfaction of the Licensee's employee deputed for the purpose, the supply shall not be disconnected.
- 6.2 Consumers who suffer disconnections will have the right to appeal for reconnection as per procedure provided in this document.
- 6.3 In case of a disconnection being justified, the security deposit of the consumer will be adjusted to the extent of the consumer's arrear. In case it is found by the Ombudsman that the disconnection is unjustified, the Licensee may be penalized and compensation may be awarded to the consumer.
- 6.4 Reconnection will be done within the time limit mentioned below as per Table 6A on receipt of due payment:

Table 6A

S. No.	Type of Service	Time Limit for Rendering the Service
1.	Reconnection after payment	
	a) Urban areas	24 hours
	b) Rural areas	48 hours

Procedure for restoration of power supply

- 6.5 In cases of incorrect disconnection and delays in reconnection, the consumer may lodge a complaint in Form 1 with the office (level 1) of the utility mentioned in the Table 6B below. Complaint may be registered over telephone or in person. In case of non-redressal or unsatisfactory redressal of complaints the consumer may approach the higher office (level 2) as mentioned in the Table 6B by registering his complaints. The office, after investigating the case, shall intimate the consumer, in writing, the reason of delay, within the next working day and take steps to correct the situation in the next 24 hours.

Table 6B

S. No.	Category of Consumers	Where to lodge complaint – Level 1 (Office of)	Next higher level for complaint – Level 2 (Office of)
1	All LT consumers	Junior Engineer / Assistant Engineer	Executive Engineer
2	All HT consumers	Executive Engineer / Area Manager	Chief Engineer

7. Delay in providing new connection including enhancement or reduction of load

- 7.1 All applications for new LT connections shall be received by the Junior Engineer / Assistant Engineer. The Executive Engineer shall receive all applications for the new HT connections and change of load. The application forms shall be available at the offices of the Distribution Licensee or on the website of the licensee.
- 7.2 The timeframe for activities to provide new connection including inspection of premises, information of charges to be paid and execution of the work after payment is provided in the Table 7A below.
- 7.3 Where the distance of the premises where service connection is required is more than 50.0 (fifty) meters away from the existing distribution main, such service connection shall be deemed as requiring the extension of distribution main.
- 7.4 Within the overall time limit allowed under the Act or fixed by the Commission, the recommended time limit given below for various types of services shall also apply to applications for change of connection point and change of establishment.

Table 7A

1.	LT connection	
	a) Notice of inspection on receipt of complete	

	application	3 working days
	b) Inspection after sending the notice	
	i. Urban areas	
	ii. Rural areas	5 working days
	c) (i) Issue of demand note to the applicant for payment of estimated charges (if the extension work is not required and the connection is to be given from the existing network)	7 days
	a) Urban areas	
	b) Rural areas	5 working days
	(ii) Issue of demand note to the applicant for payment of estimated charges (if the a) extension work or b) enhancement of transformer capacity is required)	7 working days
	For extension of LT network	
	a) Urban areas	
	b) Rural areas	10 working days
	For extension of Transformer Capacity	15 working days
	a) Urban areas	15 working days
	b) Rural areas	30 working days
	d) Commencement of supply	
	(i) After payment of necessary charges (if the connection is required to be given from existing network)	10 working days
	a) Urban areas	12 working days
	b) Rural areas	
	(ii) After payment of necessary charges (if a) extension work or b) enhancement in transformer capacity is required)	
	a) If extension of LT line is required	42 days
	I) All connections excluding	60 days

	agriculture II) Agricultural connection with approachable roads III) Agricultural connection with no approachable road b) If enhancement of transformer capacity or new transformer is required I) All connections excluding agriculture II) Agricultural connection with approachable roads III) Agricultural connection with no approachable road	80 days, provided approach load is done by the applicant 60 days 60 days 80 days, provided approach road is done by the applicant
2.	High Tension Connection a) Informing feasibility after receipt of the application b) Issue of demand note of estimated charges (after issue of notice of feasibility) c) Release of connection after receipt of estimated charges i. If no extension work is involved ii. If extension work is involved	7 working days 10 days 10 days 90 days
3.	Extra High Tension Connection a) Informing feasibility after receipt of the application	10 working days

b) Issue of demand note of estimate charges after issue of notice of feasibility	30 days
c) Release of connection after receipt of estimate charges	150 days (Since it will involve extension of line)

- 7.5 In all cases when the licensee completes the extension work and is ready to give supply, the licensee shall serve a notice on the consumer to take power supply within thirty days. If the consumer fails to make arrangements to receive power supply within the notice period, the agreement shall come into force from the day following the end of the notice period, and thereafter the consumer shall be liable to pay any charges due as per the agreement. In the cases where the consumer is informed about non-feasibility of any of his requisitions the Board/ Licensee, the Customer may approach the Commission for necessary direction.

Procedure for resolution of complaint

- 7.6 In case action is not taken by the utility as per the time limit provided in the table above, the applicant may lodge a complaint in Form 1 with the office (level 1) mentioned below in Table 7B. Complaints may be lodged over telephone or in person. If still no action is taken within 7 working days, the applicant may lodge his complaint with higher office (level 2) as mentioned below. The office, after investigating the case, shall intimate the consumer, in writing, the reason of delay, within the next working day and take steps to correct the situation in the next 7 days.

Table 7B

S. No.	Category of Consumers	Where to lodge complaint – Level 1 (Office of)	Next higher level for complaint – Level 2 (Office of)
1	All LT consumers	Junior Engineer / Assistant Engineer	Assistant Engineer / Executive Engineer
2	All HT consumers	Superintending Engineer	Chief Engineer

- 7.7 In case the licensee delays in serving new connection (at variance from table 7A), he is liable to pay penalty to the consumer as per the decision of the Commission.

8. Other complaints

- 8.1 In case of complaints of a nature other than those covered above, for example complaint/ information on electricity theft, wastage of energy, misbehavior by Distribution Licensee personnel, irregular entry into consumer's premises by Distribution Licensee employees into consumer premises etc., those may be

registered with the office of the Assistant Engineer / Executive Engineer / Superintendent Engineer. The complaint may be made by telephone, by post or personally for which a Complaint Number shall be provided. For postal complaints, the receipt shall be dispatched by the next working day. The concerned officer of the Distribution Licensee shall ensure prompt response and action and also ensure non-recurrence.

- 8.2 The time limit for resolution of such a complaint would normally not exceed 15 days and a written reply shall be made along with resolution of the complaint.

Implementation Steps

To ensure that these Guidelines is put in place and action taken accordingly, the following steps will be taken by the Distribution Licensee:

1. Consumer Grievance Register:

All information regarding complaints received at the respective office and their redressal shall be maintained in a "Consumer Grievance Register" in the specified format at all Distribution Centers, Division Offices, Circle Offices and Chief Engineers' Offices and in the office of the forum.

2. Monthly Report:

The higher officers shall review the above "Consumer Grievance Register" fortnightly and records shall be maintained in a Monthly Report in specified format. The Inspecting Officer shall also review the above register of complaints and follow-up action from time to time. A synopsis of the format, represented circle wise, shall be posted on the websites of the Companies. The progress of the resolution of complaints by the Forum shall also be posted on the website of the licensee every month.

3. Complaint Monitoring Cell:

There shall be a separate Complaint Monitoring Cell in the offices of the Executive Engineer, Superintendent Engineer, Chief Engineer and the Chief Executive. This Cell shall maintain the records of delay in providing service to consumers and monitor actions taken to redress complaints and take remedial action if necessary.

4. Daily Report:

Information on the following parameters shall be reported to the Complaint Monitoring Cell in the office of the concerned Chief Engineer and the Chief Executive daily:

Number of problems of interruption of power / Fuse-off / Fault calls not attended to for more than 24 hours. This should be accompanied with a brief description of the issues involved.

Name of areas where load shedding / scheduled outage continued for more than 24 hours.

Number of cases where unauthorized entry into consumer's houses were reported.

5. Reasons for Non-redressal of Complaints:

In case of failure by the notified officer to resolve the complaint to the satisfaction of the consumer within the specified time limit, he shall report the reasons for the failure to the Executive Engineer / Superintendent Engineer on a monthly basis.

6. Availability of Forms / Rules:

The licensee will ensure the availability of the following items at all offices for the convenience of the consumers:

- a) Guidelines for Redressal of Consumer Grievance.
- b) Various forms for lodging of complaints.
- c) Application form for power supply.
- d) Seniority list for new connections.
- e) Electricity Supply Code
- f) Schedule of Miscellaneous Charge.
- g) Consumer Rights Statement.
- h) Approved Performance Standards.
- i) Applicable electricity tariff and surcharges/duties.
- j) Display of the names, addresses and telephone numbers of officers on the notice boards.
- k) Display of the office timings for bill collection on the notice boards.
- l) Display of the time schedule of the power cuts on the notice board.
- m) Display of target time-period within which the different types of problems will be resolved by the licensee.

7. Central Complaint Centre:

The licensee shall establish Central Complaint Centre in due course where consumers should be able to lodge complaint through telephonic conversation or through the Internet. Licensee should make arrangements to acquire a single telephone number for the entire state where consumers can lodge complaint. The Central Complaint Centre will receive all the complaints of the licensee and will provide a token number to the complainant. The Central Complaint Centre shall thereafter initiate steps to process the complaint. The licensee may implement this facility first of all in cities and thereafter extend the same facility to the rural areas.

8. Infrastructure and Training:

The Distribution Licensee shall ensure that all adequate infrastructure is put in place, to handle the complaint redressal mechanism and to ensure that all time limit are adhered to. It shall be the responsibility of the Distribution Licensee to ensure that there are adequate phone lines to take all complaint calls, that the complaint desk is manned at all times, that adequate training on telephone and personal etiquette is undertaken, that all necessary forms / rules / procedures etc are available at all times and all other necessary steps are taken to ensure that consumers have a good experience in their interaction with the officers / staff.

Form – 1

Cost of Form – Re 1/-

Registration of Grievance**At Level 1**

Grievance No.& Date

(To be provided by office)

Consumer No. : _____

1. Name and address : _____

2. Telephone no. of complainant : _____

3. Type of problem	Interruption	Voltage	Load Shedding	Meter	Bill	Disconnection	New Connection	Others
Please tick the type of problem applicable								

4. Brief description of grievance: _____

_____5. Any other information : _____

6. Date of complaint : _____ Signature of complainant

----- Tear from here-----

To be retained by consumer

Complaint No.& Date

(To be provided by office)

Consumer Number : _____

1. Name of consumer : _____

2- Brief description of complaint : _____
_____3- Target date to resolve grievance : _____
(To be provided by office)

Signature of staff receiving the application

Designation & Seal

(Please provide your complaint number in any future communications)

Form – 2

Cost of Form – Re 1/-

Grievance Registration at Level 2

Grievance No.& Date

(To be provided by office)

Consumer No. : _____

1. Name and address : _____

2. Telephone No. of complainant : _____

3. Name of office (Level 1) where complaint was registered earlier: _____
_____4. Brief description of grievance : _____

5. Date on which complaint at Level 1 office was registered : _____

6. Grievance no. (given by licensee at level 1) : _____

6. Please attach copies of communication with level 1 office (Optional):

7. Date : _____

Signature of complainant

----- Tear from here -----

To be retained by Consumer

Complaint No.& Date

(To be provided by office)

Consumer Number : _____

1. Name of consumer : _____

2- Brief description of complaint : _____

_____Signature of staff receiving
the application

Designation & Seal

(Please quote complaint number in future communications)

Form - 3

Name of office : _____

Place : _____

Complaint Receiving Register

Sr No	Date	Complaint No.	Name of complainant and his telephone number	Type of problem	Complaint forwarded to	Remarks
1	2	3	4	5	6	7

Form - 4

Month: _____

Monthly report on complaints received

[illegible]
