

Demystifying Distribution Business

This note attempts to explain the build up of tariff which is charged to end consumers for supply of electricity right from the source (i.e from where power generation happens) upto the door step of the end consumers.

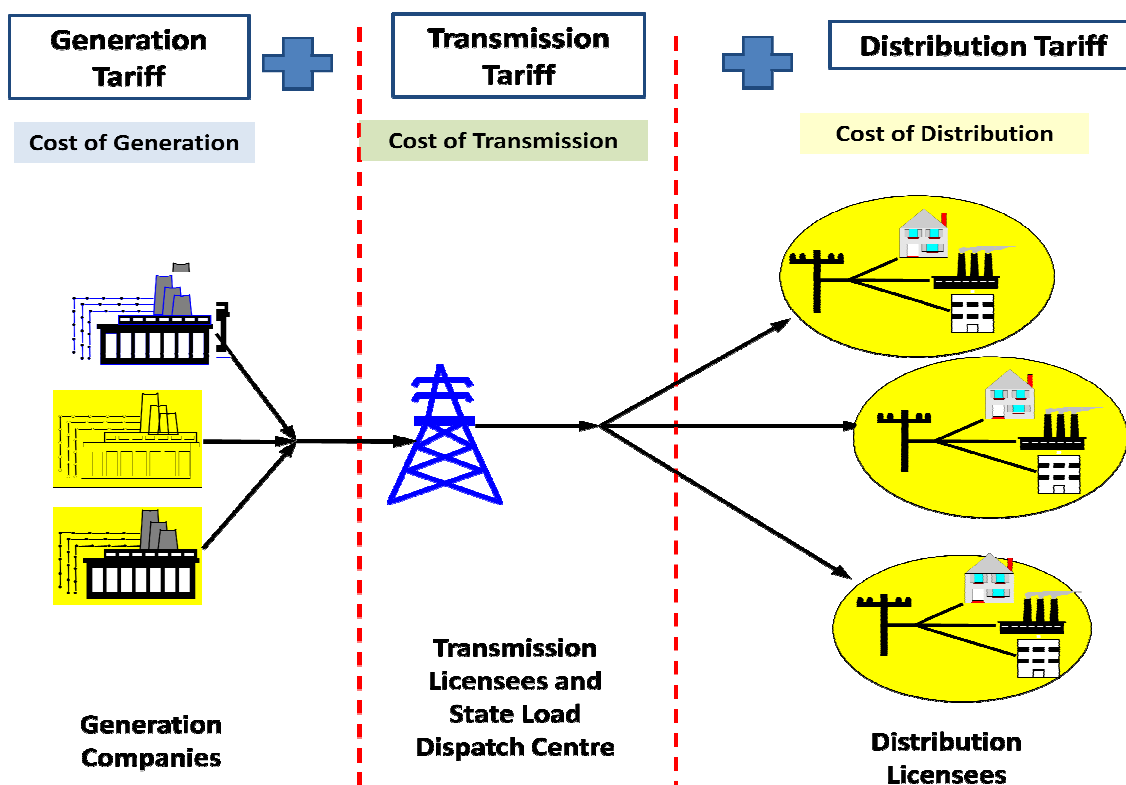
i.) How power flows from Source to Destination?

The block Diagram shown below shows the flow of power from Source to Destination and the build up of costs for delivering the power to the end consumer.

Power is generated in Generating Stations (i.e “Source”) by Generating Companies, which is then transmitted through the Transmission Network over long distances at very high voltages to the load centers (where the consumption happens). The load centers are embedded in the network of a distribution company.

The load centres have a wide distribution network of High voltage (HT), Medium Voltage and Low Voltage (LT) systems through which the power flows and reaches the consumer as per his voltage requirement (HT or LT).

The transmission network is owned by a Transmission Licensee and the distribution network is owned by the Distribution Licensee.



As can be noticed from the above, final consumer has to pay a tariff which will cover the costs of (i) Generation activity (ii) Transmission activity and (iii) Distribution activity. However the relation of the consumer is only with the distribution licensee. Hence on behalf of the consumer, the Distribution Licensee purchase power from the Generating Company

and uses the transmission network to bring such power to the boundary of the distribution licensee and finally give it to the consumer.

Hence the Distribution Licensee incurs primarily the following cost on behalf of the consumers to reach the power to the consumer:

- Power Purchase Cost – For purchase of power from the Generator
- Transmission Cost – For using the transmission network to bring the power to the doorstep of the Distribution Company.
- Distribution Cost- To maintain its own network and provide services to the consumers

In addition to the above, there are certain other costs that are paid by the consumers of Mumbai as given later in this note.

ii.) Distinguishing Characteristics of Distribution Licensee

Each Distribution Licensee operates within its Licensed Area of supply. The above costs are not the same for every distribution licensee. The parameters which are Unique to each distribution Licensee are as detailed below:

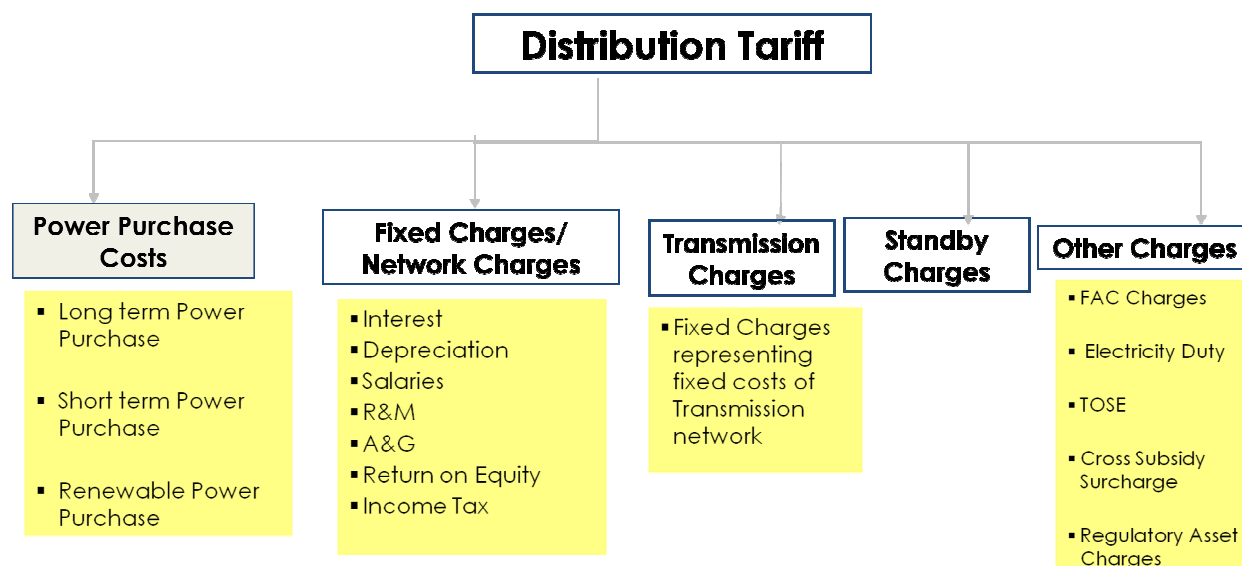
- **Power Purchase Cost** : The Distribution licensees source power from Different sources viz a) From Generators using conventional fuel such as coal oil and gas and with whom the distribution licensee has a long term contract, b) Renewable Energy Generators and c) Other sources through agreements for short time. The Power Purchase Cost accounts for almost 80% of the Annual cost (called the “Annual Revenue Requirement”) of a Distribution Licensee.
- **Network Spread**: The Network Spread is different for Different Licensees. For example, the network of Reliance is in Suburban area of Mumbai while that of MSEDCL is in whole of Maharashtra (excluding Mumbai)
- **Losses**: It depends on the Network Spread, Network configuration (HT/LT), thefts in the system, unmetered consumption if any among other things.
- **Consumer Mix**: The consumer mix may be different for Different Distribution Licensees. The Consumer Mix refers to the ratio of LT to HT out of total Sales. Within HT and LT, the consumer Mix further depends on the individual categories viz Industrial, Commercial and Residential.

Owing to these parameters, the cost of power of each licensee can be different. Since the Distribution Licensee undertakes this activity for the consumer, the consumers of different

distribution licensees pay different costs and hence the tariff of the consumers in two distribution areas is different.

iii.) Various Costs and Tariff Buildup

The various cost comprising the tariff are presented below:



Let's look at each of the cost elements that lead to the ultimate tariff for the end consumer:

1. Power Purchase Costs

A Distribution Licensee has to arrange for Power from different sources for supplying power to his consumers. A sum total of all the power purchased by the Distribution Licensee from different sources forms a part of Power Purchase cost. The same are classified into Long term Power purchase costs, short term power purchase costs and Renewable power purchase costs.

1.1 Long term Power purchase costs

These costs primarily represent the costs incurred by a distribution licensee for availing the assured usage of a portion of generation capacity available with a generation company. It is necessary to tie up the power source on Long Term basis to ensure continuity of supply over the period of time.

Such Long Term sources are used to cater to the demand that is normally required to be met for most parts of the day. The same is normally bifurcated into the following:

The tariff of a Generating Unit consists of two components:

- i. Fixed Charges or Capacity Charges proportional to the quantum of capacity contracted
- ii. Energy Charges proportional to the quantum of generation and varies with the type of fuel used

1.2 Short Term Power purchase costs

These costs are incurred towards purchase of additional quantum of power which may be required from time to time to meet the peak demand fluctuations during the day or variation in seasonal loads. Since, such quantum of power is not required throughout the year or during the entire day, typically it is purchased on short-term basis as per estimates of power demand on a day to day or month on month basis. This is normally procured through traders or power exchange and is usually more expensive than the long-term power prices.

1.3 Renewable power Purchase costs

Every distribution licensee is mandated by law to procure a certain quantum of its requirements from renewable energy sources like wind power, solar power etc. The power procured from these sources is usually at prices determined by the Regulatory Commission. As per the present stipulations, about 6 % of the power required is to be met through the purchase from Renewable sources.

3. Transmission Charges:

These charges reflect the cost incurred by a distribution licensee for Transmitting (also called wheeling on transmission network) the power from a generation plant into its distribution system. These are entirely determined by the Regulatory Commission and a distribution licensee has to contribute its share for using the State Transmission system. The following example will give an idea of how the Transmission Charges are shared between the Distribution licensees.

Transmission Licensee	Fixed Cost (Rs Crs)	Distribution Licensee	Share in Co-incident Peak Demand	% Share	Share in Transmission Cost
MSETCL	1547	MSEDCL	9568	81%	1459
TPC-Trans	211	TPC-Dist	353	3%	54
REL-Trans	42	REL-Dist	1245	11%	190
Total Maharashtra	1800	BEST	641	5%	98
		Total	11827	100%	1800

The above fixed charges decide the Transmission wheeling charges applicable for a distribution licensee.

3. Fixed Charge Of Distribution licensees:

These charges are primarily on account of (i) the costs incurred by a distribution licensee to maintain the distribution network infrastructure and includes the operational costs for maintaining network infrastructure and (ii) for providing customer service infrastructure like meter reading, billing, payment collection etc. The various elements of these costs are as below:

- **Operation and Maintenance Expenditure:** This head is further broken down into sub heads namely Repair & Maintenance Expenditure, Administration & General Expenditure, and Employee Expenditure.
- **Depreciation:** The Depreciation Expenses are claimed on the assets which have been allowed to be capitalized. The Hon'ble Maharashtra Electricity Regulatory Commission has notified a Depreciation schedule as part of the tariff regulations based on which the Depreciation is charged to the consumers.
- **Interest on Long term loan:** These are the interest expenses incurred for the debts taken by a licensee for funding the capital expenditure required for either maintaining or augmenting its distribution network infrastructure. These funds are utilized for laying new cables, installation/replacement of transformers and sub-station equipments etc apart from other customer service related infrastructure. The same are scrutinised for prudence check by the Regulatory Commission
- **Interest on Working Capital:** For the normal Operations of its Businesses, the distribution Licensee borrows short term loans from Banks. The Hon'ble Commission has set norms to compute the working capital. The Interest on such working capital is allowed as a part of fixed cost at the prevailing PLR rates.
- **Return on Equity:** For the assets that are capitalized the Hon'ble Commission considers a maximum of 30% as Equity contribution or actual, whichever is lesser. The Hon'ble Commission allows a Return on Equity of 14% on Generation and Transmission and 16% on Distribution Business. The same is a part of Fixed cost
- **Other Miscellaneous** items include Income Tax, Incentives if any, Sharing of gains and losses.

4. Standby Charges:

These charges are unique to the Licensees in Mumbai License Area viz Tata Power-D, R-Infra-D and BEST. In order to provide continuous and uninterrupted power supply to Mumbai License Area, standby support is provided by MSEDCL by way of providing additional power in the event of non-availability of any generation capacity that normally provide power to Mumbai licensees. For availing the facility of standby support, all the Distribution licensees within Mumbai have to pay standby charges to MSEDCL. The

Distribution Licensees contribute to the Standby charges in the ratio of Co-incident peak demand of Mumbai

5. Wheeling Charges payable to Rlnfra

Many of the consumers of a distribution licensee like Tata Power are “Changeover consumers” in the sense that the power to them is reached by using the network of Rlnfra. As the network of Rlnfra is used in addition to the transmission network explained earlier, a charge called “Wheeling Charges of Rlnfra Network” is also payable by Tata Power to Rlnfra and is recovered from its consumers. A detailed note on the tariff of Changeover consumer is given in **Annexure 1**.

6. Past Recoveries

These are primarily on account of deferred or pending entitlements of distribution licensee which have not been recovered through tariff earlier. The same may accrue either on account of dis-allowances by the Regulatory Commission, which have been subsequently allowed by the Appellate Tribunal or on account of unrecovered Fuel adjustment charges. These can also arise due to voluntary deferment of recoveries by a distribution licensee so as to prevent tariff shock to consumers.

The overall buildup of tariff to the end consumer can be ascertained by way of a example shown below:

Tariff Build up of Tata Power-D as approved by MERC in the recent Tariff Order

Description	Tariff (Rs/unit)
Long term Power Purchase	3.45
Short Term Power Purchase	0.36
Renewable Power Purchase	0.25
Total Fixed Cost Tata Power-D	0.44
Transmission Charges	0.19
Standby Charges	0.18
Wheeling charges payable to R-Infra	0.24
Past Recovery	0.09
Total	5.20

7. Element of Cross Subsidy

The above figure of Rs 5.20 per Kwh is the average Tariff paid by the consumers of the distribution licensee (i.e Tata Power). However different tariff categories will have tariff that is different from the average tariff worked out above. The difference in the tariffs paid by the various categories arises out of the “Cross subsidy” payable by the category. For Example the cross subsidy payable by LT Commercial (> 50 KW) is 103 % and hence the tariff for such category works out to Rs 5.38 per Kwh.

8. Other Charges

In addition to the above, the following charges are levied as per the various regulations and laws.

a.) FAC Charges (Fuel adjustment charges)

These charges are usually on account of the fuel price variations that are passed on by the generation company to the distribution licensee. The generation tariff that is charged to distribution licensees is determined by the Regulatory Commission based on a certain assumption of fuel prices. In the event of any changes in fuel prices on account of market conditions, the generation company is entitled to recover the same from the distribution licensee by additionally charging the differential between the actual fuel price and that assumed while determining the energy charge charge of a generating unit.

b.) Electricity Duty

These are additional levies and which are to be recovered from consumers and to be deposited with the State Government under the Bombay electricity Duty Act. The quantum of charges per unit is prescribed by the State Government from time to time.

c.) Tax on Sale of Electricity (TOSE)

This is also a levy imposed by the State Government and is payable by distribution licensees to the State Government and hence is recoverable from consumers

d.) Cross Subsidy Surcharge (CSS)

This is payable if any consumer avails power supply from any other licensee who is not a distribution licensee in the area where the consumer is situated. The MERC has recently ruled that such charges are also payable by consumers who have changed over from Reliance Infrastructure to Tata Power by way of a a CSS as determined by the MERC. The same will be recoverable by Tata Power and reimbursed to Reliance Infrastructure.

Tariff for Changeover Consumers

The system of changeover of consumers from R-Infra-D to Tata Power-D is as represented in the block diagram below:

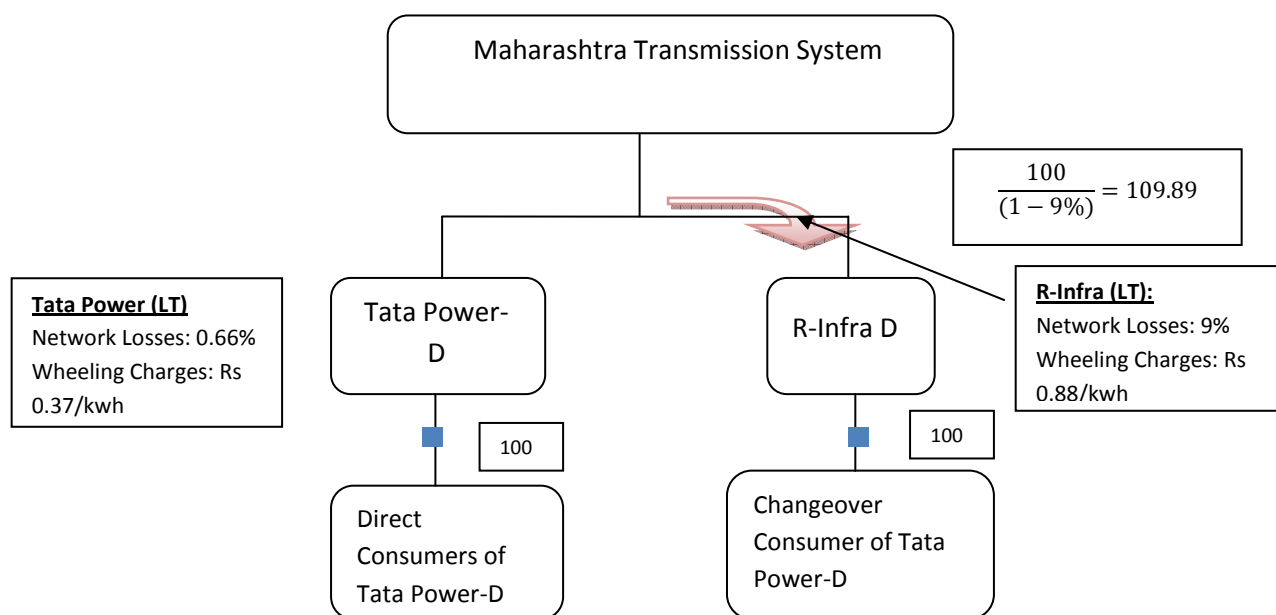


Figure: Distribution system in Mumbai

Changeover of consumers from R-Infra-D to Tata Power-D was facilitated by the Hon'ble MERC Order dated 15th October 2009. In the said Order the Hon'ble MERC allowed Tata Power to use the network of R-Infra-D to serve the Changeover consumers. Thus consumers even though connected to R-Infra-D network, were able to avail of Tata Power-D supply. However since the Changeover consumers were connected to R-Infra-D network they have to bear the network losses and Charges of R-Infra-D network. The LT network parameters for Tata Power-D and R-Infra-D network are as given in the Block Diagram above.

Thus a LT Change over consumer with a metered consumption of 100 units will be billed for $\frac{100}{(1-9\%)} = 109.89$ units, since Tata Power-D has to send 109.89 units in R-Infra-D network to ensure that 100 units reaches the LT changeover consumer. A Direct LT consumer will be billed on metered consumption i.e 100 units since Tata Power-D losses is already a part of Tata Power-D ARR. In addition the LT changeover consumer will be charged R-Infra-D LT wheeling Charge (Rs 0.88/unit) less Tata Power-D LT wheeling Charge (Rs 0.38/unit) i.e a net wheeling charge of Rs 0.50/unit.

Impact of the recent Order by MERC in the Tariff Order of R-Infra on Cross Subsidy surcharge and Regulatory asset charge to be recovered from Changeover consumers

Hon'ble MERC has notified the applicable Cross Subsidy Surcharge (CSS) to MSEDCL, Rlnfra and Tata Power Consumers in the order dated 9th September, 2011 (Case No. 43 of 2010). Such CSS would be applicable to consumers who are receiving supply from Tata Power –D through Rlnfra- wires (“Changeover Consumers”). Similarly the Hon'ble Commission in this Order dated 29th July 2011 (Case 72 of 2010) has ruled that Regulatory Assets of Rlnfra- D would also be recoverable from the Change over consumers. However, unlike the CSS, the computation of the quantification for the Recovery of Regulatory assets from various classes of Changeover consumers is yet to be done.

The CSS applicable to the various Changeover Consumers and net Energy Charge payable by them would be as follows

Category	Applicable Cross Subsidy Surcharge (Rs/Kwh)	Energy Charge (Rs/Kwh)	Applicable Loss (%)	Wheeling Charges of Rlnfra Applicable (Rs/Kwh)	Wheeling Charges of Tata Power -D (Rs/Kwh)	Net Wheeling Charges Payable (Rs/Kwh)	Effective Energy Charge (Rs/Kwh)
a	b	c	d	e	f	g= e-f	h=b+[(c+g)/(1-d)]
HT Consumers							
Industry	-	5.00	1.50%	0.46	0.19	0.27	5.35
Commercial	0.26	5.20	1.50%	0.46	0.19	0.27	5.81
Group Housing	-	4.10	1.50%	0.46	0.19	0.27	4.44
Temporary Supply	2.22	9.00	1.50%	0.46	0.19	0.27	11.63
LT Consumers							
Non Domestic							
<i>Upto 20 kW</i>	-	4.25	9.00%	0.88	0.38	0.50	5.22
<i>>20 kW and <50 kW</i>	0.84	4.80	9.00%	0.88	0.38	0.50	6.66
<i>Above 50 kW</i>	1.90	5.05	9.00%	0.88	0.38	0.50	8.00
Industrial							
<i>Below 20 kW Load</i>	-	4.50	9.00%	0.88	0.38	0.50	5.49
<i>Above 20 kW Load</i>	-	5.10	9.00%	0.88	0.38	0.50	6.15
Residential Single Phase							
0-100 Units	-	1.05	9.00%	0.88	0.38	0.50	1.70
101 Units - 300 Units	-	2.50	9.00%	0.88	0.38	0.50	3.30
301 - 500 Units	-	4.40	9.00%	0.88	0.38	0.50	5.38
Above 500 Units	0.03	5.30	9.00%	0.88	0.38	0.50	6.40
Residential Three Phase							
0-100 Units	-	1.05	9.00%	0.88	0.38	0.50	1.70
101 Units - 300 Units	-	2.50	9.00%	0.88	0.38	0.50	3.30
301 - 500 Units	-	4.40	9.00%	0.88	0.38	0.50	5.38
Above 500 Units	0.03	5.30	9.00%	0.88	0.38	0.50	6.40
Advertisements	8.35	13.55	9.00%	0.88	0.38	0.50	23.79
Street Lighting	-	4.00	9.00%	0.88	0.38	0.50	4.95
Temporary Religious	-	2.00	9.00%	0.88	0.38	0.50	2.75
Temporary Others	5.51	11.00	9.00%	0.88	0.38	0.50	18.15
Crematorium and Burial Grounds	-	2.00	9.00%	0.88	0.38	0.50	2.75