**Electricity Tariffs**

**Definition: The amount of money frame by the supplier for the supply of electrical energy to various types of consumers in known as an electricity tariff. In other words, the tariff is the methods of charging a consumer for consuming electric power. The tariff covers the total cost of producing and supplying electric energy plus a reasonable cost.**

**The actual tariffs that the customer pay depends on the consumption of the electricity. The consumer bill varies according to their requirements. The industrial consumers pay more tariffs because they use more power for long times than the domestic consumers. The electricity tariffs depends on the following factors**

* **Type of load**
* **Time at which load is required.**
* **The power factor of the load.**
* **The amount of energy used.**

**The total bill of the consumer has three parts, namely, fixed charge D, semi-fixed charge Ax and running charge By.**

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**where, C – total charge for a period (say one month)
x – maximum demand during the period (kW or kVA)
y – Total energy consumed during te period (kW or kVA)
A – cost per kW or kVa of maximum demand.
B – cost per kWh of energy consumed.
D – fixed charge during each billing period.**

**This is known as three-part electricity tariff, and it is mainly applied to the big consumer.**

**Factors Affecting the Electricity Tariffs**

**The following factors are taken into accounts to decide the electricity tariff:**

* **Types of Load – The load is mainly classified into three types, i.e., domestic, commercial, or industrial. The industrial consumers use more energy for a longer time than domestic consumers, and hence the tariff for the industrial consumers is more than the domestic consumers. The tariff of the electric energy varies according to their requirement.**
* **Maximum demand – The cost of the electrical energy supplied by a generating station depends on the installed capacity of the plant and kWh generated. Increased in maximum capacity increased the installed capacity of the generating station.**
* **The time at which load is required – The time at which the maximum load required is also essential for the electricity tariff. If the maximum demand coincides with the maximum demand of the consumer, then the additional plant is required. And if the maximum demand of the consumers occurs during off-peak hours, the load factor is improved, and no extra plant capacity is needed. Thus, the overall cost per kWh generated is reduced.**
* **The power factor of the load – The [power factor](https://circuitglobe.com/power-factor.html) plays a major role in the plant economics. The low power factor increases the load current which increases the losses in the system. Thus, the regulation becomes poor. For improving the power factor, the power factor correction equipment is installed at the generating station. Thus, the cost of the generation increases.**
* **The amount of energy used – The cost of electrical energy is reduced by using large amounts of energy for longer periods.**

**Types of Electricity Tariff**

**Some of the most important types of tariff are as follows;**

1. **Flat Demand Rate tariff**
2. **Straight-line Meter rate tariff**
3. **Block meter Rate tariff**
4. **Two-part tariff**
5. **Power factor tariff**
6. **Seasonal rate tariff**
7. **Peak load tariff**
8. **Three-part tariff**

**The different types of tariffs are explained below in details**

**1. Flat demand rate tariff – The flat demand rate tariff is expressed by the equation C = Ax. In this type of tariff, the bill of the power consumption depends only on the maximum demand of the load. The generation of the bill is independent of the normal energy consumption. This type of tariff is used on the street light, sign lighting, irrigation, etc., where the working hours of the equipment are unknown. The metering system is not used for calculating such type of tariffs.**

**2. Straight-line meter rate tariff – This type of tariff is given by the equation C = By. The generation of the bills depends on the energy consumption of the load. Thus, different types of bills are generated by the consumers.**

**The charges for different types of consumption depends on the load and diversity factors of the load. For example, the tariff for small devices is less as compared to the power loads. Hence different meters are used for measuring the power consumption**

**3. Block meter rate tariff – In this type of tariff, the energy consumption is distinguished into blocks. The per unit tariff of the individual block is fixed. The price of the block is arranged in the decreasing order. The first block has the highest cost, and it goes on decreasing accordingly.**

**The price and the energy consumption are divided into three blocks. The first few units of energy at a certain rate, the next at a slightly lower rate and the remaining unit at a very lower rate.**

**4. Two-part tariff – In such type of tariff, the total bill is divided into two parts. The first one is the fixed charge and the second is the running charge. The fixed charge is because of the maximum demand and the second charge depends on the energy consumption by the load.**

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**The factor A and B may be constant and vary according to some sliding.**

**5. Power factor tariff – The tariff, which depends on the power factor of the load is known as the power factor tariff. The power factor tariff is mainly classified into two types.**

**a. kVA maximum demand tariff – This is also a two-part tariff.**

**The low power factor increases the KVA rating of the load.**

**b. kWh and kVarh tariff – The bill is calculated by the sum of the kVarh and Kwh rating of the load**

**The kVarh is inversely proportional to the power factor of the load.**

**c. Sliding Scale or Average power factor tariff – In Average power factor tariff, the particular value of the power factor is taken as reference. If the power factor at the consumer end is low, then the consumer has to pay the additional charges. Similarly, if the power factor of the load is above from the reference value, then the discount will be given to the consumer.**

**6. Seasonal rate tariff – Such type of tariff measures the high price in kWh used by the consumer in one complete year. It is also known as the on peak season tariff. If the low consumption occurs in the year, then it called the off-peak season tariffs.**

**7. Peak-load tariff – Such type of tariff is similar to peak load tariffs. The only difference is that the seasonal tariff measures the peak hour of the year and the peak tariff calculates it for the day.  If the power consumption is high, then it is known as the on-peak tariff, and for low power consumption, it is called off-peak load tariffs.**

**The peak load and seasonal tariffs both are used for reducing the idle or standby capacity of the load.**

**8. Three-part tariff – The three-part tariff is in the form of,and it is applied to the big consumer.**

**Tips To Save Energy On Pumping Systems**

1. *Select the most efficient pump type for the application*

A Finnish research study shows that the average pump efficiency is below 40 percent and that 10 percent of pumps are 10 percent efficient or less. Oversizing often comes in the design phase, since the practice for adding multiple safety factors is quite common.  This means that both pressure and flow parameters for the pump design may be 25 percent more than the actual system operation. The specifying engineer may need to work closely with the pump manufacturer or distributor to optimally select the pump, in addition to its size, speed, power requirements, and type of drive, as well as the mechanical seal and ancillary equipment.

1. *Right-size the pump*

Right-sizing the pump represents a significant economic opportunity to reduce energy consumption. This is important because centrifugal pumps can consume up to 60 percent of motor energy in a facility, and also have the highest process equipment maintenance cost. When engineers add too much of a safety factor during the design phase, the pump can be oversized, resulting in higher energy and maintenance costs.

1. *Trim the impeller*

The impeller should not be trimmed any smaller than the minimum diameter shown on the manufacturer’s pump curve. This is typically about 75 percent of a pump’s maximum impeller diameter. Pump curves and affinity rules (which are valid for a maximum of approximately 5 percent change in diameter) can both provide information on impeller trim changes and the affected performance. In practice, impeller trimming is typically used to avoid throttling losses associated with control valves.

1. *Minimize system pressure drop*

A key way to reduce pressure drop is through pipe-sizing optimization. Hydraulic friction loss creates a reduction in pressure from one end of a straight pipe to another. Factors such as the flow rate, pipe size (diameter), overall pipe length, pipe characteristics (surface roughness, material, etc.), and properties of the fluid being pumped all influence the system pressure drop.

1. *Implement proper control valves*

Control valves are typically used to control flow and/or pressure. They can help to reduce energy losses over non-controlled systems such as irrigation systems with a fixed-speed pump and multiple locations with different distances and elevations. The main functions of control valves are throttling flow or for bypassing flow. Throttling reduces the flow but increases the pressure. You can minimize excess pressure by bypassing excess flow back to the reservoir or another location.

1. *Implement variable speed drives (VSDs)*

Drivers are used for either fixed-speed or variable-speed operation. For many applications, you can save energy by implementing variable speed drives. With a variable speed drive, the rotational speed of the pump is adjusted to achieve the desired head and flow necessary for the process application. A VSD can often be added to an existing pump motor system to slow the pump down to meet the actual requirements verses the theoretical requirements that were calculated at the start of the project.  Once installed, the VSD can accommodate changing system demands, including many potential future expansion plans. This method often results in the highest energy efficiency with lowest life cycle costs.

1. *Maintain pumping systems effectively*

Effective pump maintenance allows facilities to keep their pumps operating efficiently. Regular maintenance may reveal deteriorations in efficiency and capacity, which can occur long before a pump fails. Wear ring and rotor erosion, for example, can be costly problems that reduce efficiency by 10 percent or more. Most maintenance activities can be classified as either preventive or predictive. Preventive maintenance addresses routine system needs such as lubrication, periodic adjustments, and removal of contaminants. Predictive maintenance focuses on tests and inspections that detect deteriorating conditions. Sometimes called “condition assessment” or “condition monitoring,” it has become easier to conduct with modern testing methods and equipment. This can help minimize unplanned equipment outages, which can be very costly.

1. *Use higher efficiency/proper pump seals*

Sealing systems impact efficiency, and mechanical friction losses are only the beginning. Leaks from static and dynamic seals waste fluid and can contaminate the environment. Leaks between the pump suction to the pump discharge reduce pump volumetric efficiency. Dynamic seals consume energy from the mechanical friction between the static and moving parts. Potential sealing system savings can exceed the energy savings obtained from switching to variable frequency drives, trimming impellers, or re-sizing pumps in many applications.

1. *Use multiple pumps*

When multiple pumps operate as part of a parallel pumping system, there are opportunities for significant energy savings. A multiple pump parallel system works best when each pump is run individually, not concurrently, most or all of the time.  Running multiple pumps simultaneously is appropriate as dictated by the flow requirements specific to the application and duty cycle.

1. *Eliminate unnecessary uses*

One of the most simple, but often overlooked, measures to save energy is to eliminate unnecessary use. Pumping system efficiency measures include shutting down unnecessary pumps and using pressure switches to control the number of pumps in service when flow-rate requirements vary. Each pump system is different and there are many opportunities to save energy. Don’t forget to look for the obvious