

As we all know solar energy is not a source of firm continuous power made available on demand, unlike a Diesel generator or a hydropower plant. Solar power is only available during the day time and that too varying from low in the morning to high at noon and again low towards the afternoon hours. It is further distorted due to very much unpredictable cloud cover. In addition to these diurnal variations it is also affected by seasonal variations such as the two monsoons.

Most of the power demand in the home occurs in the evening hours, which is now referred to as the 'TV drama belt'. If we are to totally depend on solar power excess has to be stored in some form to be used when needed. To overcome this mismatch the widely used method of storage is the well known rechargeable battery. The cheapest form of rechargeable battery is the lead acid cells. But this has many drawbacks such as, power loss during the charging and discharging cycle, short life time and the need of regular battery care. Other option of Nickel cadmium deep discharge battery is somewhat expensive. Therefore to overcome this nagging demand-generation mismatch, several developed nations have initiated the 'Net Metering' system. One should remember that those being industrialized countries; they have a day time peak which is in harmony with solar power.

Under the net metering system, the utility (power distributor) undertakes to receive your excess power during day time and allow you to draw power from the national grid during other times when your demand is in excess of the generation. You are billed only for the difference. At this stage I do not wish to burden the reader with the mechanism of how the utility balances this out. Such systems are also referred to as 'Grid Tied Solar PV' systems. Almost all the domestic solar power systems installed in this country are of this type, and accordingly I will limit my analysis to such systems only.

Sri Lanka monthly electricity bill is computed by adding the fuel surcharge to the meter charge. The meter charge is based on the principle of increasing block rates for higher consumers (Rs 3 per unit for those consuming less than 30 units per month and increasing to Rs 42 per unit for those consuming over 180 units per month). This is done for two reasons; firstly to discourage excessive consumption and next to charge higher rates from those who could afford to pay as a measure of ensuring social equity. The surplus thus collected from high-end users is used to cross subsidize the lower end users. On the other hand the average delivered cost of electricity to your home costs the utility only Rs 23 per unit. Our

electricity tariff made up of unit charge, fuel surcharge and fixed charge is shown in the graph below.

What is the cost of solar energy?

One way of computing the cost of energy is to divide the capital investment of solar cells by the total number of units of energy generated during the system life time. The current price of a solar PV system is around Rs 400,000 for one peak kilo Watt. Such a unit can produce 120 units (kWhrs) of electricity per month in Sri Lanka. However this generation ability is known to reduce at the rate of 1% per year as the system ages. If the life of the Solar system is assumed as 25 years it

Assuming 10% annual interest, one will receive Rs 3333 as interest per month. By dividing this to 120 units generated each unit can be valued at Rs 28. For this calculation I have ignored both the 400,000 left in the bank as well as the residual value of the solar PV systems. Therefore effect of any errors will cancel each other.

From the foregoing computation it will be clear up to 120 units of consumption of solar energy is not financially attractive as one has the option of buying those 120 units from the national grid for Rs 2800, whereas the foregone interest is Rs 3333. Therefore one needs to be

Selection of Solar Panels for Your Home

will produce 32000 units during its life time. But one must be mindful that the future benefits have to be discounted to bring it to present time. For such purposes a discounting factor of 10% is used. Another adjustment is needed as the future price of electricity is expected to increase due to inflation. We can assume a price escalation of 5% per annum. Under these assumptions the solar panel generated electricity unit will cost Rs 22. It should also be kept in mind that the current net metering contracts are valid for a 10 year period only. There is no guarantee that the system will be continued after the lapse of 10 years for reasons I will be explaining later in this article. Based on 10 years life the cost of solar energy is Rs 36 per unit.

There is a much simpler way of computing the financial viability of solar energy. That is by comparing the opportunity cost of the initial investment with possible savings in the electricity bill. Instead of investing the Rs 400,000 on a solar panel system that can produce 120 units of electricity per month, one can decide to place it in a fixed deposit.

careful in not reducing the meter reading below 120 units with solar energy.

Beyond 120 unit consumption the scenario keep changing rapidly as the additional units will cost Rs 42 per unit. When it exceeds the 180 units additional unit will cost Rs 58.80. If you are a consumer of 240 units per month you should only invest on a 1 kWp panel system that can generate 120 units per month. Similarly those who are consuming 300 units may invest on 1.5 kWp system costing him around Rs 600,000. Such a system will reduce your electricity bill from Rs 12500 to Rs 2800 resulting in a saving of Rs 9700, whereas you will receive only Rs 5000 as fixed deposit interest.

Above computations clearly demonstrate the financial benefits that can be achieved through domestic solar PV systems for heavy users whose consumption exceeds 240 units per month.

I promised to tell you why I doubt the net metering system will last beyond 10 years. Although it is extremely attractive to the heavy consumers, it hurts the country's economy. Cost of generation

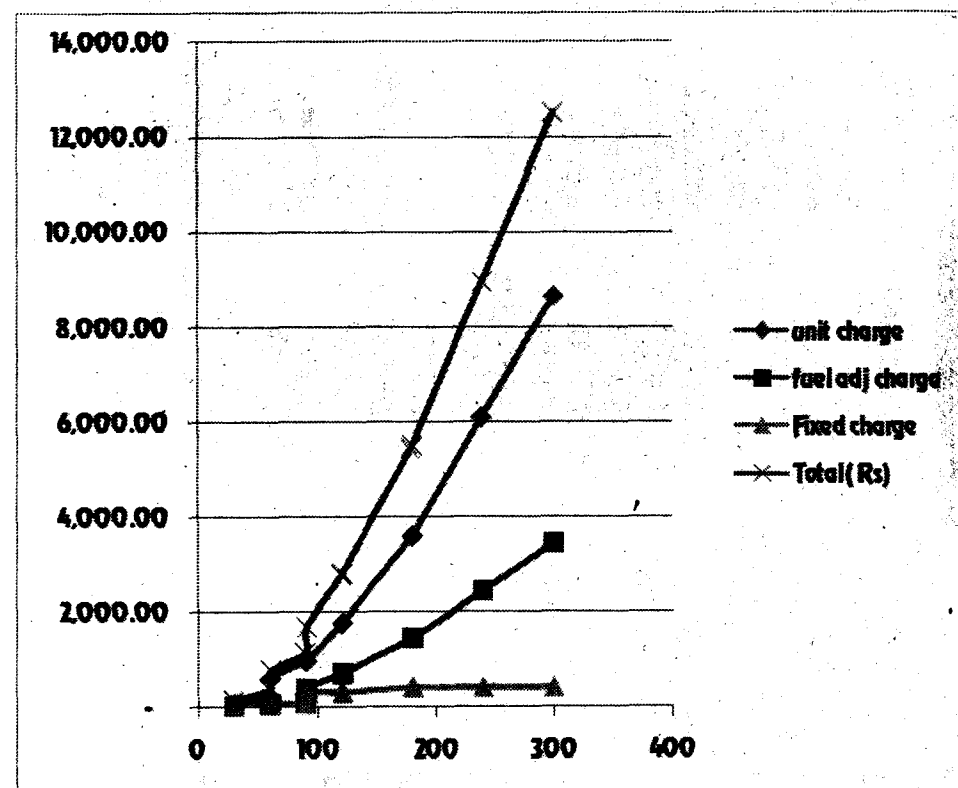


Figure 1 Electricity bill vs. units consumed

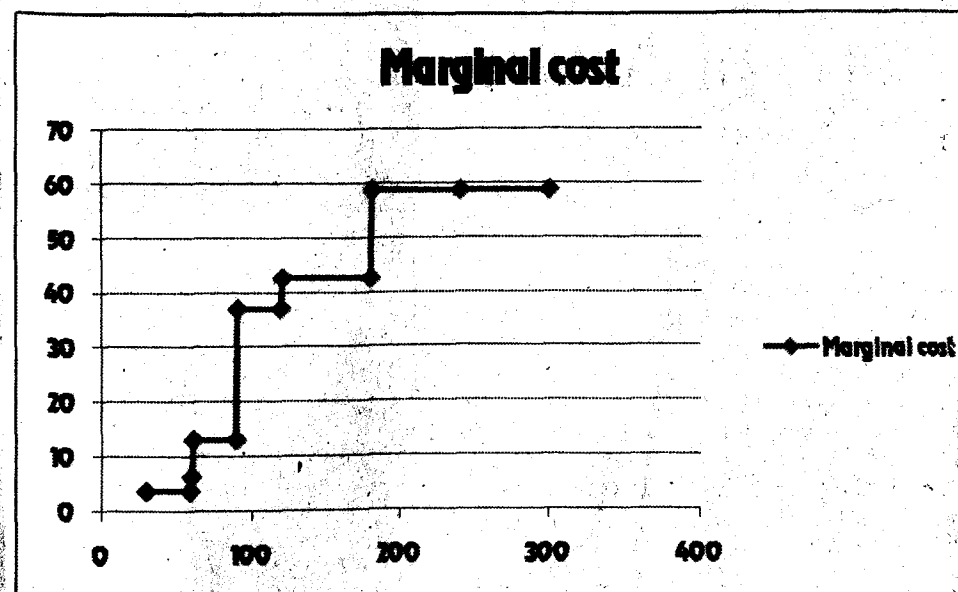


Figure 2 Marginal cost vs. units consumed

and distribution of electricity is about Rs 23 as at today. This is expected to come down with the commissioning of new coal power plants. As shown here solar energy will cost Rs 30 per unit at today's prices. Some argue that it will come down in the future. My answer is that we shall wait until that day dawns to promote solar energy for the benefit of the nation. Second problem is, solar energy is available only during day time, which is also the non peak time in Sri Lanka unlike other industrialized nations. Therefore the CEB needs to install generation plants to match the night peak which is not reduced by the use of solar. Thus the CEB will have to

invest on many idling plants which are capital intensive. Third reason is the present tariff is based on the principle of cross subsidizing the bottom end lower consumers with the surplus extracted from the heavy users. If the heavy users move the higher units to solar and consume only the first 120 from the grid, CEB will not have funds to subsidize the bottom of the pyramid. Fourth reason is associated with the upfront nature of heavy investment in solar systems, which will hurt our economy as we are rather short of foreign exchange, compelling us to borrow further.

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