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SUSTAINABLE NET METERING MODEL FOR DIVERSIFIED INDIA

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Abstract

With the increase in deployment of solar PV in India, a feasible net metering policy is need of the hour. In this paper, an analysis of data has been carried out for studying the feasibility of net metering in India. It is found that simple net metering policy is unable to accommodate various categories of consumers. A new model is proposed for making net metering more scalable, feasible and financially viable in India. The simulation results of model indicate that the proposed model is able to serve varied consumers leading to a sustainable net metering model which is economically acceptable.

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Keywords: Net Metering, India, Solar tariff, Net Metering Models, Net present value (NPV)

1. Introduction

Net metering is a policy initiative in which consumers are compensated for the amount of green energy which is fed back to the grid, to encourage the usage of renewable energy sources. This mechanism offsets the units consumed by the consumer from the grid and hence, a reduced electricity bill is achieved with the use of green energy. In the present policy of net metering, a single meter with a solar generating capacity is acceptable with a fixed limit on size of solar panels based on annual consumption units. For consumers with lesser requirement of energy, the individual net metering option is not financially viable. There are cases where a consumer owns multiple meters or meters at different sites, which is not accounted in simple net metering policy. The advent of smart grid has led to a dire need of change in energy policies for realization of benefits of smart grid to its full potential [1]. Smart meters would augment the net metering policy and play a big role in making net metering successful in India. In this paper, a new model is proposed for net metering through analysis and simulation of data collected from three different types of consumers. The paper aims to propose a modification for net metering policy in India taking in account, the needs and requirements of majority of population, so that the green energy is in reach of the masses.

In many developed countries the presence of feed in tariff policies has made green energy a reality. In Australia, the net metering policies are being revised again [2], where as in USA different states have different policies based on constraints of capacity, size, location etc. [3]. Several micro grids are present in India with different renewable energy

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sources. Net metering in India is in its nascent stage wherein very few cities like Delhi, Bengaluru [4], CESC of Kolkata [5] etc. has drafted their initial net metering policy.

2. Data Analysis

2.1. Data

The data is collected from Kharagpur from three different sectors of consumer categorized with respect to their lifestyle. A semi-structured interview based on questionnaire was conducted for 35 respondents. From them, 30 samples were selected, 10 being in each category for the purpose of simulation and analysis. The three categories in which consumers are divided will be referred to as A, B and C, with category A representing the lower class in terms of lifestyle and C being the highest among the three types. The data for category A was collected from a village, for category B from a suburban area and for category C from a township. The total members in the family for category A was in the range of 4-10, for category B it was 2-16 and category C it was 2-6. Apart from this, the number of members staying at home throughout the day was in the range of 1-6 for category A, 0-4 for category B and 0-2 for category C with an exception of 8 members in one case which included two maids. The electricity utility company for all the consumers was WBSEDCL (West Bengal State Electricity Distribution Company Limited). In case of education, it was found that the level of education for the highest educated person in the family varied from illiteracy to high school for category A, primary education to under graduation for category B and high school to post graduation for category C. Based on this, the respondents in category C were questioned regarding climate change, awareness about solar panel technology and their readiness for adapting the same. It was found that most of them were not concerned about climate change and its impact. Except one, all of them showed their readiness for installation of solar panel. The most important issue was capital followed by lack of awareness about technology and finding a suitable and trustworthy contractor.

Table 1. Factors for Simulation

Factors	Values	Factors	Values
Total load supported	80%	**Total losses**	14.08%
O&M Costs	Rs. 2400 per year	Soiling	2%
Inverter Efficiency	96%	Shading	3%
Module Efficiency	15%	Mismatch	2%
DC to AC ratio	1.1	Wiring	2%
Tilt	30 degree	Connections	0.5%
Loan	70% of total capital	Light induced degradation	1.5%
Subsidy	30% of total capital	Nameplate	1%
Loan term	10 years	Availability	3%
Loan interest	5% annually	**Year-end sale rate for net metering**	Rs. 7.2
Inflation	8.35% annually	**Fixed monthly charges**	Rs.10
Period of Analysis	25 years	**Monthly Minimum Charges**	Rs. 28
Degradation	0.5% per year	**Load growth rate**	1.2% per year
Electricity cost escalation rate	9.38% per year		

2.2. Analysis

The simulations were carried out both for technical as well as financial feasibility of the project. The values considered for calculation are given in table 1. The software used for analysis is System Advisor Model from National Renewable Energy Laboratory [6]. The size of the solar panel is calculated using the formula

$$\text{Size of the system} = (\text{Annual consumption units})/(\text{CUF}*24*365) \quad (1)$$

The Capacity Utilization Factor is calculated from a solar power plant installed at IIT Kharagpur. The capacity of the plant is 100 kW. The data related to power generated and solar irradiance was collected for an interval of 15mins,