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Using Small Hydro Rural Electrification through Renewable Energy

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ABSTRACT

The energy supply to remote areas is one of the most challenging tasks facing the developing countries like India. Since the urban areas are able with wealth resources of renewable energy like Small hydro and therefore, assembly the energy need of such unreachable inaccessible regions through the available renewable energy tries to cover the implication of urban electrification using renewable energy. Electrification of inaccessible regions in the state of Haryana, power potential available, initiatives being taken up by the State Govt. to supply electricity to inaccessible regions, stratagems required to plan electrification renewable energy resources offered, predictable results likely to be completed and commendations for speedy development of energy production & utilization in urban inaccessible regions of the national resources is one of the fore seeable options of instant consideration. The current paper contracts with the preparation of inaccessible region for seminar the energy needs by optimum operation of renewable energy resources in the State of Haryana.

Keyword: ***Small hydro power, Renewable energy, Optimization***

1. INTRODUCTION

The energy is important, without which the humanities can neither function socially nor commercially. Urban growth programmes generally goal at a development in organization, particularly, to stimulate local industrialization, agricultural production & common services such as health & education. Providing electricity, in combination with other essential conditions, can help to raise their living standard through satisfying their basic needs such as lighting, improved energy supplies related to water supply, health care & education etc. Renewable energy is energy generated from natural resources-such as sunlight, wind, rain, tides and geothermal heat—which are renewable (naturally replenished). Renewable energy technologies range from solar power, wind power, hydroelectricity/micro hydro, biomass and biofuels for transportation. Renewable energy is energy that is generated from natural processes that are continuously replenished. This includes sunlight, geothermal heat, wind, tides, water, and various forms of biomass. This energy cannot be exhausted and is constantly renewed.

India is able with vast renewable base of the order of 1, 00,000 MW, out of which only 3.5% of the total potential has been bound so far. Department of Non-conventional Energy Sources, Government of India, has fixed a target of connecting at least 10% of the total potential during 11th and 12th plan period. As per current, estimates, there are about 18,000 un-electrified villages in the country, which have no access to grid electricity. The energizing such areas are a challenge to be faced by the country. The present paper deals with situation of electricity supply to urban people in the country, status & problems of urban electrification in the country, case study of Haryana state which will covers the power potential available in the state, state govt. policies for private participation in setting up of self-governing power plants/captive power plants, strategies required to be adopted for power generation from renewable energy sources viz. solar, biomass, wind & small hydropower.

1.1 Energy for Development

The popular of the primarily living in urban regions, lack a number of services, as a effect of scarcity & inadequate access to energy, state that electricity is basically necessary to encourage human progress in rising countries and therefore, accessibility of electricity is a must for the upliftment & overall development of remote urban regions having no grid supply. The urban electrification is seen as a remedy to a number of difficulties such as deforestation for fuel wood, poverty & migration to urban areas. The urban electrification has been

differently analyzed in different countries & hence the different objectives were considered

- Provision to agricultural, industrial & commercial development including irrigation.
- Reduce irrigation from rural areas to urban areas
- Substitution of more costly energy sources
- Improvement of quality of life & time savings by the use of domestic electrical equipment
- Enhance security, political stability
- Improvement of living standards of rural poor
- Alleviation of urban/rural disparities

1.2 Rural Electrification in India

Approximately 80% of the India's population lives in 5.79 lack villages. Most states have electrified their villages except some of the northern states where about 1/4th villages are only electrified by grid supply. Usually, a town in India is stated as electrified even if single construction is provided. For this purpose, it is essential to set up at least an 11/22/33 kV line & one-transformer & transmission & distribution lines. This provides the representation of high capital investment convoluted by the services for providing a single connection.

1.3. Rural Electrification through Renewable Energy Sources

In interpretation of the endless problems discussed, above, the best utilization of Small Hydro Resources of the country performs to be the only solution. India is able with vast potential of Small Hydro Resource base and generation of electricity is the main sector, which is getting the attention of the organizer & technologists of the country, where the power may be directly supplied to meet the local loads and in case of convenience of excess power, the same may be added to the grid such that during peak demand, the power can be found from the local/regional/national grid. This will be helpful in sustaining the power quality at the tail end consumers.

2. RENEWABLE ENERGY RESOURCES BASED RURAL ELECTRIFICATION IN THE STATE OF HARYANA

2.1. About the Haryana State

The small state of Haryana was founded in 1966 when the former state of Punjab was divided into Haryana and the modern Punjab. It is both the oldest and most modern of places. Delhi, Punjab, Rajasthan, Himachal Pradesh and Uttar Pradesh surround the state. The state was a major contributor to the "Harit Kranti", the green revolution and is a good blend of traditional and modern cultures. Located in the Northern part of India, Haryana is bound by Uttar Pradesh in the east, Punjab in the west, Himachal Pradesh in the north and Rajasthan in the South. The national capital territory of Delhi is next to Haryana. Haryana is situated between the latitude 30.30. North and longitude 74.60. East. Most of Haryana is in the plains with the Aravali mountain range starting its westward journey from here. The Yamuna is the only major river that passes through this small state, which is one of the greenest in the country. There is a very good network of canals throughout the state, giving it the much-needed impetus for agriculture, the mainstay of Haryana's economy. By Manu, the lawgiver in Indian mythology designated Haryana as Brahmavart from where the Brahmanical religion and social system grew up and spread outwards to the rest of the country. In a sense, therefore, one can say that much of the Hindu religion and society was formed on the flat, dry plains of the present-day Haryana. In the epic of the Mahabharata, it was at Kurukshetra, during a battle between that Kaurava and Pandava princes that Lord Krishna delivered one of his most important messages through the celestial sermon-the Geeta. With Delhi as the prize awaiting generations of invaders, Haryana served as a sort of a geographical corridor. Over the centuries, waves of invaders poured across the plains of Haryana, sometimes fighting battles there. At the end of the 14th century, Timur led an army through the state towards Delhi. In 1526, the invading Mughals defeated the armies of the ruling Lodi dynasty at the Battle of Panipat and 30 years later, in 1556, the Mughals won yet another decisive battle there. By the mid-18th century, the Marathas were in control of Haryana, an era that was brought to an end after the Afghans under Ahmed Shah Abdali defeated the Maratha forces in the third battle of Panipat in 1761.

2.2. Power Scenario in Haryana

The Haryana Power Generation Corporation Limited (HPGCL) has commissioned its first 10 MW solar project at Panipat Thermal Power Station. The solar plant, on its first day, generated nearly 10,000 units. In the current scenario where India is facing acute power shortage and setting up Greenfield plants involves

large investment and long gestation period, maintenance, renovation and modernization of the existing power plants is considered the best option. Due to a technical glitch, the 300 mw capacity unit 2 at Yamuna Nagar thermal power station has come under forced shutdown since the past seven days .Opposting a tariff hike for electricity supplied from Adani Power's 4,620 mw station at Mudra, the Haryana State electricity distribution utilities have moved the Appellate Tribunal For Electricity. Sources in Haryana Power Generation Corporation said that the Corporation has approached the tribunal saying it does not agree with the compensation tariff.

2.3. Haryana Power Sector an Overview

Haryana became the first fully electrified State in November 1970. Generation capacity increased to 4072.30 MW in 2007 from 343 MW in 1967. Sub-Stations have increased to 560 in 2007 from 47 in 1967. Transmission and Distribution lines have increased to about 195000 KMs in 2007 from about 1800 KMs in 1967. Connected load has increased to 11693 MW in 2007 from 372 MW in the year 1967. Number of consumers increased to more than 41 lac in 2007 from about 3 lac in 1967. State has the maximum density of Agriculture tubewells in the country i.e. 10 tubewells per square Km area and has 475000 tubewells in 2007 compared to 20190 in 1967. About 50% of available power is provided to rural sector against national average of 26%. Average daily availability of power has increased to 665 LUs per day in 2007 from about 18 LUs per day in 1967. Per capita consumption of electricity has increased to 660 Units in 2007 from 57 Units in 1967.

2.4 Performance Improvement and Operational Efficiency-Generation

Parameters	2000-01	2006-07
Installed Capacity (MW)	863.30	1587.40
Generation (MUs)	3792	10780
Plant Load Factor(%)	49.73	78.78
Auxiliary Consumption (%)	11.80	9.80
Coal Consumption (gms/kwh)	816	721
Oil Consumption (ml/kwh)	5.97	1.85

Table.1 Capacities of parameters of different years (Source CEA)

3 STRATEGIES FOR UTILISING RENEWABLE ENERGY IN THE STATE

Given the current scenario, it is evident that concerted efforts are required to strengthen the sector in the state. The following thrust areas have been identified:

- Reforms and restructuring of the power sector
- Improvement in the PLF of the existing power plants by carrying out extensive and comprehensive renovation and modernization of the units.
- Strengthening of the transmission and distribution system
- Extending coverage of rural electrification as more than 80% villages are yet to be electrified.
- Improving the hydrothermal ratio by perusing quick implementation of sanctioned electricity scheme and taking up short gestation small and mini hydel plant.
- Harnessing of renewable energy sources.
- Commencing work on the sanctioned power generating projects to meet the growing in the future.

In view of the above energy scenario of the state, the concept of SHP can be considered appropriate for providing electricity to the selected area.

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3.1. Small Hydro-Power Plants -A Review

Paish [1] emphasized that Small hydropower (SHP) has emerged as an energy source which is accepted as renewable, easily developed, inexpensive and harmless to the environment. These features have increased small hydropower development in value giving rise to a new trend in renewable energy generation.

Schwartz et al. [2] addressed the issue of small hydro as green power and discussed the fundamental differences between small and large-scale hydro, and investigated small hydro implementation from the stand point of its development philosophy, operational principles, construction features, the small hydro resource, and equipment maintenance and scheduling.

Reddy et al. [3] highlighted that the low capacity hydropower project is considered as a non-conventional and renewable energy source. Quantitatively a small volume of water (such as hills canals, falls etc.) with small heads can be tapped easily for generating electricity using micro water turbine and generator. The low capacity hydro projects are categorized as:

(i) Small hydro project (2-25 MW)
(ii) Mini hydro project (100 KW – 2 MW)
(iii) Micro hydro project (5-100 kW) and
(iv) Pico project up to 5 kW.

Adhau Sarala [5] highlighted that energy production has become highly expensive worldwide and its shortage has led to intensified research studies for developing alternate sources of energy. Mini/Micro/Small Hydro-power are some of the alternative sources whose proper utilization can improve the overall energy picture of the world. The increase in oil prices and subsequent worldwide energy crisis in 1973 prompted many countries to search and develop renewable sources of energy. Since each year costs increase and the supply of fossil fuels is diminishing. The installation and development of non-conventional energy sources have taken priority. Much of the small hydro potential is in the hilly and remote, inaccessible areas of India, where generation from other sources or transmission of power over long distance would not be feasible. The development of this local potential meets a long felt need.

Akella [6] discussed how conventional energy sources based on oil, coal, and natural gas have proven to be highly effective drivers of economic progress, but at the same time have damaged the environment and human health. The social, economical and environmental effects of renewable energy system have also been discussed. The uses of renewable energy system instead of conventional energy system to control the social, economical and environmental problems have been further identified. The results show that the trends of total emission reduction in different years are exponentially increasing after the installation of renewable energy system in remote areas.

Stepanescu et al. [7] studied the possibilities of implementing small hydro power plants in a valley from Romania using hydrographical data. These power plants are combined to form a virtual power plant. The implementation of the VPP, using the water sources, has an advantage on the reduction of major investments for the grid and maintains the environment clean.

Roque et al. [10] described technical solutions to be used in micro-hydro power plants and proposes suitable equipment for a particular solution, based on average values of water fall and water flow. An economic analysis of the considered power plant is also presented.

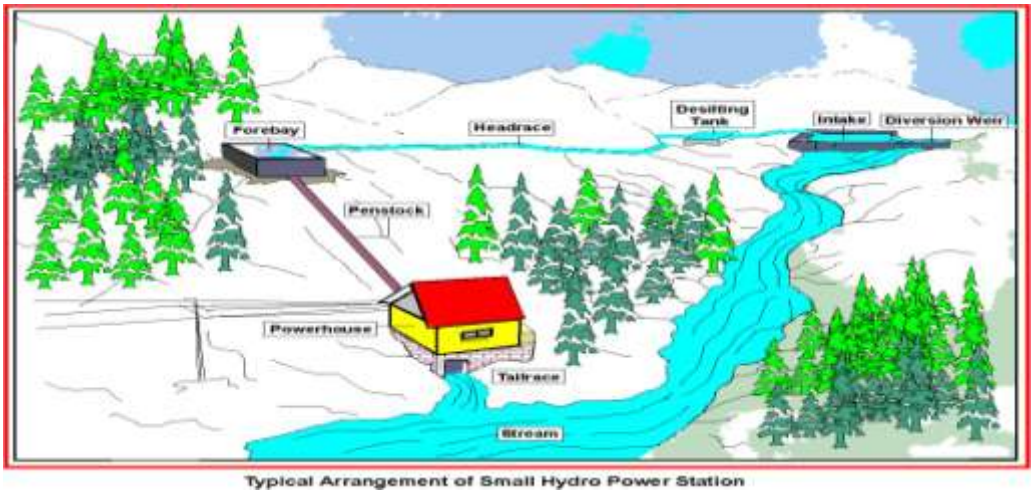

Fig.1. Diversion Hydroelectric [10]

Adhau [9] highlighted that Micro hydropower plants are emerging as a major renewable energy resource today as they do not encounter the problems of population displacement and environmental problems associated with the large hydro power plants. In this paper the work is carried out for evaluating Micro hydro power plants (MHPP) generation availability that can be applied to generation systems reliability and to generation planning studies.

4. CONCLUSION

In this paper the development of power supply to urban population in the nation, prestige & difficulties of rural electrification in the nation has been discussed. A case study of Haryana state which will covers the power potential available in the state, state govt. policies for private participation in setting up of self-governing power plants/captive power plant is presented. Schemes required to be accepted for power generation from small hydropower in the state have been calculated.

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