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Ultra Small Water Power Generation with Help of Canal

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***Abstract*: Renewable energy (RE) is non-polluting Micro hydropower system, a run-of-river energy that comes from inexhaustible resources, micro-hydropower generating system, can generate such as wind, sunshine, and falling water. Due to electricity extremely well in ultra-low head increasing global interest on conservation of situations. Because it is so compact and easy to environment, distributed generation of power is install, it is a good match for areas of de-centralized gaining attention. They do not encounter the power generation. Common installations for its use problems of population displacement and can include; agricultural irrigation canals, waterways improve overall energy picture of the world. These with regulated water discharge, water treatment is the clean, pollution free, eco-friendly energy plants, and power plants. sources. As per present power crisis small hydro, non- source of electric power in some 30 countries, and conventional plants may be planned to work during provides about one fifth of the world's annual peak demand. Small hydro is one of the best options electrical supply. Its power stations include some of for rural electrification which can offer considerable the largest artificial structures in the world. Figure financial benefits to the individual as well as below shows classification of hydro power plant on communities served. It is an attractive alternative to the basis of different aspect is done. Here we also diesel technologies in rural and remote areas of introduce comparison of hydro power technology developing countries as a means of achieving rural with other renewable and potential of different types electrification. With the advancement of technology of hydro power plant is introduced. It is possible to harness hydroelectric power efficiently with heads as low as 2 meters. a.) Classification according to the availability of approach by which multiple micro scale hydro head: 1) Low head power plants (<10m) generating units can be planned over a catchment 2) Medium head power plants (10-50m) area consisting of several potential installation sites 3) High head power plants (>50m) so as to extract the maximum possible energy per b.) Classification according to the nature of load: unit investment cost. As a cheap, renewable source 1) Base load power plants, 2) Peak load power plants of energy with negligible environmental impacts, 3) Classification according to the quantity of water small, mini, micro & Pico hydro power technologies available: have an important role to play in future energy. 1) Run-off river plant without poundage, 2) Run-off river plant with pond age, 3) Storage type plants, 4) Pump storage plants, 5) Mini and micro-hydel plants.**

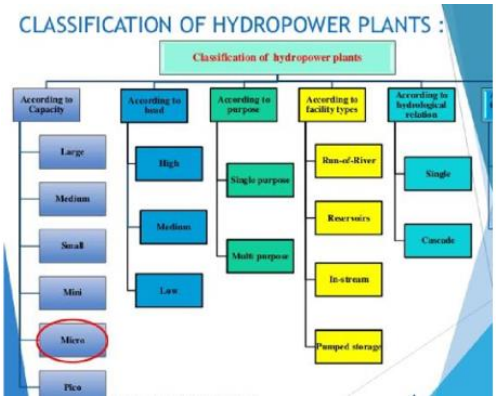
***Keywords*: Non-conventional energy, Mini-Hydro system, Small-scale hydropower, Turbine, Run-off-river, Renewable energy, Economic assessment of small hydro power.**

1. Introduction

The bulk of our energy comes from coal, oil, and 3) Small hydro plant. (1-15MW) natural gas exhaustible resources that create 4) Mini hydro plant. (>100KW) pollution when burned and contribute to global 5) Micro hydro plant. (5-100KW), 6) Pico hydro plant. (>5KW).

Classification based on the purpose:

1. Single Purpose
2. Multi-Purpose



2. Small, mini, micro, pico hydro power technology

Small hydro is the development of hydroelectric power on a scale serving a small community or industrial plant. The definition of a small hydro project varies but a generating capacity of up to 10 megawatts (MW) is generally accepted as the upper limit of what can be termed small hydro. This may be stretched up to 30 MW in the United States, and 50 MW in Canada. Small hydro works on the same principle as large hydro for electricity generation. The turbine converts the energy from falling water into rotating shaft power, which in turn gets converted into mechanical and electrical energy. In most of the cases, Small hydro is 'run of the river'; in other words, any dam

or barrage is quite small, usually just a weir and generally little or no water is stored. Power, P, is the energy converted over time or the rate of work being done. The Power, P, which can be extracted from a water flow; is: $P = \eta Q H \rho g$ Where; η is the efficiency of the system, Q is the total volumetric flow, H is the head, ρ is the water density, and g is the gravitational constant

A. Components & working of small hydro plant

"Mini-hydro" means which can apply to sites ranging from a tiny scheme to electrify a single home, to a few hundred kilowatts for selling into the National Grid. Small-scale hydropower is one of the most cost-effective and reliable energy technologies to be considered for providing clean electricity generation. The key advantages of small hydro are:

- High efficiency (70 - 90%), by far the best of all energy technologies.
- High capacity factor (typically >50%)
- High level of predictability, varying with annual rainfall patterns

Slow rate of change; the output power varies only gradually from day to day (not from minute to minute). A good correlation with demand i.e. output is maximum in winter. It is a long-lasting and robust technology; systems can readily be engineered to last for 50 years or more storage schemes hydropower plants with reservoir.

B. Specification & standard

The Ministry of New and Renewable Energy is giving financial subsidy, both in public and private sector to set up SHP projects. In order to improve quality and reliability of projects, it has been made mandatory to get the project tested for its performance by an independent agency and achieving 80% of the envisaged energy generation before the subsidy is released. In order to ensure project quality/performance, the ministry has been insisting to adhere to IEC/International standards for equipment and civil works. The subsidy available from the Ministry is linked to use of equipment manufactured to IEC or other prescribed international standards. The equipment in the project is required to confirm to the following IEC standards.

3. Small hydro power in India

A. Challenges & potential

1) Barriers / Challenges

Most of the challenges facing small hydropower exploitation are not specific to hydropower but generic for all types of renewable energy and rural electrification projects.

General barriers for renewable energy projects are the absence of clear policies on renewable energy, limited available budget to create an enabling environment for mobilizing resources and encouraging private sector investment, and the absence of long-term implementation models that ensure delivery of renewable energy to customers at affordable prices while ensuring that the industry remains sustainable.

Looking specifically at small hydropower development, the following barriers can be identified: Policy and regulatory framework: unclear or nonexistence of policies and regulations that govern the development of (small) hydropower. In some countries hydropower developments under a certain threshold are not regulated at all, while in other countries it might be part of a broader regulatory framework for rural electrification in general. Generic frameworks often lack clarity on a number of hydropower specific issues like access to water and water infra-structure and the associated payments.

Financing: hydropower developments are faced, even more than other sources of renewable energy, with high upfront costs and low O&M costs, something most available financing models do not favour. Nearly all of the new developments on the continent are relying in one form or the other on donor financing. Development of alternative financing models, including tapping into alternative funding sources, is needed to facilitate small hydro developments. Capacity to plan, build and operate hydropower plants: national and regional knowledge and awareness on the potential of small hydro in rural electrification is missing or very mini-mal. This includes knowledge at political, government and regulatory entities, as well as knowledge on local production of parts and components. Data on hydro resources: linked to the limited knowledge about the technology is the lack of proper resource data on water availability and flow on which hydro developments can be based.

2) Scopes / Potential

The total hydroelectric power potential in the country is assessed at about 150,000 MW, equivalent to 84,000 MW at 60% load factor. The potential of small hydro power projects is estimated at about 15,000 MW.

4. Performance analysis

As there is limited availability of coal and other fossil fuels, hence for total upliftment of country, growth of remote places is must with these analyses may results and suggestions of new technologies can be developed so that overall cost will reduce, efficiency will increase, and such schemes will be attractive especially for standalone and grid connected applications. Comparison with other Non-Conventional energy sources based on parameters of Site selection, Grid connection problems, operation, maintenance and control problem, economic consideration and impact on environment are also considered. Hydrological information is obtained from the meteorology or irrigation department usually run by the national government. This data gives a good overall picture of annual rain patterns and likely fluctuations in precipitation and, therefore, flow patterns. The site survey gives more detailed information of the site conditions to allow power calculation to be done and design work to begin. Flow data should be gathered over a period of at least one full year where possible, so as to ascertain the fluctuation in river flow over the various seasons.

The constraints and problems arising in development of power hydel schemes are demonstrated.

5. Conclusion

Small hydro power plants are usually up to capacity of 15MW whereas mini hydro plants are above 100KW but below 1MW either stand-alone scheme or more often feeding into the grid. Mini hydel schemes can be constructed on dam-toe, canal drops, and return canals of thermal power stations and also in the flowing small river as well as small revolute which are flowing usually nearby villages. Area required for the construction work is small as canal already exists. It requires very small gestation period and such power stations can be ready for generation within 3 years, in contrast to the large hydro schemes. Micro hydro plants ranging from a few hundred Watts for battery charging or food processing application up to 100KW usually provided power for small community or rural industry in remote area away from the grid. Micro Hydro Power Schemes are already been constructed at the deserted weir and contribution to approaching to Directive EU for renewable energy sources. But to transmit power to such remote places is very costly, which gives rise to Pico-hydro power plants that does not require construction of dams and hence considered as run-off-river.

The designed discharge is constant for canal drop project. But for runoff river project there are considerable changes in the discharge available as the river flow is seasonal. During dry season, the flow rate is so slow, that existing stand-by (diesel generator) unit would have to be used to supplement the available generation.

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