Renewable Energy – Hydel and Bio Energy

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PICO Hydel Generation Systems:

Very small water turbine systems can be deployed in places where a steady stream of water in available in rivulets. Either the available head or the discharge can be made use of to run a turbine. Depending on the terrain, head & discharge available different types of turbines can be deployed to run a generator to get electricity. These are run of the river systems, which does not need elaborate storage dams or penstocks. Water from the rivulet is run through the turbine and let off back to the turbine in the same stream. Thus there is no potential dislocation of the ecosystem or families/ villages which have to relocate. The latter is often the major factor in determining issue in the site selection of major hydro electric project. Also the dam and the associated construction work could be a major obstacle in such projects.

In the PICO hydro projects the power involved is often a few kW or tens of kW only. In many projects where there is but a small gradient in the terrain, a cross flow turbine would do the job. Water flows naturally through the turbine and the quantity of discharge determines the power plant rating. Basil Energetics has done a prototype of a 5 kW generating system and this can be replicated or appropriately scaled for any new project depending on the head & discharge available.

The key features of Basil generating system are the following:

- No speed governor is needed to take care of the change in speed of the turbine depending on the discharge/head.
- As much as 1:2 speed variation is permissible
- The output voltage and frequency is constantly controlled by the associated generator controls. Frequency can be held absolutely constant the output voltage will be within 5 %.
- This energy source could also be added along with other renewable energy sources like Wind, Solar, Biomass/Biogas, etc., through Basil's smart micro grid (iGrid)
- This can be a part of the emerging DC micro grid.
- Brushless alternators can be deployed to maximize the efficiency of the generator.
- If single phase output is sufficient self excited induction generator can also be deployed.

While the overall configuration and system design is easily worked out the following sub assemblies have to be developed depending on the size of the power plant. India has a huge potential for such run of the river systems - in Himalayan and sub Himalayan regions, North East and the Western Ghats. It is estimated that a potential of around 20000 MW is there for this kind of renewable energy and this can easily be tapped. Many places in India have rivulets streams that have running water for about six months a year. Invariably this power is available in monsoon seasons when the solar energy is lower and thus two are very complementary in nature. Water that is being let out of check dams, which are plenty in the country, can be used to energies the nearby hamlets. It is very easy to build power plants in the range of 15 ~ 25 kW without any major economical or environmental issues.

Energy from Solid Waste:

Disposal of solid waste is humongous task facing town & city planners today in India. Once the bid degradable waste is segregated from the other types, they form the basic raw material for production of biogas. Biogas plants of varying sizes are easily being built in the country now. Once the CO2 is separated from the biogas the remaining is energy rich methane which is very eco-friendly. With or without compression this can be used for heating, lighting and even running an engine. With the gas powering an engine, (certain types of engines do not require any major changes) the engine can be connected to a generator to produce electricity. Like in the wind or PICO hydel no speed governor is required. It is always recommended that the gas is used for heating and lighting and only the excess is used for electricity generation. Stand alone systems with very good quality power can be obtained from such projects. Depending on the price point, one can use self excited induction generator or a high performance synchronous alternator.

All these three renewable generating systems, along with solar power and grid power can be connected to form a DC micro grid using DC appliances. Thus an optimum solution which tackles both the supply and demand side can be made available to ensure “Sustainable Electricity Access’ to millions of people who are yet to get good quality power even after nearly 70 years of independence in the country. DC Micro Grid & DC appliances are the emerging technologies in the world now and many countries are focusing their attention in this area. Reliable and Good Quality power is often the key element in enabling the masses to be on their own. Cost is, of course, an important factor and governments can play a vital role in ensuring that such projects reach out for the benefit of the taking masses. Many national and international agencies along with major foundations are focusing their efforts towards this area and India should not lag behind in such an important area. And the entire above are done without harming the environment and at affordable costs.