

## Energy Audit in Hydropower Plants in Nepal

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A large number of hydropower projects are being constructed in Nepal which inherently focuses on the efficiency of power generation and transmission while overlooking the consumption side of the power plant. Since the plant itself generates power, energy consumed within the powerplant facilities are overlooked considering it as insignificant. Is it so?

Studies shows that about **0.2 to 2%** of annual energy is used within the power plant depending upon the size of the plant. The energy is mostly used by cooling pumps, sump pumps, for lighting, operation of cranes and gates and household usage in staff quarters. In financial term, this means a part of revenue is sacrificed to run the plant.

Although the internal consumption can be overlooked in a new plant where the equipment are new and efficiency of these equipment are fairly high, it's not the case in an ageing plant. With continuous usage, wear and tear, creep and fatigue reduces the equipment's efficiency. Similarly, availability of advance energy efficient technology could far surpass the old technologies (e.g. replacement of fluorescent lamp with LEDs).

Energy audit is defined as a systematic process to measure, record and analyze the energy uses patterns in a given system.

In a hydropower station, energy audit is done both in the generation side and the consumption side. On the generation side, the average hydraulic efficiency are estimated by measuring the flow at headwork's and water levels at intake, surge shaft/forebay, tailrace and power output from the plant. On the consumption side, the energy consumed by various components such as pumps , ventilation, lightings and motors are recorded. Keeping track of chronological data allows owner to pinpoint the location where energy generation/consumption can be improved, thus providing an opportunity for extra revenue.



An energy audit requires a skilled manpower and support from the power plant operators. Various handheld and portable equipment are used in the energy audit such as ultrasonic flow

measurement, power analyzer, data logger and heat sensor. The equipment should be well calibrated in advance to the audit to collect accurate data for analysis.

A well metered powerplant is a first step toward energy conscious plant management. In traditional plants, actual energy consumption at different plant areas such as colony, headworks and store house is difficult to quantify. So adding energy meters at respective places including the plant auxiliaries will help quantify the energy used by these equipment and provide guidance on energy conservation measures. This will also assist in measuring the actual plant consumption.

Similarly records of tripping hours, daily and monthly energy records, and flow and pressure records are essential. Regularly calibrating sensors used in the power plant will increase the quality of data generated by the sensors.

