

Utility of weather forecasts for run-of-river hydroelectric systems.

Hydropower systems generate electricity using the kinetic energy of water flowing into the turbines, which are connected to generators that generate electricity. They are broadly divided into reservoir-based (storage) or run-of-river. The diversion method used to divert the water into the turbines is the main difference between these. Storage systems have a large dam act as a barrier on a river. This creates a large lake through which the water is diverted. In contrast, run-of-river systems have a smaller barricade called weir. The weir acts as a diversion only, without creating a large pond of water. Hence, run-of-river are intermittent, with the power output depending on stream inflow.

Streamflow prediction using weather forecasts is widely used for operation of storage hydro systems. Since traditional run-of-river projects do not have additional flow control capabilities other than the weir, future inflow information seems redundant. Accordingly, there has been inadequate study in this topic. This research will explore the several water-related operating constraints that a run-of-river hydroelectric operator could experience and explore how streamflow forecasts could be used in such scenarios. Example scenarios where streamflow forecasts could add value include:

- Potential damage due to flooding during construction phase of project
- Forecasting of future energy yield for wholesale markets that rely on day ahead bidding.

The study area is in Nepal, where more than 90% of domestic electricity production is through run-of-river hydro systems.