

## ABSTRACT

In the energy sector, hydropower energy is very significant as it contributes to being a major source of renewable energy. Therefore, knowledge about hydropower energy and its existing challenges has led to an emerging need to obtain real-time data and a consistent monitoring model of the applications. This is meant to improve the performance and accuracy of the real-time data monitored by the model. In Kenya, a lack of hydrological datasets has been documented as a challenge in the Energy Act of 2018. This is primarily caused by an unprecedented reduction in the water levels in the hydropower plants, which leads to downtime and blackouts caused by little or no hydropower production. This study, therefore, sought to design, develop, and implement an Internet of Things-based model for hydropower monitoring. To achieve this objective, the study identified specific hydropower plants that are currently in operation, where data would be collected for validation, and the hardware and software to be used. In addition, the study also sought to identify an appropriate cloud storage service for storing the data set. The developed model was tested and validated with a total of 120 readings collected from the database. The selected site for data collection was Wanjii hydropower station, based in Murang'a County. The study used latency, throughput, consistency, and accuracy as metrics to evaluate the performance of the model. The T test was used to determine the significance of performance metrics. The study found that the monitoring model using LORA (long range) was feasible and practical during the testing and performed as expected during its validation. Based on the findings, the study recommends that the approach be scaled up and adopted for the entire hydropower system, including the mechanical valves. This would be more effective as its low-power and cheaper to embrace.

**Keywords:** Internet of Things, Lora, Latency, dataset, Real-time, Hydropower, Performance