**FORWARD**

**The following is a description of the latest version of the Index Test Box (ITB) and its capability as an instrument to advance the state of the art in monitoring hydroelectric generating units. It is designed to optimize the performance of individual generating units powered by either Kaplan or Francis turbines and to monitor their performance and alert an operator whenever there is a degradation in performance that indicates a need for maintenance. The original device was developed to be connected to the governor and in an unattended manner to collect operational data and sort the data for analysis. It was field tested several times and compared to manually conducted index tests and found to work perfectly. In fact, it produced data with virtually no uncertainty or scatter.**

**The instrumentation technician invented the software while working at Woodward Governor Company. Evaluation of signal composition in the frequency domain led to the development of a nonlinear digital filter to glean steady-state data from the noisy continuous data streams emanating from the machine. Unfortunately, the ITB project did not achieve commercial success for Woodward Governor Company. Some familiarity at index testing is necessary to fully appreciate the ITB's accuracy and laborsaving value. There are scant few engineers with such expertise, especially in management/procurement positions.**

**Development work continued on the device, particularly on the aspect of being able to feed recorded data from the power station SCADA (Supervisory Control and Data Acquisition System) directly into the ITB as though it was actual field data. Playback is sped up to over 100 times normal speed. The sorting process to decide what to keep and what is too noisy is fully automated. This remote index testing capability was demonstrated to function perfectly in the Dorena field-tests for index testing a Kaplan turbine. A long-term condition monitoring system is available to track operational performance of generating units over time so that maintenance may be scheduled on an as needed basis.**

**Lee Sheldon, P.E.**