

In-house Engineering Support Services – Hydroelectric Design Center

The Hydroelectric Design Center (HDC) is seeking information on the qualifications of persons from academic institutions who would be interested in providing in-house, engineering support services. These engineering services will be obtained by the use of an IPA (Interagency Personnel Agreement). The prime effort of the support services will be to assist in the development of both the hardware and software to conduct automatic, unattended relative efficiency or "index" tests of hydraulic reaction turbines, particularly Kaplan turbines.

The Hydroelectric Design Center is a unit in the Portland District (NWP) of the Northwestern Division (NWD) of the US Army Corps of Engineers (USACE). The office is located on the eighth (8th) floor of the Robert Duncan Plaza Building at 333 SW First Avenue in downtown Portland, Oregon.

An index test is performed on hydraulic turbines in order to determine the relative efficiency profile of any type of turbine and the blade to gate cam curve of Kaplan turbines. The former is used to locate the generation level of maximum efficiency and the power limits to remain within a one-percent decrease in efficiency of that peak. The blade to gate or cam curves are input into the governor, which controls the machine, to optimize efficiency at any power and head level.

A "proof of concept" test has been successfully completed. A device known as an Index Test Box was developed under a prior contract and demonstrated that automatic, unattended index tests can be successfully conducted. Now the Corps is seeking assistance to develop a production version to be installed in each powerhouse in the Pacific Northwest. Due to security concerns, the Corps will retain exclusive ownership of all developed software.

The support services would be physically performed at HDC from the initial development until field testing of this next generation device, referred to now as a T1 Optimizer. The "T" stands for Type and the 1 refers to optimization on a per unit basis as opposed to a powerhouse basis, T2, or river basin or watershed basis, T3. The duration of this developmental effort is presently estimated to require six (6) to twelve (12) calendar months.

The skill sets considered to be needed for this support services are as follows:

- * Software Programming. The support services person(s) will need to be versed in writing continuous process control software in several languages, including Lab View and C++. The data signals will come from several sources including GDACS (Generic Data Acquisition and Control System).

- * Digital Signal Processing. The data signals contain random noise levels to which the true time averaged or steady state values must be determined. Normal filtering techniques are usually insufficient. These signals include: gate and blade positions, head, power and the Winter-Kennedy pressure differential.

- * Hydraulic Turbine Governors. The T1 Optimizer will be interfacing with the turbine governors. There are several types in the Corps inventory, including the newest electronic 3-D governors. A common interface will need to be developed. The T1 Optimizer will be more than just a data recorder in that it will send control signals to the governor to position the unit as needed.

- * Hydraulic Equipment Testing. Knowledge of the techniques and instrumentation for testing hydraulic equipment, particularly turbines, will be needed or will need to be acquired. This includes the applicable test codes and data reduction techniques.

The person(s) providing the support services must have US citizenship, be physically able to climb ladders, and be able to obtain the necessary security clearance to work in both the HDC office and to have access to various Corps' powerhouses.

Parties having an interest in providing the described support services are invited to send information on their qualifications to: Lee H. Sheldon, P.E., (503) 808-4298, email, lee.h.sheldon@nwp01.usace.army.mil. All information submitted will be acknowledged and held in confidence.

Classification: UNCLASSIFIED
Caveats: NONE