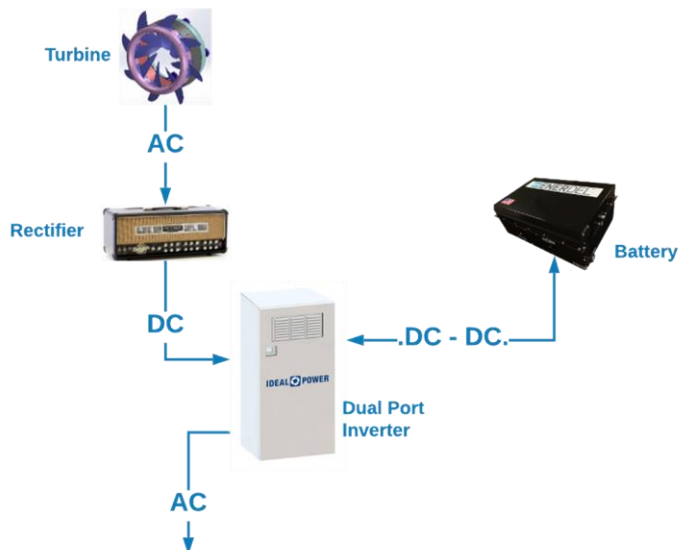


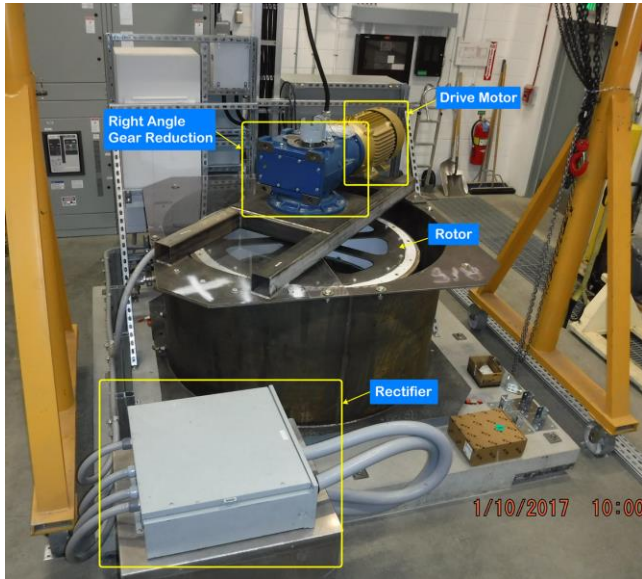
## Update: PSI Lab Oceana Turbine Testing and Inverter Integration 06/10/2019

Hydrokinetic energy generators are an emerging technology to convert the kinetic energy of moving water into usable electricity. The technologies are of considerable interest in Alaska because numerous villages with high energy costs are located either along the coast or on rivers with abundant hydrokinetic energy resources. Pursuant to the development and testing of emerging hydrokinetic energy technologies in Alaska, the Alaska Center for Energy and Power (ACEP) Power Systems Integration (PSI) Lab at the University of Alaska Fairbanks was contracted in 2016 to perform controlled lab-based testing (Phase 2) of a run-of-river hydrokinetic turbine generator developed by Oceana Ltd. The hydrokinetic turbine generator with rated power capacity of 25 kW and a speed of up to 200 rpm previously underwent field testing (Phase 1) in the summer 2014 and 2015 at the Tanana River Hydrokinetics Test Site managed by the Alaska Hydrokinetics Energy Research Center (AHERC). During field testing the Oceana turbine produced about 4.5 kW @ 40 rpm and was successfully operated in the river with a debris diversion device designed by AHERC researchers. Subsequent testing in the PSI lab was focused on measurement of power output versus rotational speed when the turbine was integrated into a grid environment via the use of an inverter and battery energy storage system. Despite significant challenges with the inverter, base-line testing was completed in January 2018 with the system demonstrating power output in grid-following, grid-supporting, and limited grid-forming operation in a rotational speed range from 10 to 80 rpm. Further development and testing of the inverter and control system as used in the PSI lab test platform is needed to fully demonstrate reliable grid-forming capability of the Oceana turbine.

### Phase 2: Integration Testing in the PSI Lab: *Flow diagram of test setup.*



**Phase 2: Integration Testing in the PSI Lab: *Integration of turbine with a dual port inverter and a battery for grid-forming capabilities.* Left: Turbine test basin set up in ACEP's Power Systems Integration lab (Fairbanks, AK). Right: Inverter, battery and VFD cabinet.**



Phase 2: Integration Testing in the PSI Lab: *Power and torque versus rotational speed. Top: Generator and rectifier power output vs. rotor speed. Bottom: Generator and rectifier torque output vs. rotor speed.*

