

## Energy Recovery is the Goal From Water-to-Wire System

The engineers and technicians at Sorensen Systems recently built and installed a renewable energy system in Keene, NH, that transforms excess pipe pressure and flow into clean “green” power. This Water-to-Wire energy recovery project provides 480 VAC (volts alternating current) power from water flow exiting the treatment plant.

The system includes a 22 kW and 40 kW dual-turbine generators. The electricity generated from the system is sent to the power grid, which offsets the amount of electricity the plant uses. According to officials from the Keene, NH, Public Works Department, this is the first installation of its kind in New Hampshire and represents an opportunity for gravity-fed water system deploying regulator valves.

In addition to the two turbine generators, control cabinets were designed and built at Sorensen Systems with controls and status indicators that can be used to monitor the operation of the turbine generators while they are being operated under remote control, or as a means for operating the turbine generators locally for diagnostic purposes. The control cabinet for the system is dual-bay; the left-hand side includes the controls specific to the 22 kW turbine generator, and the right-hand side includes the controls specific to the 40 kW turbine generator.

The PLC (programmable logic controller), used to control all operating features for both turbine generators, is located in the left-hand bay of this control cabinet. It is an Allen-Bradley Compact

Logix platform that communicates with the SCADA (supervisory control and data acquisition) system via EtherNet. A mains disconnect circuit breaker is located under the central pillar on the front of the control cabinet; this device is used to isolate the entire control cabinet from the mains AC line and to shut off power to all circuitry within this control cabinet.

Each turbine generator has its own touch-screen. These HMI's are used to monitor all operational parameters for each turbine generator. They are also used to control the operation of the turbine generators if local control is selected and as a means for diagnosing fault conditions within the turbine generator controls. Each turbine generator has a key-lock switch on the control front panels. These switches have three positions: Local, Remote, and Off. These switches are used to determine the source for the on/off control signals for the turbine generators, or to lock out the turbine generator from operation.

Each turbine generator has its own HMI screen that is used to control its operation and to display status information. These HMI's when they are turned on, default to the main status screen, which is called the Turbine System State. This screen displays the status information for its turbine generator while it is running. This screen has two distinct functions: numerical displays for turbine data and pushbuttons used to select further display for the generator. The touch-screens on this system are the primary means whereby a machine

operator can monitor and control the operation of the turbines locally. There are five screens that the HMI's display. They are 1) Turbine Systems State, 2) Intertie Status, 3) Turbine Status, 4) Turbine Maintenance Controls, and 5) Turbine Local Start Controls.

The power necessary for running these controls is derived from the 480 VAC power grids to which this control cabinet is connected. However, once the turbines are on-line and generating power, the power source for this cabinet is the turbine-generators that it is controlling.



*Sorensen Systems engineers and technicians recently built and installed a renewable energy system for the Keene, NH community at its Water Treatment plant.*



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