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Water-to-Wire, Turbine-Valve-Controls Integration,
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Sorensen Systems Designs/Builds/Installs Innovative Hydroelectric Plant for MWRA

With each glass of fresh, clean water drawn from a water tap in Boston, consumers are helping to generate electricity that goes back into the grid at a rate that will power the energy needs of over 100 homes. As the water flows from reservoirs in the western part of the state, a unique hydraulic turbine and hydroelectric generator combine to generate enough electricity to operate an MWRA storage facility, with left-over electricity sent back into the grid.

This Micro electric power generator is one of many innovative installations being installed around the state to meet the goal of getting at least 15 percent of its annual electricity requirements from renewable sources by 2012. According to an article in the Boston Globe, Frederick Laskey, executive director of the water agency said, "It basically helps get us off the roller coaster of utility bills. The more we can self-generate, the less vulnerable we are to the peaks and valleys of the energy commodities market," he added.

Gravity sends the water to Boston from the Quabbin Reservoir and the Wachusett Reservoir, which becomes pressurized as it travels via aqueducts to a treatment plant about 30 miles west of Boston. From there it travels to a network of tanks that depressurize and store the drinkable water before it is distributed to Boston and other communities. It's here at the storage facility that the magic happens.

At the Loring Road facility in Massachusetts, the potable water now moves through the recently installed hydroelectric turbine, which reduces the gravity-fed pressure from the water and converts it to electric energy. By by-passing

the pressure reducing valves with a 200 kW turbine-generator unit, instead of dissipating the energy with the sleeve valves, it is converted into electricity. The compact horizontal Francis turbine with wicket gates will generate an average annual 1.2 million kWh.

The storage tanks at the Loring Road facility were constructed to protect and store treated drinking water in compliance with the Federal Safe Drinking Water Act. The storage tanks replaced a 100 year old system of open reservoirs. The covered tanks protect drinking water from potential contamination. The two reservoirs that feed into the Loring Road facility supply an average of 200 million gallons per day to consumers.

The Sorensen Systems company designed and built the turbine-generator systems used at the Loring Road facility by the MWRA. The purpose of the project was to meet the requirement by the MWRA to recover the energy previously lost through the power reducing sleeve valves. The water passes through the turbine the pressure is reduced and the energy is transferred into electric power via the induction generator connected to the turbine water wheel, or runner. The electric power generated through this process is used to power the equipment in the vault, with the balance exported back to the utility for revenue.

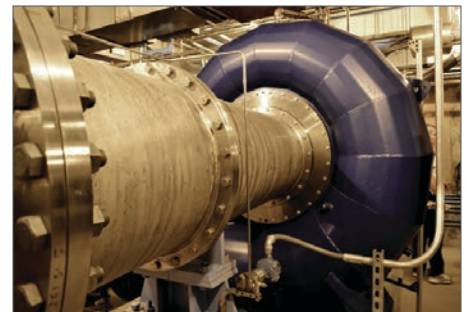
Sorensen Systems design engineers and technicians were responsible for overall project management to include the turbine generator, the hydraulic power unit, the turbine circuit breaker, the turbine control panel, the Francis turbine unit, the induction motor and the large butterfly valves and piping.



The custom built Turbine Control Panel used Allen-Bradley SLC500 PLC and Panelview Plus HMI.



The 200 kW, 480 VAC, 3PH, 60 Hz, 727 rpm induction generator was manufactured by Marelli Motori.



The Francis turbine with wicket gates will generate an average of 1.2 million kWh per year.

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