



RETRICITY CASE STUDY

City of Keene Water Treatment Facility, New Hampshire

INTRODUCTION

Rentricity is an alternative energy company that converts excess pressure in piping systems to clean, renewable power. Rentricity provides total system solutions that include design and implementation of turnkey hydrokinetic systems, custom designed to the customer's specific site, operational conditions and constraints, inclusive of all requisite monitoring, control and protective relays. Systems can be stand alone or integrated into the client's existing SCADA system and can be fitted with sensors for smart water system monitoring. Energy can be recovered anywhere within the water distribution system, usually from mandated releases, pressure reduction valves (PRV) and transfer stations. Rentricity also works with clients to comply with all electrical utility intertie and safety requirements, as well as government permitting and licensing procedures.

THE CHALLENGE

The City of Keene, New Hampshire's water treatment facility (WTF) system consists of a gravity fed system inclusive of a strainer and a pressure reduction valve (PRV) that passes raw water into three filter trains, each controlled by a flow control valve (FCV). Flow rate through each train is set by operator keyboard command to vary between 700 GPM and 1400 GPM. Significant diurnal flow change is experienced daily to support maintenance for one or more of the three filter trains. Filtered water flows by gravity to two hydraulically connected storage tanks with capacities of 1.5 MG and 3.0 MG. The water treatment facility and the distribution system are monitored and controlled by a SCADA system from the central control room with remote dial up access.



The PRV serves the WTF functionally by reducing pressure from the gravity fed line descending from the raw water storage reservoir. The energy released through the PRV was dissipated as heat energy. The City of Keene wanted

to recover this source of clean and reliable energy, while maintaining their flow regimes, daily maintenance requirements and other normal operations. Further, the City of Keene wanted the flexibility to be able to utilize the generated power to offset demand inside the WTF and export the excess to the local grid.

RETRICITY'S SOLUTION

Rentricity installed two new turbine generators with different capacities in parallel to the existing PRV inside the Keene WTF to maximize flexibility in operations while maintaining complete transparency to their primary mission – providing safe, reliable drinking water.

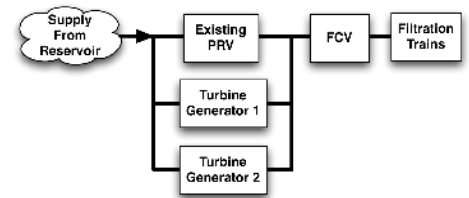


Start-up of either one or both turbine generators is initiated either by operator selection through SCADA or local control panel. Shutdown is initiated by operator keyboard control (through SCADA), local control panel, or automated by protective devices during loss of utility power. A surge release valve operates in accordance with local conditions to prevent overpressure or water hammer effects in the event of a rapid unplanned turbine shut down. Surge release discharges into a waste drop box that in turn drains into the recycled water storage tanks.



A switchgear cabinet was installed inside the electrical room for interconnect to the WTF electrical distribution system in accordance with the Public Service Company of New Hampshire (PSNH) cogeneration interconnection and net metering requirements.

The turbine generator assemblies can be selected to operate either individually or in parallel under the following approximate operating conditions: Turbine Generator 1 at 720 GPM, generating 17-18 kW power, Turbine Generator 2 at 1440-1470 GPM, generating 36 - 38 kW power, Turbine Generators 1 and 2 operating in parallel at 2,070-2170 GPM, generating 50 to 55 kW power, either or both of the turbines operating in combination with the PRV, or turbine generators non-operational with pressure reduction through the PRV.



RETRICITY'S RESULTS

The city of Keene, New Hampshire is now recovering energy that was previously lost to a pressure reduction valve. Rentricity's energy recovery system was customized to be transparent to normal operation, configured to recovery energy at variable flow rates and plant operation scenarios so as to not disrupt the plant's mission to provide water to meet the City of Keene's demand. Keene is now producing renewable power, moving closer to a more sustainable and efficient water system.

THE FINANCIAL CASE

Rentricity's energy recovery systems are durable and reliable, designed to last 40 years with little operation and maintenance costs. The rate of return is attractive, with a shorter technology payback period than other renewable energy systems. Federal, state and local incentives, including grants and other subsidies increase the rate of return dramatically. The City of Keene was awarded a grant of over \$200,000, for an accelerated payback on the project. The Keene project costs are approximately \$0.05/kWh, excluding the grant, and the system provides the City with continuous revenue.