RENTRICITY CASE STUDY
Municipal Authority of Westmorland County, Pennsylvania

INTRODUCTION
Rentricity is an alternative energy company that converts excess pressure in piping systems to clean, renewable power. Rentricity's experience includes design and implementation of turnkey hydrokinetic systems, custom designed for a site's operational conditions and constraints, inclusive of all requisite monitoring, controls 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 throughout a water distribution system, typically at 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 Pennsylvania Department of Environmental Protection mandates a continuous discharge from the Municipal Authority of Westmoreland County (MAWC) Beaver Dam into the Beaver Run Creek at a minimum flow rate of 6.5 million gallons a day (MGD).

By releasing water through a gravity main from the reservoir, energy is lost that can otherwise be used to generate electricity. With rising electric costs and rate caps coming off, rates are increasing over the next 3 years. The MAWC was faced with the question of how to comply with its discharge requirement, non-invasively recover energy for self-generation.

RENTRICITY'S SOLUTION
The existing mandated discharge system consisted of two parallel pipes, one 8-inch diameter and one 12-inch diameter, both leading from the industrial raw water main to the Beaver Run Creek. A below ground vault allowed access to the two pipes, each one with an insertion flow meter interfaced with the SCADA system.

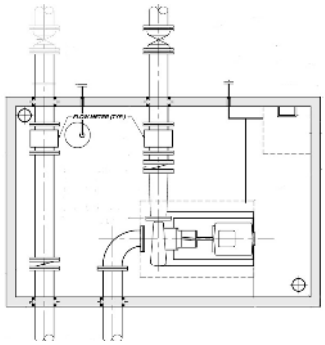
The mandated discharge system was adjacent to, but functionally separate from, the Beaver Run Raw Water Pump Station that provided raw water to the treatment plant on the adjacent hill.

Rentricity designed a system utilizing existing technologies and retrofitted them to recover the energy. A new below ground vault was constructed for housing a horizontally mounted 30kW turbine generator and associated hardware and appurtenances. A pressure tap was installed on the pipe with a local readout and remote pressure signal. The new turbine generator assembly was also inclusive of a hydraulically actuated inlet valve.

In addition to the energy recovery system, a 12-inch bypass line was also installed in the vault, replacing the 8-inch line which was only able to accommodate a maximum flow of 3.7 MGD. This new 12-inch pipe was installed parallel to the turbine generator assembly, to release the mandated 6.5 MGD flow in the event the turbine generator is offline. This replacement 12-inch line was fitted with a flow control valve to modulate the flow between 1.1 MGD, when the turbine generator is in operation, to at least 6.5 MGD when it is offline, with a total combined flow through the two lines of at least 6.5 MGD.

As a continuous flow mandated release site, in normal operation the turbine generator will run continuously. Static head, as measured at the inlet to the turbine, results in a sustainable flow through the turbine of about 5.4 MGD. Additional flow, as desired or mandated can be routed through the parallel 12-inch pipe for discharge into the creek.

A control panel in the adjacent pump house allows for local or remote startup. Local startup mode is operated by switch control while remote startup mode is operated by keyboard command from the MAWC SCADA system. In the event of shutdown due to fault, loss of grid power, or initiated for preventive maintenance, the turbine generator will shut down automatically, with the hydraulic actuator, automatically closing the turbine inlet valve, a process that takes 30 to 60 seconds. The valve on the bypass line will open to permit the 6.5 MGD mandated release. The turbine generator will remain offline until manually started again on the control panel. Similarly, shutdown can be operator initiated by the same procedure.



The electricity generated from the new 30 kW turbine generator system is utilized "behind the meter" to partially power the adjacent pumps that transfer raw water from the Beaver Run Reservoir to the neighboring water treatment plant, decreasing demand from the electrical utility grid.

RENTRICITY'S RESULTS
MAWC is now recovering energy that was previously lost, moving closer to a more sustainable and efficient water system.

Electricity costs account for one-third of MAWC's production budget. It is estimated that Rentricity's single system, producing over 250 MWh a year, will save MAWC $40,000 in electricity costs per year because costs are anticipated to increase.

THE FINANCIAL CASE
Rentricity's energy recovery systems are durable and reliable, designed with a 40-year lifespan and little need for maintenance. The rate of return is very attractive, with a much shorter base case payback period than other renewable energy systems and project costs around $0.04/kWh. Federal, state and local incentives including, grants and other subsidies, increase the rate of return and decrease $/kWh dramatically. The MAWC was awarded a state grant of over $200,000, for an accelerated payback. The following shows the different payback scenarios for the site, including anticipated rise in energy costs.

Case	CoE $/kw-hr	Grants	RECS ($/kw-hr)	Payback Yrs	% IRR	Comments
1	$ 0.08	$ -	$ -	16	6%	Base Case
2	$ 0.08	$ -	$ 0.03	11	8%	Add RECs
3	$ 0.08	$ 200,000		6	18%	Grant
4	$ 0.08	$ 200,000	$ 0.03	4	26%	Grant + RECs
5	$ 0.12	$ -	$ -	10	10%	Anticipated COE Increase Base Case
6	$ 0.12	$	$ 0.03	8	12%	Anticipated COE Increase + RECs
7	$ 0.12	$ 200,000		4	28%	Anticipated COE Increase + Grant
8	$ 0.12	$ 200,000	$ 0.03	3	35%	Anticipated COE Increase + Grant + RECs