



PORTLAND WATER BUREAU • Portland, Oregon

The Portland Water Bureau (PWB) in Portland, Oregon has turned a major city water pipeline into a generator of renewable energy from in-pipe hydropower. The 200kW LucidPipe™ Power System from Lucid Energy harvests excess pressure from the gravity flow of water inside the PWB pipeline. Four 42" spherical turbines spin as fast-moving water flows through them, generating an average of 900 megawatt hours of electricity per year – enough to power approximately 100 homes and help the city meet its Climate Action Plan goals with clean hydropower that doesn't harm ecosystems.



The Portland LucidPipe Power System serves as a pilot for the multi-turbine system installation and for its funding model. Similar to how many solar and wind projects are financed, the LucidPipe installation was funded entirely through private investment. PWB shares in the revenues produced by the sale of electricity to Portland General Electric through a 20-year Power Purchase Agreement (PPA). After 20 years, PWB will have the right to own the system and all the energy it produces. Since pipelines have useful lives in excess of 50 years, this is an excellent opportunity for the investor and for the City. The Portland LucidPipe project has the distinction of being the first in the U.S. to secure a 20-year PPA for renewable energy produced by in-pipe hydropower in a municipal water pipeline.

The patented LucidPipe turbines are specially designed to turn excess pressure in gravity-fed water pipelines into electricity – with no impact on water delivery. The Portland turbines are installed inside a section of large-diameter, gravity-fed water pipeline just upstream of a pressure reducing valve (PRV) below the city's new Powell Butte reservoir. The 4-turbine system extracts approximately 20psi of pressure from the pipeline and converts it into electricity. In addition to recapturing energy that would otherwise have been lost through the PRV, this placement of the LucidPipe system reduces the workload of the PRV and helps extend its life.

PROJECT FACTS:

Location: Portland Water Bureau pipeline, Portland, OR USA.
System: A four-turbine, 42" 200kW system inside a 48-inch diameter water pipeline.
Placement: Upstream from PRV, turbines placed 4-diameters apart.
Reliability: >95% availability in first 8 months of operation.
Output: 900 MWh per year. Electricity is fed to the grid.

SYSTEM BENEFITS:

Clean energy: turns water infrastructure into a source of renewable energy (LCOE: 5-12 cents per kWh).
Sustainable: operates seamlessly with no impact on water delivery.
Consistent: not weather-dependent, power production is under water agency control
Environmentally-friendly: provides hydropower that doesn't harm ecosystems.
Reduces valve wear: through a slight reduction in pressure in the pipeline.

LUCIDPIPE SYSTEM INFORMATION:

- Tested and certified to ANSI/NSF Standard 61 for use in potable drinking water systems.
- LPS pipe sections comply with AWWA C200.
- Gross system weight ~6,500 lbs.
- Rated output - 50 kW per 42" turbine.
- Turbine materials: Composite and stainless steel.
- Inverters tested to UL 1741.
- 150 PSI max working pressure.