

Canyon Hydro

GENERATING RENEWABLE ENERGY FROM EXISTING INFRASTRUCTURE



Canyon Hydro ILT-12 Turbine Installation

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Section 1: Specific Technologies

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Section Contents

Pico Hydro

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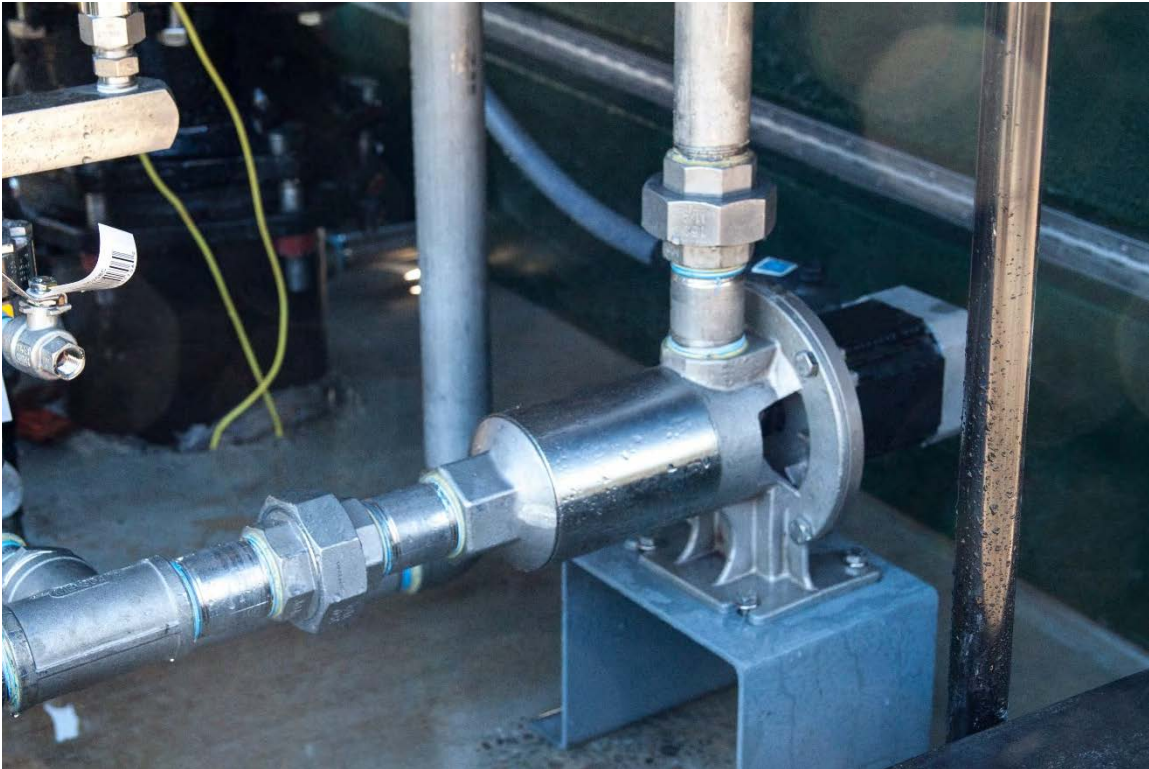
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Pico Hydro

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Technology Overview

Canyon Pico Hydro Turbines are small generation packages intended for producing 300 watts of power in off-grid locations. Typical locations include non-powered vaults, flow regulating stations, and remote equipment sites. Pico Hydro serves as an alternative to running grid power to these locations which is often prohibitively expensive.

The turbine/generator assembly generate power off of flow and pressure at the location. Often the units are installed in parallel with a pressure reducing or flow control valve. Power output depends on both flow and head (pressure differential) with a maximum output of 300W continuous power.

The included control system is connected between the turbine and a battery bank. The hydro controller regulates power output of the turbine through modulation of an electronic positioning inlet valve to maintain charge level on the battery bank.

Power generated is either 12V or 24V DC (the system automatically detects battery bank voltage and configures itself for either). If AC power is needed, an inverter can be supplied with the system to accommodate 120VAC accessories.

Common uses for the systems are to power lighting, fans, SCADA systems, radios, telecommunication equipment, leak detection equipment and flow control devices.



Expected useful life of the Pico Hydro Turbine depends largely upon site conditions and system load. Conservatively, the units are expected to last 2-4 years with no maintenance and can be serviced to as-new condition by field technicians or sent back to Canyon Industries for professional rebuild services. Spare units can be kept on hand to minimize downtime.

At the time of this publishing, capital costs of the standard Pico Hydro system are \$6995 and include: Pico Hydro Turbine, Generator, Electronic Inlet Valve, Y-Strainer, and (2) 1.25" NPT Pipe nipples for connecting supplied components. In addition to the standard system the user will need to supply a battery bank, field wiring, and plumbing components to connect the turbine to the water system.

Pump-Turbines

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Technology Overview

Canyon Hydro Pump-Turbines are cost effective fixed flow generation solutions. They can be installed in any water delivery network with excess pressure and are ideal for applications which have relatively small flow fluctuation and require positive discharge pressure.

Pump-Turbines are commonly installed at pressure reduction locations in both new and existing water networks. These are often at flow control or pressure control locations such as tank fill/discharge stations, line pressure reduction stations, or facility water regulating valves.

As with all hydro turbines, power output of pump-turbines depends on the head and flow conditions. Applications with 0.3-20 Cubic Feet per Second (CFS) flow rates and between 50-500 feet of head are good candidates. Power outputs range from 1kW to over 300kW.

Pump-Turbines can be applied to both on-grid and off-grid applications. Utility grade control systems are typically supplied with the turbine-generator assemblies as well as interconnection equipment if required. Common systems are supplied for 480V/3Ph/60Hz interconnection however others can be supplied without difficulty.

Power generated can be used on-site, offset utility power usage, or sold back to the local utility through Power Purchase Agreements.

Expected useful life of the Pump-Turbines depend largely upon site conditions. Conservatively, in a clean water system the units are expected to last 20 years with



minimal maintenance. Seals and bearings can be replaced as necessary by local contractors or Canyon Hydro representatives.

Cost of pump-turbine systems vary by site conditions and requirements. Canyon Hydro works closely with customers to select the appropriate equipment for each application and to develop control systems that operate seamlessly with water delivery operations.

In-Line Turbines

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Technology Overview

Canyon Hydro In-Line Turbines are specifically optimized for conduit energy recovery applications. With simplified installation and an extremely compact footprint they integrate seamlessly into both new and existing water delivery networks.

In-Line Turbines (ILTs) are commonly installed at pressure reduction locations in both new and existing water networks. These are often at flow control or pressure control locations such as tank fill/discharge stations, line pressure reduction stations, or facility water regulating valves.

ILTs are variable flow solutions utilizing a Francis style runner and fully adjustable wicket gates. Flow ranges are typically 25% to 120% of design flow (optimum efficiency flow). Units are available with standard 6, 8, 12, 16, and 24-inch pipe flanges.

As with all hydro turbines, power output depends on the head and flow conditions. Applications with 1-56 Cubic Feet per Second (CFS) flow rates and between 50-575 feet of head are good candidates. Power outputs range from 1kW to over 300kW.

In-Line Turbines can be applied to both on-grid and off-grid applications. Utility grade control systems are typically supplied with the turbine-generator assemblies as well as interconnection equipment if required. Common systems are supplied for 480V/3Ph/60Hz interconnection however others can be supplied without difficulty.

Power generated can be used on-site, offset utility power usage, or sold back to the local utility through Power Purchase Agreements.

Expected useful life of the In-Line Turbines depend largely upon site conditions. Conservatively, in a clean water system the units are expected to last 20 years with minimal maintenance. Seals and bearings can be replaced as necessary by local contractors or Canyon Hydro representatives.

Cost of ILT systems vary by site conditions and requirements. Canyon Hydro works closely with customers to select the appropriate equipment for each application and to develop control systems that operate seamlessly with water delivery operations.

Francis Turbines

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Technology Overview

Canyon Hydro Francis Turbines are state of the art variable flow turbines with premium efficiencies. Francis turbines can be installed at pressure reduction locations in both new and existing water networks as well as in traditional run-of-river applications.

A Francis style runner and fully adjustable wicket gates ensure optimum efficiency over a variable flow range. Hydraulically engineered flow paths and runners extract maximum energy available. As with all hydro turbines, power output depends on the head and flow conditions. Applications with flows in excess of 10 Cubic Feet per Second (CFS) and discharges to piped systems are good candidates. Power outputs range from 10kW to over 1MW.

Francis turbines are typically applied to on-grid applications. Utility grade control systems are frequently supplied with the turbine-generator assemblies as well as interconnection equipment. Common systems are supplied for 480V/3Ph/60Hz interconnection however others can be supplied without difficulty.

Power generated can be used on-site, offset utility power usage, or sold back to the local utility through Power Purchase Agreements.



Expected useful life of the Francis Turbines depend upon site conditions. Conservatively, in a clean water system the units are expected to last 20 years with minimal maintenance. Seals and bearings can be replaced as necessary by local contractors or Canyon Hydro representatives.

Cost of Francis systems vary by site conditions and requirements. Canyon Hydro works closely with customers to select the appropriate equipment for each application and to develop control systems that operate seamlessly with water delivery operations.

Pelton Turbines

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Technology Overview

Canyon Hydro Pelton Turbines are state of the art variable flow turbines with premium efficiencies. Pelton turbines can be installed at pressure reduction locations in both new and existing water networks as well as in traditional run-of-river applications.

A Pelton wheel with adjustable needle nozzle(s) ensure optimum efficiency over a variable flow range. Hydraulically engineered runners extract maximum energy available. As with all hydro turbines, power output depends on the head and flow conditions. Applications with flows in excess of 1 Cubic Feet per Second (CFS) and discharges to atmospheric conditions are good candidates. Power outputs range from 1kW to over 1MW.

Pelton turbines apply to both on-grid and off-grid applications. Utility grade control systems are typically supplied with the turbine-generator assemblies as well as interconnection equipment if necessary. Simple systems with either fixed or manually adjustable needle nozzles can be supplied for applications with little flow variation. For sites with variable flows hydraulically actuated needle nozzles can be provided to automatically adjust for maximum power recovery. Common systems are supplied for 480V/3Ph/60Hz interconnection however others can be supplied without difficulty.



Power generated can be used on-site, offset utility power usage, or sold back to the local utility through Power Purchase Agreements.

Expected useful life of the Pelton Turbines depend upon site conditions. Conservatively, in a clean water system the units are expected to last 20 years with minimal maintenance. Seals and bearings can be replaced as necessary by local contractors or Canyon Hydro representatives.

Cost of Pelton systems vary by site conditions and requirements. Canyon Hydro works closely with customers to select the appropriate equipment for each application and to develop control systems that operate seamlessly with water delivery operations.