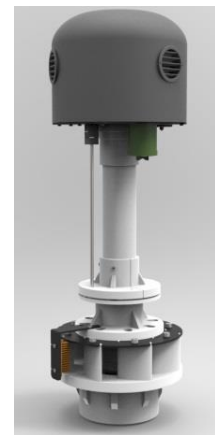




PowerSpout Technical Specifications

PowerSpout PLT, TRG and LH



PowerSpout Contact details

Web: www.powerspout.com

PowerSpout is a product proudly designed and manufactured by:

EcolInnovation Ltd

671 Kent Road
New Plymouth R.D.1
New Zealand 4371

Web: www.ecoinnovation.co.nz

If you need to contact EcolInnovation by phone then email first via our web site and check the local time in NZ if calling from overseas. Business hours are 9:00am to 5:00pm (NZ time) weekdays only. EcolInnovation is closed for up to 3 weeks over the Christmas break.

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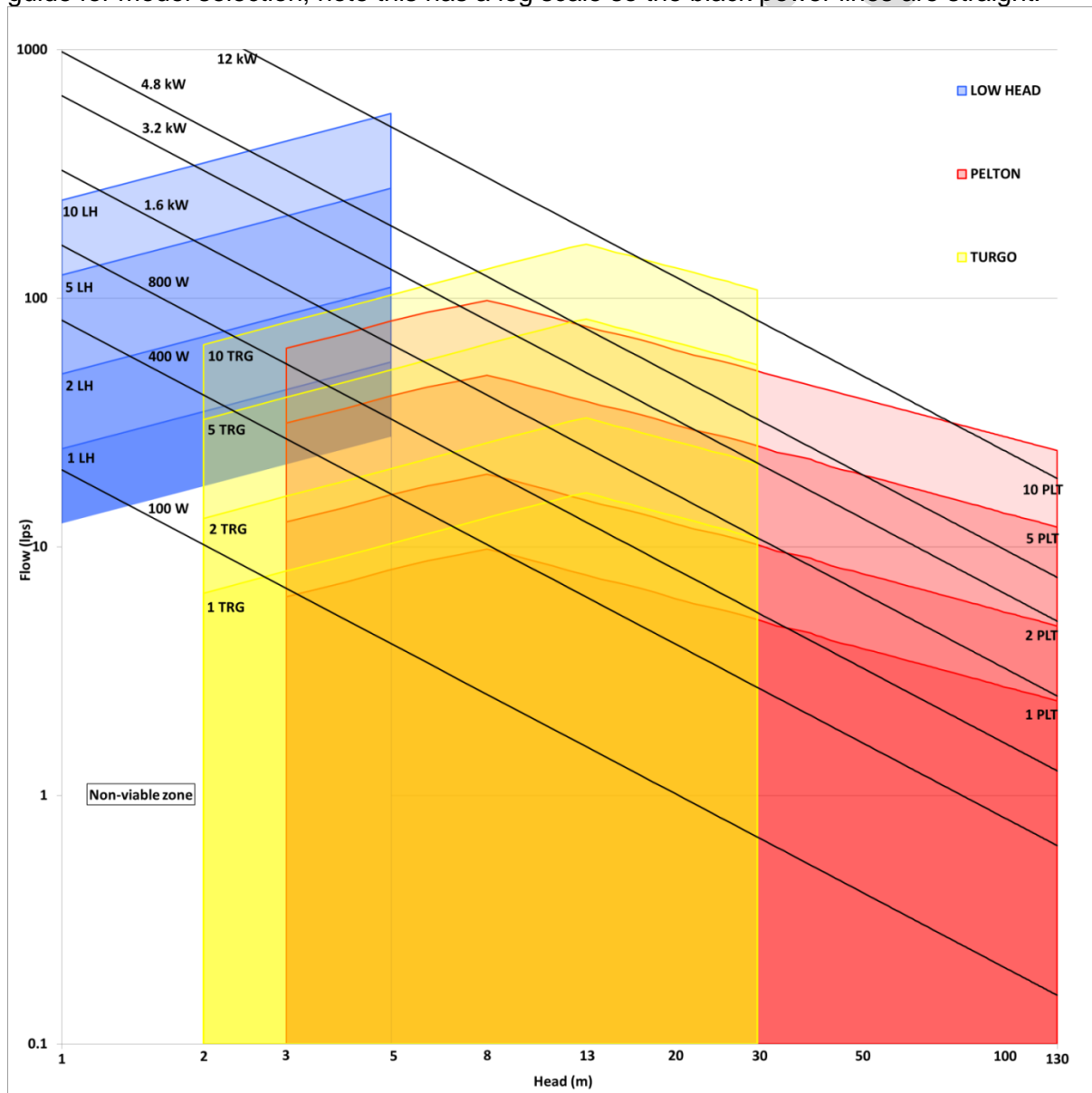
1. Introduction

PowerSpout turbines are micro-hydro generators that convert the potential energy of a watercourse to electricity. This is achieved by using water to spin the rotor and hence the generator, which generates electricity (3-Phase AC power) internally that is then rectified to DC.

The PowerSpout range includes turbines which can operate in particular situations, primarily dictated by water flow rate then available head (vertical fall height):

Version	Head (m)	Flow (l/s)
PowerSpout PLT (Pelton)	3 – 130	0.1 – 10
PowerSpout TRG (Turgo)	2 – 30	8 – 16
PowerSpout LH (Low Head)	1 – 5	25 – 56

A summary graph of turbine performance is presented below. This can be used as a quick guide for model selection; note this has a log scale so the black power lines are straight.



PowerSpout Model Selection Chart

For the head and flow rate at your site the above chart will quickly give you the maximum power you can generate (refer to black angled lines that indicate 100W to 12kW). Below 100W hydro generation is often not viable.

The coloured zones refer to the range for each product type:

The red lines are 1, 2, 5, 10 PowerSpout Pelton (PLT) turbines respectively

The yellow lines are 1, 2, 5, 10 PowerSpout Turgo (TRG) turbines respectively

The blue lines are 1, 2, 5, 10 PowerSpout Low Head (LH) turbines respectively

For example a site with a 20m head and flow of 10l/s can generate about 1000 W with 1 TRG or 2 PLT turbines.

Once you have identified the most suitable turbine type(s), use the Advanced Calculation Tools at www.powerspout.com to perform accurate site calculations.

2. PowerSpout turbine options

PowerSpout PLT and TRG turbines are also identified by voltage to suit the site and system design e.g. connected directly to battery banks, connected to battery-based MPPT regulators or to grid-connect inverters. The turbine abbreviation (PLT, TRG) is followed by a number that indicates the approximate maximum power point voltage (MPPV), which is also the operating cable voltage. For example:

- PowerSpout PLT 28 has an MPPV of 28 V (connects to 24V battery bank via PWM regulator). 28 V is the bulk voltage for a 24 vdc battery.
- PowerSpout PLT 200 has an MPPV of 200 V (connect to grid via grid-tied inverter)

For PowerSpout LH turbines, for example the LH200, the 200 is not the MPPV but the maximum open circuit voltage (OCV) at turbine runaway. This is because there are no LH turbines that connect directly to batteries. All LH turbines require MPPT regulation for battery charging or the use of a grid connect inverter.

The relationship between OCV and MPPV is stated below:

- PLT and TRG turbines OCV is approximately 3 x MPPV
- LH turbines OCV is approximately 2 x MPPV

2.1. PowerSpout PLT

Common versions of PowerSpout PLT with no overvolts crowbar

PLT model	Off-grid*					On-grid	
	14	28	40	56	80	170	200
Max cable length m	50	150	250	500	1000	1000	1000
Operating cable V	14	28	40	56	80	170	200
Max open circuit V	38	75 ELV US/EU	120 ELV NZ/AUS	150	220	<450	<550
Regulator/inverter	PWM	PWM	MPPT	PWM	MPPT	Grid-tie	Grid-tie

* All off grid MPPT turbines can charge 12, 24 or 48 V battery bank except PLT40 which can only be used in 12 and 24 V systems.

Common versions of PowerSpout PLT with overvolts crowbar fitted*

	Off-grid 75vdc clamp	Off-grid 120vdc clamp	Off-grid 240vdc clamp		On-grid Aurora PVI wind interface
PLT model	56C	100C	170C	200C	350
Max cable length m	500	1000	1000	1000	1000
Operating cable V	56	100	170	200	250-350
Max open circuit V	<75	<120	<240	<240	<400
Regulator/inverter	PWM	MPPT	MPPT	MPPT	Grid-tie

* refer to Technical Manual

2.2. PowerSpout TRG**Common versions of PowerSpout TRG with no overvolts crowbar**

	Off-grid				On-grid	
TRG model	28	40	56	80	170	200
Max cable length m	150	250	500	1000	1000	1000
Operating cable V	28	40	56	80	170	200
Max open circuit V	75 ELV US/EU	120 ELV NZ/AUS	150	220	<450	<550
Regulator/inverter	PWM	MPPT	PWM	MPPT	Grid-tie	Grid-tie

*All off grid MPPT turbines can charge 12, 24 or 48 V battery bank except PLT40 which can only be used in 12 and 24 V systems.

Common versions of PowerSpout TRG with overvolts crowbar fitted*

	Off-grid 75vdc clamp	Off-grid 120vdc clamp	Off-grid 240vdc clamp		On-grid Aurora PVI wind interface
TRG model	56C	100C	170C	200C	350
Max cable length m	500	1000	1000	1000	1000
Operating cable V	56	100	170	200	250-350
Max open circuit V	<75	<120	<240	<240	<400
Regulator/inverter	PWM	MPPT	MPPT	MPPT	Grid-tie

* refer to Technical Manual

2.3. PowerSpout LH**Common PowerSpout LH and LH Pro products**

All LH and LH Pro products connect via MPPT regulators or grid-tied inverters. There are no direct battery options available.

- **LH150 and LH150Pro** – use with MPPT regulator rated for up to 150 VDC charging 12/24 VDC batteries. Cable voltage may be as low as 50 VDC.
- **LH250 and LH250Pro** – use with MPPT regulator rated for up to 250 VDC charging 12/24/48 VDC batteries. Cable voltage may be as low as 80 VDC.
- **LH400 and LH400Pro** – use with MPPT regulator or grid connect inverter rated for up to 400 VDC. Cable voltage may be as low as 140 VDC.

3. Turbine specifications

For wiring diagrams, installation drawings/pictures and circuit diagrams refer to manuals.

All parts and assemblies are fully described with drawings and pictures in product installation manuals. The following provides a summary.

All PowerSpout turbines have the following specifications:

PowerSpout Specifications	
Generator	10.5 in (270mm) 3-phase Smart Drive permanent magnet generator (PMG)
Generator efficiency	> 70% and up to 80% in ideal conditions
Wattage single	100 - 1200 W standard. Custom HP version up to 1600 W
Wattage stacked (2-10 units)	0.2-12 kW standard. Custom up to 16 kW
Current rating	Up to 32 amp standard, up to 50 amp surcharge applies
Running speed	200 - 1600 rpm (up to 2000 rpm for TRG)
Watt/rpm	Up to 0.7 W/rpm standard, up to 1.0 W/rpm high power versions with MPPT
Regulation (optional)	75/120/240 Voltage-limiting clamp available on PLT and TRG turbines.
PowerSpout Materials	
Case	LDPE
Drive shaft	stainless steel
All fasteners and fixings	stainless steel
Recycled content	up to 68%



The following section specify characteristics of each turbine type, and the variations found in the PLT and TRG twin packs offered at a reduced price.

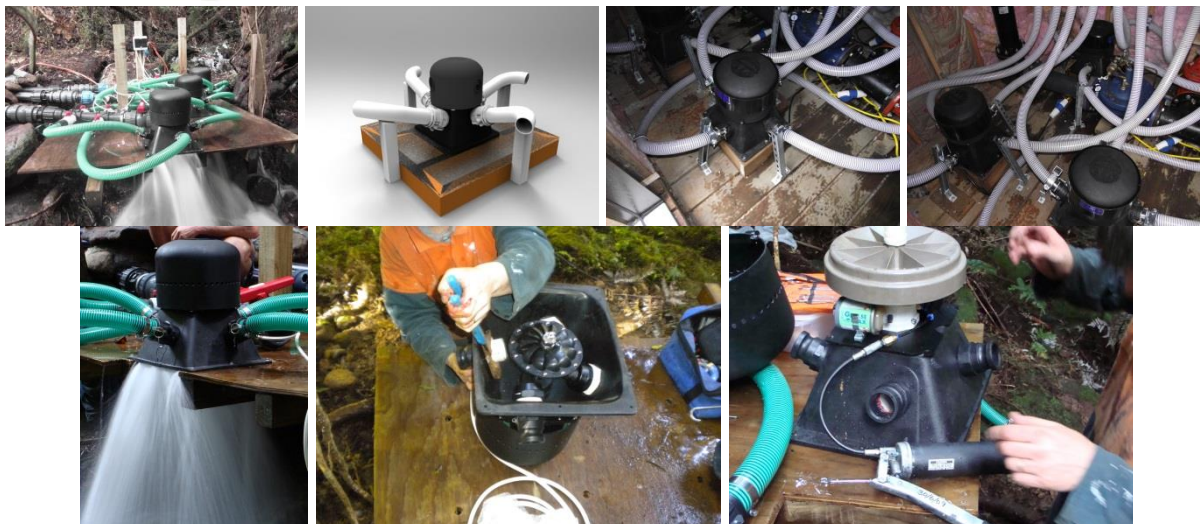
3.1. PowerSpout PLT

Runner	Pelton wheel (Impulse turbine)	
Jets	1 or 2, range 2-25mm each	
Maximum water flow rate	10 l/s	
Pelton wheel	Number of spoons on rotor	20
	Pelton spoon width	70 mm
	Length of spoon	62 mm
	Maximum jet diameter	25 mm
	Hub thickness	17 mm
	Hub fixing hole	12 mm
	Running diameter	230-240 mm
Pelton rotor hub	GF30 Nylon 230mm (9 inch) PCD	
Pelton spoons	GF30 Nylon	
Casing	LDPE plastic case 6mm thick (twin pack cases are 4mm)	
Bearings	Front 6005-2Z OD 52mm ID 25mm and rear 6205-2Z OD 47mm ID 25mm	
Static head range	3 to 160m (10 – 525 feet) - twin pack is limited to 100m	
Dynamic head range	3 to 130m (10 – 430 feet) - twin pack is limited to 100m	
Maximum flow/turbine	8-10 l/s (130 – 160 gpm) - twin pack is limited to 4 l/s	
Minimum flow/turbine	0.05 l/s (0.8 gpm) (special reduced core Smart Drive needed)	
Jets supplied	1 set cut to calculated size + 1 spare uncut set	
Rectification	100 amp water cooled rectifier on DC output version	
Dimensions	470 x 400 x 430 mm (18.5 x 15.7 x 17 inches)	
Weight	Net Weight 23kg. Up to 25kg packed weight.	
Warrantee	3 years extendable to 8 years Discounted twin packs 1 year Pelton wheel has a 5 year durability warrantee	



3.2. PowerSpout TRG

Runner	Turgo wheel (Impulse turbine)
Jets	1-4, range 2-22mm each
Turgo wheel	Number of spoons on rotor 12 Spoon width 45 mm Length of spoon 65 mm Maximum jet diameter 25 mm Hub thickness 50 mm Rim fixing hole 5 mm Outside diameter 180 mm Running diameter 90 mm
Turgo rotor material	GF30 Nylon 90mm PCD
Casing	LDPE plastic top case 3mm thick, bottom case 8mm thick
Bearings	Front and rear 6005-2Z OD 47mm ID 25mm
Static head range	2 - 30 m (6.6 - 100 feet)
Maximum Dynamic head	40m (130 feet)
Maximum flow/turbine	16 l/s (254 gpm)
Minimum flow/turbine	8 l/s (127 gpm) - less possible, PLT turbine may be better suited
Jets supplied	1 set cut to calculated size + 1 spare uncut set
Rectification	100 amp air cooled rectifier
Dimensions	430 x 410 x 350 mm (16.9 x 16.1 x 13.8 inches)
Weight	Net Weight 15kg, with pipe fittings 28kg. Up to 30kg packed weight
Warrantee	2 years extendable to 7 years Discounted twin packs 1 year Turgo wheel has a 3 year durability warrantee



3.3. PowerSpout LH

Runner	150mm stainless steel propeller (Reaction turbine)
Casing	LDPE plastic case 3mm thick
Bearings	6005 OD47mm ID25mm
Static head range	3 – 16 feet (1 to 5m)
Maximum flow/turbine	55 l/s (880 gpm)
Minimum flow/turbine	25 l/s (400 gpm)
Rectification	100 amp air cooled rectifier
Dimensions	Diameter 300mm x length 1050mm (12 inches x 42 inches)
Weight	LH 23 kg (51 pounds) packed weight. LH Pro 30 kg (66 pounds) packed weight.
Warrantee	2 years extendable to 7 years Stainless propeller has a 3 year durability warrantee



3.4. PowerSpout Twin Packs – available from February 2014

Twin packs provide you with the opportunity to buy 2 turbines at once for a reduced price. Both turbines in a twin pack are for identical site data only.

Twin packs are a cost-effective option made possible by some small changes that result in lower production and freight costs. Costs are further reduced due to a shorter warrantee period and longer production lead times of up to 4 weeks.

3.4.1. PLT twin packs

The PLT twin pack includes 2 turbines, each of which is:

- Suited to sites with a head of 10-100m, and maximum flow 4l/s each
- Models available PLT 40/56/80 turbines
- Able to generate up to 300/600/900W in each price band.

These turbines are freighted face to face and plastic wrapped, no freight box is provided. As such any scuff marks caused in freight are excluded from the freight warrantee.

Each turbine has:

- No valves supplied, A200 male camlocks supplied only
- Reduced thickness case to save weight
- Warrantee reduced from 3 to 1 year
- Production lead time up to 4 weeks
- May not be available during production high season times

The twin pack also excludes:

- Cable
- Auto grease canister
- Cardboard freight carton

3.4.2. TRG twin pack

The TRG twin pack includes 2 turbines, each of which is:

- Suited to sites with a head of 2-30m, and maximum flow 16l/s each
- Models available TRG 40/56/80 turbines
- Able to generate up to 300/600/900W in each price band.

These turbines are freighted in a cardboard carton.

Each turbine has:

- No valves supplied, A200 male camlocks supplied only
- Warrantee reduced from 2 to 1 year
- Production lead time up to 4 weeks
- May not be available during production high season times

The twin pack also excludes:

- Cable
- Auto grease canister