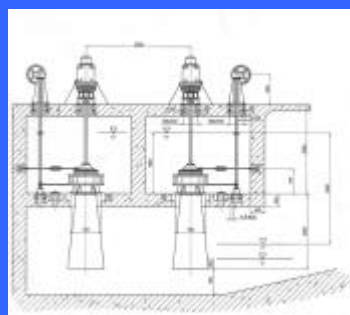
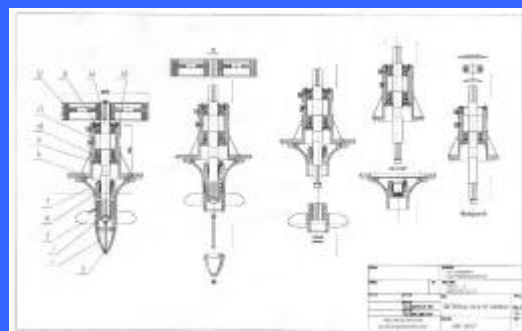
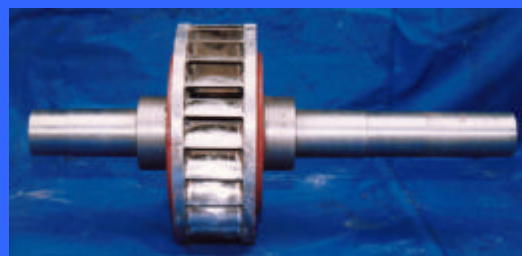
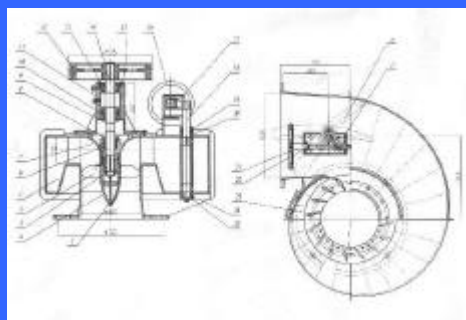


# Electricity from Water with PowerPal.



## Mini Hydroelectric Generator Series.



## Case Histories – 10kW to 200kW Systems



**Asian Phoenix Resources Ltd.**  
A Canadian Corporation

village power   industrial use   grid tie • independent power • electricity co-ops

*We at PowerPal are committed to providing affordable and reliable renewable energy for both developing countries and remote locations everywhere. We realize that PowerPal is often a major investment for our customers, whether it is for a single 200W generator for a farmer or a consortium of business interests planning a larger power project. Our aim is to provide reliable and robust solutions that are competitively priced and do what they're supposed to do – bring you the power where you need it.*

## 200kW Pelton

### Nam Quang Power Station, Cao Bang Province - Vietnam

Cao Bang Province is one of the most mountainous as well as poorest provinces in Vietnam. To help alleviate poverty and to bring power to remote Nam Quang District this 600kW hydropower station was built in 1999. The station comprises three 200kW Pelton turbines manufactured in Hanoi, Vietnam. Site details are:

- Water Head: 166m
- Water Flow: 180 l/sec per turbine.



## 150kW Francis

### Na Tu Power Station, Cao Bang Province - Vietnam

Also in Cao Bang Province, this power station consists of two 150kW Francis turbines for a combined output of 300kW. The generated electricity powers a small town including government buildings, shops and households and has been operating since 1999.

Site details are:

- Water Head: 53m
- Water Flow: 400 l/sec per turbine.



## 135kW Francis

### "E40" Power Station, Gia Lai Province - Vietnam

This installation was built for a Border Police outpost and adjacent township in the Central Highlands province of Gia Lai. Twin Francis turbines and associated equipment were manufactured and installed to give a combined output of 260kW. It has been operating since 1999.

Site details are:

- Water Head: 12m
- Water Flow: 1760 l/sec per turbine.



*On these pages you will find examples from our range of 10kW to 200kW Hydro Systems. Many other combinations have been successfully manufactured & installed including our range of micro-hydro (<10kW) and larger mini-hydro (>200kW) solutions. We are always pleased to quote for new projects and for this we ask you for water head and flow data, whether for stand-alone or grid-connect use, plus required voltage, phase and frequency output. Any other available data is welcomed such as simple site drawings / photographs.*

## 55kW Cross-flow

### Lang Than Power Station, Yen Bai Province - Vietnam

This Provincial-funded project was undertaken to provide lighting and domestic power where grid power had not reached. A single 55kW system was installed there in 2001 and like all other installations elsewhere is performing very well under remote and difficult conditions.

Site details are:

- Water Head: 31.6m
- Water Flow: 290 l/sec.



## 25kW Cross-flow

### Ma Po Power Station, Ha Giang Province - Vietnam

Built expressly for a workers' co-operative in 1998, this station provides enough electricity for operating heavy machinery, for the worker's accommodation and for the management office. Two 25kW turbines have been installed for an output of 50kW.

Site details are:

- Water Head: 30m
- Water Flow: 1480 l/sec per turbine.



## 11kW Semikaplan

### Pena Guest House, Galicia - Spain

The Pena Family in northern Spain ordered this system to power an old mill house they were restoring for use as a holiday guest house. The system had to fit a confined area to conform with Heritage laws thus a scroll-case turbine was designed in 2001. It is used to power hot water systems, lighting, appliances as well as central heating.

Site details are:

- Water Head: 3m
- Water Flow: 500 l/sec.





# List of Vietnam Projects since 1998

Name of project	Parameters			Type	
	Province	Q (m <sup>3</sup> /s)	H (m)		N (kW)
E40 – Gia Lai (2 units x 135kW)		1.76	12	135	Francis
Na Ri - Bac Can		1.350	14.5	135	Francis
Na Ri - Bac Can		0.75	14.5	84	Francis
Z12 - Dac lac		0.38	41	84	Cross-flow
380 - Bac Can (2 units x 200kW)		0.56	48	200	Francis
Hoa Binh		0.180	16	20	Cross-flow
Tan Lac - Hoa Binh		0.250	8	12	Cross-flow
Ba Che - Quang Ninh		0.270	8	12	Cross-flow
Na Tri - Ha Giang (2 units x 44kW)		0.187	45	44	Cross-flow
Thac Bay - Lai Chau (3 units x 800kW)		2.5	42.5	800	Francis
Ban Hoang - Cao Bang		2.1	18	270	Francis
Nam Quang - Cao Bang (3 units x 200kW)		0.18	166	200	Pelton
Khoang San I-Cao Bang (2 units x 400kW)		0.45	125	400	Francis
Bom Puoi - Thanh Hoa		0.42	75	200	Francis
Thach Ban -Thanh Hoa		14.2	4	400	Semikaplan
Ta Sa - Cao Bang		2.1	50	780	Francis
Na Ngan - Cao Bang		2	45	760	Francis
Na Tu - Cao Bang (2 units x 180 kW)		0.4	53	180	Francis
Nam Si Luong - LaiChau (2 units x 250kW)		3.2	9.5	250	Semikaplan
Xuan Minh - Hoa Binh		0.028	240	40	Pelton
Giap Dat - Hoa Binh		0.15	20	12	Semikaplan
Thung Lung - Hoa Binh		0.5	4	12	Semikaplan
Ma Po – Ha Giang (2 units x 25 kW)		1.48	30	25	Cross-flow
Lang Than – Yen Bai		0.29	31.6	55	Cross-flow



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