MICRO HYDRO FOR THE FARM AND HOME

How much can I expect to save?
This depends entirely on the available flow, available head (fall) and the duration that the flow is available. Some farms struggle to maintain adequate dam levels and experience low environmental flow during irrigation seasons – this can impact on your ability to generate hydroelectricity.

If the unit you install is less than 10kW, you can normally expect to achieve net metering which means that if you pay 25 cents per kwh for your power you will be credited on your account the same rate for the power you generate.
This is up to your power provider, acceptance may be based on the quantity of power you purchase, the quantity you expect to produce and the location of the system.
Please note that if you are on a contestable contract you need to look closely at the kwh rate you are on and contact your provider regarding buy back / credit for the power you generate. They may offer you net or less or they may not want it at all.

What will a typical system cost and how much water will it need?
Installation prices can vary considerably and depend upon:

- The type and size of turbine best suited to your needs
- What penstock (inlet pipe work) is required
- The amount of civil required
- The amount of electrical infrastructure required
- The proximity and access to a grid connection.

<u>'Low Head' Case Study – Typical System $40,000 to $50,000</u>
For example, a 'low head' with minimal fall to the turbine might typically involve two turbines each capable of generating 3kWh based on a flow of 45-60 litres per second each, from an 11m head. Connecting the system required 15m of 300mm poly penstock with only average civil works and an existing shed. Grid connection was readily available on site.

Are there incentives for micro hydro systems?
The Federal Government offer low interest loans for energy efficiency projects which can help mitigate the initial cost of installation. Information on financial

incentives and loans can be accessed through the Department of Economic Development, Tourism and the Arts (DEDTA).

And what would be the return on my investment?
The 'low head' scenario involves a pair of 3kW units running 24 hours day, each one generating 72kWh per day. At 23 cents per kW, this equates to a return of $16.56 per day, $115.92 per week or $6,027 per unit, per annum.

So, with both turbines producing power all day, every day, all year round, the potential return on investment is $12,054 per annum.

But remember, to achieve this saving your site needs to be capable of providing flow of 2,700 litres per minute, 162,000 litres per hour or 3.8 megalitres per day per turbine - that's the same volume of water as two Olympic-size swimming pools every day!

A reduction in flow or head will drastically alter the performance of the turbine and generator.

By way of a comparison, a 300mm pipe with an 8m head is capable of passing 200 litres per second or 17.28 megalitres per day, which is more than enough to power the 'low head' system and achieve a fantastic return on your investment.

<u>'High Head' Case Study – Typical System $24,000</u>
'High Head' sites utilize a different turbine design. The High Head units we use are 'Powerspout Pelton Wheel' units capable of generating up to 2kW per unit. These state-of-the-art turbines are 'stackable' which means that additional units can be connected if the flow allows it. Turbine and inverter packages start at $4,000 plus penstock, installation.

How does this compare to the 'Low Head' system?
Comparing the two, the High Head system can deliver the same savings with significantly less water provided the fall (head) is sufficient.

For instance, a 60m head (fall) directed through 250m of penstock pipe (100mm diameter), powering 3 turbines producing 1,073 watts each, provides 3.2kW of power.

The major advantage is that this system only requires a flow rate of 11.2 litres per second, 672 litres per minute, 40,320 litres per hour or 967,680 litres per day. That's around a quarter of the flow required in the comparable 'low head' setup and as the water available diminishes, each turbine can be shut down so that generation can continue at a lower power output.

Ultra Low Head Systems – COMING SOON!

Degree C will have an Ultra Low Head, Grid Connect system available in early 2012. Requiring a fall of between 1½m and 4m and a flow of 40 litres per second, these units will produce 750 watts (based on a 3.3m fall). Prices are expected to be similar to the High Head units.

Note: System costs are approximate and will vary depending on the unique characteristics of the site. As a rule of thumb, Low Head installations require a higher flow than High Head installations.

Frequently Asked Questions

What water volume do I have?

If you do not have records on seasonal flows you will need to monitor and record your flow. The longer the recording, the more accurate the estimate and this will help to gauge the risk on your investment.

Can I generate in non irrigation season only?

Yes, but payback time may be longer.

Can I install units over 10kW for the higher winter flow?

Yes, but you will only attract the wholesale rate for the power you generate. Aurora Energy will only pay net metering rates up to 10kW at this stage. The wholesale rate is between 3 and 4 cents per kWh.

Can I sell power back on contestable contracts?

Yes but you will need to discuss this with electricity retailer and will need to negotiate a buy back rate before proceeding. The same applies to all renewable energy generations systems.

What head (fall) do I have?

Preliminary assessments can be undertaken easily. Prior to projects commencing, accurate site measurements must be done. Dams can be measured using a pressure gauge on the outflow pipe but some longer 'high head' runs may need to be professionally surveyed.

Do I need a water licence?

No, you do not need a licence to generate from an existing dam outflow or if you plan to install a high-head run-of river system. Environmental flow must remain in the water course if you are piping water for any distance and in all cases you will need to comply with the Water Management Act 1999.

In some circumstances it may be beneficial to obtain a Non-Consumptive Water License to stop the available flow being reduced by upstream allocations.

GENERAL COMPARRISONS ON RENEWABLE ENERY SYSTEMS

PHOTOVOLTAIC (P/V) SYSTEMS

A 1.5kw solar photovoltaic (P/V) system in Tasmania will produce between 4 and 5kW on average per day (1,400kWh to 2,000kWh per annum). Depending on the weather and seasonal variations, some days will be higher and some will be lower. This will depend on the system type, shading, angle etc and will generally offset around 18% of the average household power consumption.

By comparison, a micro hydro system generating 300W continuously will generate 7.2 kWh per day over 12 months for as long as the water supply is available. The resulting 2,628 kWh generated will offset approximately 25% of the average household power consumption.

SOLAR HOT WATER SYSTEMS

Evacuated tube systems have consistently reduced the hot water power consumption for households by 60 – 75%.

Performance and benefits of these systems are as individual as each house they have been fitted to.

Systems cost on average $4,000 after installation and rebates.

Assessing the usage of each house is essential to gain an insight on value for money and return on investment.

HEAT PUMPS & AIR CONDITIONING IN THE HOME

Direct electric heating has now become very expensive. The best savings when using electricity for heating can come from installing heat pump units.

A 2.4kW fan heater will consume 2.4 kWh per hour and give out a little less than this in heat. A typical 8kW heat pump will consume around 2.4 kWh per hour but give approximately 8kW out in heating (three times the heating output from the same power input). This performance will vary depending on temperature and performance of the unit.

HEAT RECOVERY FROM REFRIGERATION PLANTS

This can be done by installing a heat exchange unit on the refrigeration system allowing the hot gas to warm water which is then stored in a pre-heat water cylinder.

Performance will depend on the refrigeration system size and the time that the refrigeration unit actually runs.

This system can be combined with solar hot water systems and heat pump hot water systems.

HEAT RECOVERY FROM AMBIENT AIR IN THE DAIRY

If you have installed a heat pump hot water system you can duct the hot air from the dairy roof area and the refrigeration plant room to your heat pump hot water system. This will markedly improve the performance of the unit. The higher the ambient air temperature, the better the performance.

DEGREE C OFFER A WIDE RANGE OF SERVICES TO THE DAIRY INDUSTRY AND HOUSEHOLDS

REFRIGERATION REPAIRS, SERVICE, NEW INSTALLATIONS AND ENGINEERING

AIR CONDITIONING, HEATING/COOLING, VENTILATION AND FILTRATION, SERVICING, INSTALLATION AND DESIGN

ELECTRICAL SERVICES – REPAIRS, INSTALLATION AND DESIGN

ENERGY EFFICIENT PRODUCTS – SOLAR HOT WATER, MICRO HYDRO, SOLAR P/V, DAIKIN AIR CONDITIONERS

HOME HEALTH AIR QUALITY SYSTEMS – VENTSMART HEAT RECOVERY AND POSITIVE PRESSURE SYSTEMS

METAL FABRICATION – HEAVY STRUCTURAL STEEL, STAINLESS STEEL, GOODS HANDLING AND CONVEYORS, SHEET METAL WORK