

MELBOURNE WATER
VICTORIA

Capturing biogas at Western Treatment Plant and reusing it as a renewable energy source case study

Electricity from treatment by-products reducing operating expenses
and greenhouse gas emissions

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WATER SERVICES
ASSOCIATION OF AUSTRALIA

At its Western Treatment Plant, Melbourne Water has been generating power from a sewage treatment by-product since the mid-1990s. Biogas, mainly methane captured in covered treatment lagoons, currently produces 95% of the plant's electricity needs, reducing greenhouse gas emissions by 83,300 tonnes of carbon dioxide per year. 390,000 megawatt hours of renewable electricity have been generated since 2005. New sources of biogas are being investigated under funding from the Smart Water Fund, including capturing between 10% and 20% of dissolved methane currently lost in partly treated sewage exiting from under the lagoon covers. Another initiative involves growing algae biomass to generate electricity, enabling recovery of nutrients, taking treatment load off the plant, reducing operational expense and deferring capital expenditure.



HARVESTING ENERGY THAT COULD HAVE GONE TO WASTE

Melbourne Water is using a by-product of the sewage treated at its Western Treatment Plant (WTP) in Werribee to produce electricity. Power is generated at the plant from biogas captured in covered treatment lagoons. Biogas, mainly methane, is a by-product of sewage treatment. The on-site electricity is generated by a 10 megawatt biogas fuelled power station owned and operated by electricity provider AGL. Two new power generators were also recently installed at WTP and this will increase on-site renewable energy generation from 52 gigawatt hours per year to almost 72 GWh/yr, or about 95% of the plant's annual usage. This will reduce greenhouse gas emissions by a further 24,400 tonnes of carbon

dioxide per year, which is the equivalent to taking about 5,600 cars off the road.

The biogas power plant is a critical part of Melbourne Water's goal of achieving zero greenhouse gas emissions by 2018. Melbourne Water regularly assesses the feasibility of increasing biogas generation capacity at WTP. Several expansions have occurred since biogas generation was first installed in the mid-1990s. The decision to expand includes balancing forecasts in biogas production, the capital cost of increasing the size of the power station and the cost of grid supplied electricity.

POWERFUL PARTNERSHIP

Renewable energy company, AGL, has worked closely with Melbourne Water since 1999 on this, our latest project, to build and operate a biogas fuelled power plant at the Western Treatment Plant.

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IMPRESSIVE OUTPUT

WTP currently produces about 95% of its electricity needs through on-site renewable energy generation. This reduces greenhouse gas emissions by 83,300 tonnes of carbon dioxide per year, which is equivalent to taking about 19,100 cars off the road. The biogas fuelled power plant will help Melbourne Water achieve its goal of zero net greenhouse gas emissions by 2018. Increased electricity generation will allow WTP to not only become energy self-sufficient, but export excess electricity to the grid. Since 2005, 270,000 megawatt hours of renewable electricity have been generated at the Western Treatment Plant, preventing the emission of about 330,000 tonnes of greenhouse gases.

The plant is expected to be energy self-sufficient by mid-2012, following installation of one further power generator. By then, the plant is likely to be producing more power than it needs and the excess electricity will be exported to other Melbourne Water sites.

GOOD FOR US, OUR CUSTOMERS, THE ENVIRONMENT, AND FUTURE GENERATIONS

Energy from biogas benefits the environment by reducing emissions, our business through reduced liability via a carbon price, and customers—as that benefit passes through to water service prices. Future generations will also benefit from the ever-evolving work in increasing the use of renewable energy.



MORE POWERFUL PLANS IN THE PIPELINE

Melbourne Water is currently investigating new sources of biogas at the WTP, including:

- > Capturing dissolved methane in partly treated sewage exiting from under the lagoon covers. It has been estimated that between 10% and 20% of methane is currently lost in this manner. Melbourne Water has received funding under the Smart Water Fund for this work.
- > Growing algae biomass for conversion to biogas. It is hoped the growing of algae will:
 - provide biomass for conversion to biogas for electricity generation
 - enable the recovery of nutrients contained in the sewage
 - take treatment load off the treatment plant, reducing operational expense and deferring capital expenditure
 - Melbourne Water is working with Flinders University who has received funding under the Smart Water Fund for an algae growing trial at

WTP. It is anticipated algae growing ponds will be operational in early 2013.

- > Utilisation of Waste Activated Sludge from WTP embedded activated sludge processes

In addition Melbourne Water has investigated other sources of on-site energy at WTP and other key sites. These include:

- > Investigating the installation of wind turbines on site. There is a relatively good wind resource at WTP and operation of wind turbines would be economic. However wind turbines were not proceeded with, due to potential issues with local birds and the Ramsar listing of WTP
- > Working with students from RMIT, Melbourne Water has conducted preliminary assessments of low head, high flow, hydroelectric power stations utilising the effluent flow from the plant
- > Obtaining quotes for installation of solar photovoltaic panels at the WTP Office and maintaining a watching brief on the falling costs of solar.

MELBOURNE WATER

Melbourne Water is responsible for Melbourne's water supply catchments, treats and supplies drinking water, removes and treats most of Melbourne's sewage, provides recycled water for non-drinking purposes, and manages rivers and creeks and major drainage systems.