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FUTURE FOCUS

The Ballarat Tramway Museum Goes Solar Powered

PAUL MONG AND WARREN DOUBELDAY, BALLARAT TRAMWAY MUSEUM

Top: **A Ballarat Tramway tram leaving the Museum's maintenance shed.**

Bottom: **Solar panels on the roof of the Tramways Depot.**

Left: **Solar power inverters inside the Tramways Depot.**

Paul Mong and Warren Doubleday explain how the Ballarat Tramway Museum switched to solar to reduce operating costs and gain sustainability. This Accredited Museum is entirely operated by volunteers and is one of only three solar-powered electric tramways in the world.

Almost twelve months ago the MAP Accredited Ballarat Tramway Museum installed solar panels on its tram storage/display building in the South Gardens Reserve of the Ballarat Botanic Gardens. The Museum operates its trams along a part of Wendouree Parade, where trams have run since 1887 and many of the Museum's tramcar fleet are now over 100 years old.

Part of the solar installation work required our existing sub-station equipment to be rebuilt to meet current standards and to enable the panels to be connected. Prior to the installation being commenced, negotiation and consultation took place with Powercor, the City of Ballarat, Heritage Victoria and a local solar power installation company, Marshall Power Solar Solutions. All necessary permits were granted within the expected timeframes. Powercor authorised the installation of a 30kW system that could feed back into the grid. Only 18kW or seventy-two panels have been installed at this stage. Work to install the panels, took place during late November 2014. The Museum became the third electric street tramway in the world to use solar panels, joining Bad Schandau, Germany and Tenerife, Spain.

The project to upgrade our substation and installation of solar panels was seen by the Museum as having the long term benefit of reduced operating cost while helping to do our bit for the environment by 'going green.' Modelling prior to the installation showed that on the average year we should generate more than we would draw from the network–making us indeed a solar-powered tramway.

Our first power bill for the December to February quarter went from just over $1000 for the previous year to $280, including the fixed charges. This would have been lower again had the solar contribution been able to be measured for the whole of the quarter instead of for just one month. The March to May quarter bill was $190 including the fixed charges of $120. The previous bill for the same time last year was just over $1200.

The installation of the panels meets the Museum's power needs except when a tram car is actually operated, when some power has to be drawn from the grid due to the high starting current.

The project business case was developed and submitted for final approval at the January 2014 Board meeting. The final option was for the use of volunteer labour to undertake the building and some of the installation work in the sub-station itself. The Museum was fortunate in having the necessary in-house technical and management expertise to undertake the project. The budget to upgrade the sub-station and install the solar panels (15kW) was $38,091. The actual system installed was 18kW, more effective for a small additional cost and reducing panel costs. The panels themselves cost just under $20,500. The total project cost for the substation upgrade and the solar panels was $40,600.

A bequest from a deceased member along with internal Museum funding enabled the project to be financed. The Board decided to use this bequest for this project because it would have ongoing benefit to the Museum.

Further space is available to install another thirty-six panels or 9kW. With the ongoing development of solar panel technology the installation can be expanded, and when necessary replaced in stages in order to maintain the overall efficiency of the installation. The development of battery storage options is gaining pace and this is another option that is likely to be considered in the future and may enable us to almost go 'off grid.'

Paul Mong, Vice President and Warren Doubleday, Manager Museum Services at the Ballarat Tramway Museum.

The Ballarat Tramway Museum is located in the Botanical Gardens, on the western shore of Lake Wendouree. Trams operate every Saturday, Sunday, public holiday and during school holidays between 12.30pm-5pm throughout the year. Visit the Ballarat Tramway Museum at: www.btm.org.au

The Museum Accreditation Program (MAP) has developed a Green Guide for Small Museums and has been running Energy Auditing workshops. Find out more or request a copy of the Green Guide by emailing map@mavic.asn.au