Case Study

Mandurah Performing Arts Centre

Analysing Energy Performance

Greener Live Performances

through energy efficiency

Background

MANDURAH PERFORMING ARTS CENTRE

The Mandurah Performing Arts Centre was officially opened in June 1997 funded by the WA State Government and the City of Mandurah. Comprising the Boardwalk Theatre, the Fishtrap Theatre and the Alcoa Mandurah Art Gallery, the Centre is an icon for the performing and visual arts in the Peel Region. Other facilities within the Centre include a Dance Studio, meeting rooms, artist dressing rooms and retreat areas. As part of the local government's commitment to sustainability, the City of Mandurah has installed a 100 kW (DC) solar PV system on the Mandurah Performing Arts Centre building rooftop in December 2014.

In 2014, the Centre welcomed a total of 156,000 people to the Centre, with around 61,600 patrons to ticketed shows, and an additional 94,300 people through the Alcoa Mandurah Art Gallery and conferences and community events. The Centre's footprint is 3,344 square metres, excluding the privately operated Centre Restaurant on site.

Analysing Energy Performance

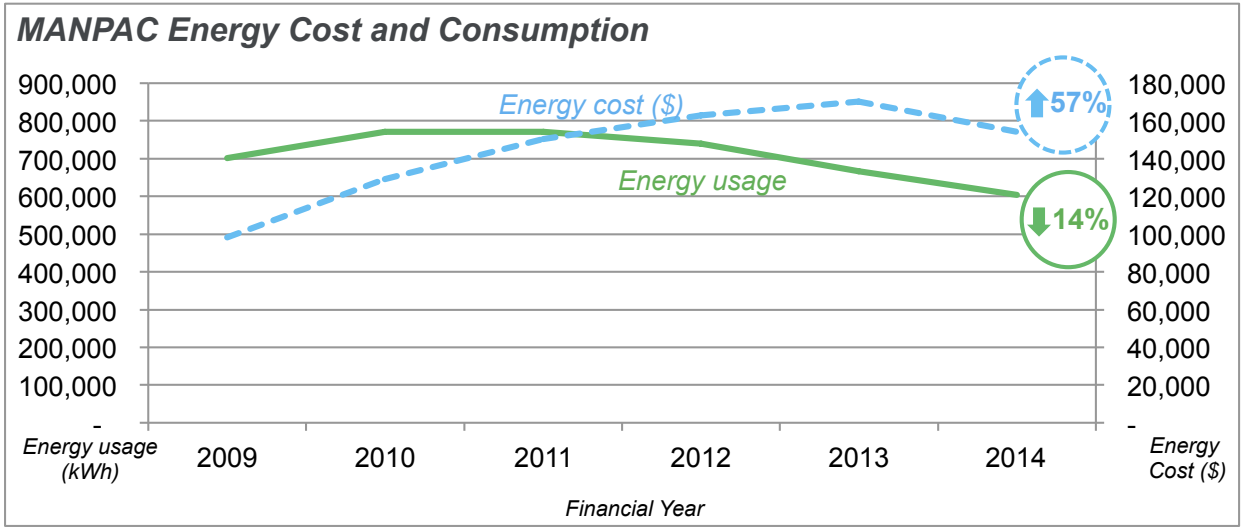
Mandurah Performing Arts Centre (MANPAC) is committed to maximising cost efficiency and reducing its environmental footprint. Electricity made up around 10% of the Centre's total operating cost in the 2013/14 Year and MANPAC has been tracking and analysing their electricity consumption periodically since 2008. MANPAC solely relies on energy usage data available through its energy provider, Western Power.

At the end of every month, MANPAC reviews its energy bill to compare performance to previous months, map the usage to the event and bookings schedule and aggregate the data to track performance on an annual basis.

To look at a more detailed break-down of the Centre's energy consumption, MANPAC requests additional data from Western Power. This includes monthly data detailing the usage per day and daily data broken down into half hourly intervals. MANPAC keeps a track record of usage data in spreadsheets to monitor performance over time using the following key performance indicators:

- Total power usage per month/ year (kWh,$, total peak and total off-peak power usage)
- Average power usage per day (kWh,$) compared to previous years (month by month)

These figures are reviewed regularly taking increases in the cost per unit of electricity into consideration. The graph below shows the Centre's energy performance over the past six years.



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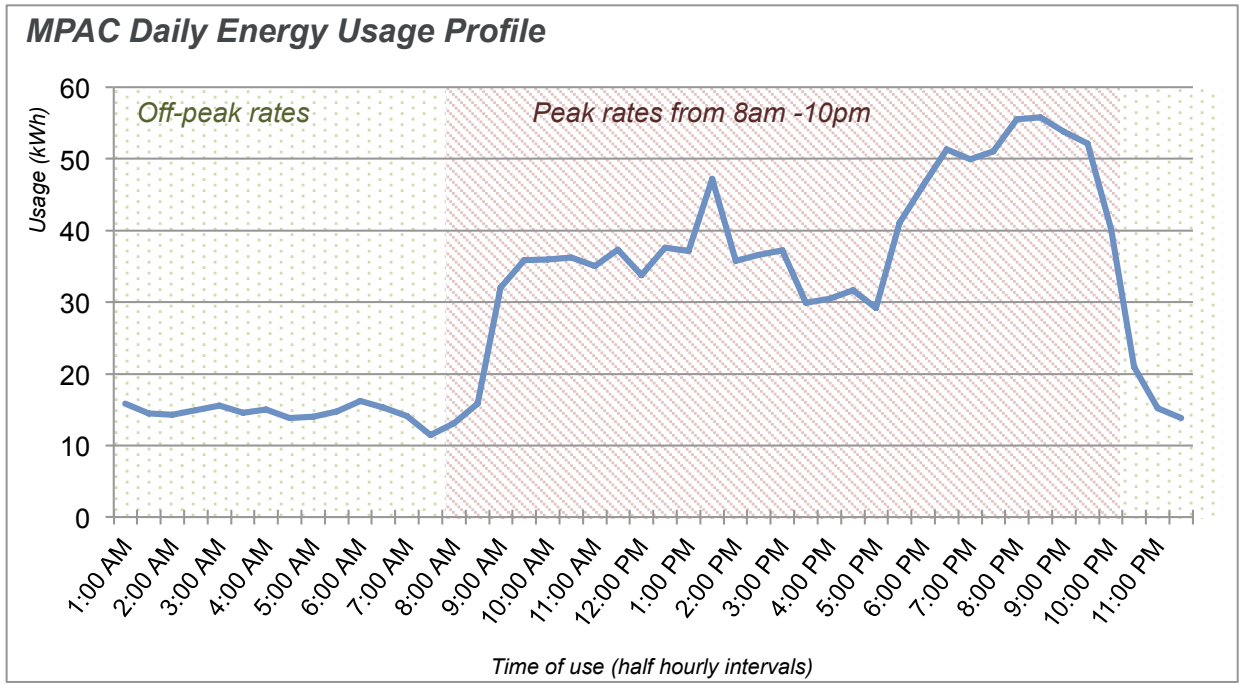
Looking at the cost ($) and energy usage (kWh) trends, the importance of monitoring both, energy usage and cost becomes apparent. While MANPAC has reduced its energy usage by 14% since 2009, total energy costs have risen by 57%. Since 2009, MANPAC has noted a 52% increase in the cost per unit of electricity explaining the rise in energy cost over time. However, the Centre's activity (measured by the amount of performances and bookings) has doubled over the same time frame, showing that MANPAC's efforts to reduce energy consumption have achieved significant results.

In the last year alone, MANPAC has reduced their energy consumption by 9% compared to the previous year resulting in $16,000 of savings on their energy bill. The Centre puts this down to a combination of staff awareness, and the growing use of LED fittings by touring companies.

By requesting half hourly use data, MANPAC can analyse its energy consumption throughout the day, track when energy usage peaked and why, and understand their energy demand in relation to peak and off-peak charges. An example of the half hourly data provided by the energy provider is presented below.



Measures Implemented

The 14% reduction in energy consumption despite the significant increase in the amount of performances run at the Centre has been achieved through a variety of measures taken across the venue:

Lighting Retrofits and Control Mechanisms

Since 2011, MANPAC has installed a number of lighting motion sensors across the venue to ensure lights are switched off in areas which are not in use. In 2012, the Centre also replaced 250 fluorescent lights with LED lights across the venue helping to reduce energy bills and it is intended to replace the balance of 100 fluorescent lights in the next financial year.

Educating Staff

Behaviour change plays a critical role in achieving energy saving goals and continuously reminding staff to switch off lights and equipment when not in use has made a significant impact at MANPAC. The changes and achievements are communicated back to staff during staff meetings.

Air Conditioning

The City of Mandurah recently engaged an energy consultancy to review energy efficiency opportunities at the venue. Findings showed that the Air Conditioning system makes up 50% of their total energy cost, which increased the Centre's awareness of the importance of managing and monitoring the Air Conditioning system to reduce inefficiencies.

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Through the Centre's Building Management System, MANPAC ensures that units are not left on when the Centre is not in use, loads are adjusted to suit conditions and the air conditioning is turned off in areas that are not in use. While the Centre's BMS is set up for timers, the usage of the MANPAC is not regular and staff has found it more expedient to adjust loads manually as required.

Benefits of Analysing Usage

By reviewing energy consumption in relation to the activities undertaken in the venue, MANPAC has a good understanding of its average daily consumption and their progress over time enabling the Centre to better manage costs and pick up on irregularities in usage.

Better cost management

Through the analysis of half hourly data and mapping event schedules to the loads, MANPAC has a good grasp of the average electricity cost incurred through particular types of events or bookings. While MANPAC does not charge shows for their power usage directly, the Centre monitors and adjusts the hire cost to ensure cost recovery. For example, by monitoring half hourly usage data, MANPAC identified that school dance shows use significantly more energy than other shows and adjusted venue hire prices for these user groups to ensure cost recovery.

Increased awareness of usage

Through the Centre's review practices, MANPAC has been able to identify irregularities in usage caused by spikes and equipment faults. For example, MANPAC picked up on a spike in energy consumption outside of usual peak hours and contacted Western Power for clarification. As it was a noticeable deviation from their normal usage pattern and there was no identifiable reason for the spike, MANPAC received a refund for the cost incurred by the spike.

While MANPAC has no influence on the type of equipment touring companies use, the Centre has observed that touring companies increasingly rely on LED stage lighting and video screens. Through the analysis of daily and half hourly data, MANPAC has noted a significant difference in energy usage between those shows using LED technology and those that don't.

Next Steps

MANPAC is committed to continue its energy efficiency journey and major next steps include the following:

Sub-metering

MANPAC is currently looking into the installation of permanent data loggers to monitor the energy usage across different areas of the venue to gain a better understanding of where energy is consumed and how improvements can be made.

Air Conditioning

Through the recent energy audit, the Centre is aware of the high energy consumption generated by the Air Conditioning system. The current unit is 17 years old and at the end of its life span. As the unit still uses the R22 gas, the City of Mandurah has recognised the need to replace the system. Through their energy consultancy, the Centre is looking into the most cost-effective option for replacement. While they have identified the system with the highest capital expenditure as the most suitable (a District Cooling Plant with an open loop to the nearby estuary outlet), the new unit is expected to reduce energy usage for the Air Conditioning equipment by half, which would mean a 25% reduction in MANPAC's overall energy cost.

Lighting

MANPAC is also looking at replacing the current incandescent foyer lighting with dimmable LED lighting, which would further reduce their energy consumption.

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