

MEASUREMENT & Verification

CASE STUDY: 530 Collins Street

M&V helps deliver a 5 Star building in Melbourne.

The Project

530 Collins St is one of Melbourne's premium office buildings. When the major mechanical systems were approaching end of life, the opportunity presented itself to improve the energy efficiency, as measured using NABERS, along with the planned capital upgrade works.

GPT entered an Energy Performance Contract (EPC) with Honeywell to deliver a guaranteed 5 star NABERS Energy performance, a significant improvement on the national average 2.5 stars. This peak performance, 5 stars being the highest rating available, would allow 530 Collins St to maintain an advantage in attracting tenants in the competitive Melbourne office market.



Cogeneration display screen

The EPC involved a guarantee in 4 parts: energy savings in \$'s and GJ, the NABERS rating and continued provision of optimal comfort conditions throughout the 67,000 sqm of office space. This involved detailed collaboration between the parties during the preparation of a comprehensive Measurement & Verification (M&V) plan at the project design stage. The intention being that daily performance could be assessed against the 5 star NABERS standard.

530 Collins Street is now operating one of Melbourne's few onsite cogeneration plants, a high efficiency, low carbon power station, from its podium roof. New high efficiency chillers, with variable speed drives, were installed along with energy efficient lighting. A sophisticated interface to the Building Management System was designed specifically for the building. It collects a broad array of energy and water meter data that enables the continuous tracking of building performance. Simple dashboard charts highlight the daily rolling NABERS rating, energy to



Installing cogeneration into 530 Collins St

consumption and a statistical analysis of building comfort conditions.

M&V overview

The M&V methodology was to establish detailed monitoring of energy and operational data for all systems impacted by ECMs. Part of the M&V commitment was to ensure that comfort conditions were tracked, managed and maintained. In order to do this, dashboards were created where energy and comfort performance could be quickly assessed.

Both M&V Option B and C were used in the project. Project guarantees were based on whole of base building performance so Option C was used. Individual ECMs were tracked using option B to ensure each ECM was contributing as expected.

The M&V approach was designed to align with Honeywell's commitment to meet a 5 star NABERS rating. Consequently the approach to understand the pre-works energy performance was to use sophisticated

Costs saved / yr:	\$360,000
Electricity saved / yr:	4,800 MWh
GHG saved / yr:	4,700 tonnes CO₂-e
Nat Gas increase / yr:	18,698 GJ **
Payback (yrs):	3*
M&V methodology:	Option B & C

* includes funding from green building fund

** See note at end of case study

modeling of the building's energy performance relative to climate conditions and time-of-use. This model also informed the metering strategy ensuring critical loads could be suitably measured and identified energy consumption per subsystem.

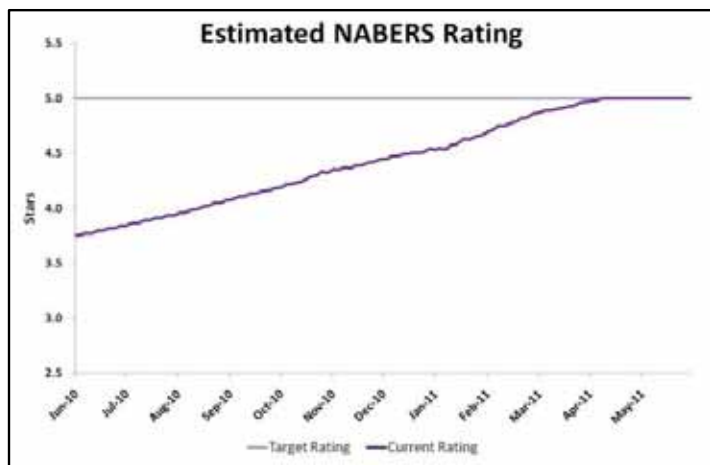
Using risk management principles the loads that had the greatest potential to affect the overall energy use are monitored and reported discretely. Then the process of how to communicate performance information at a frequency most useful to the project team identified the right information to be communicated on a daily, weekly, monthly, quarterly and annual frequency. Used this way M&V is not just a means to "keep score" at the end of each performance period it becomes an even more important management tool to predict performance and implement corrective action before it's to late.

The NABERS Performance Contract is understood to be the first contract of it's kind and is a 5 year agreement.

Benefits of M&V for this project

M&V has been crucial to the achievement of the NABERS rating targeted for 530 Collins Street. The approach to M&V has been to go beyond retrospective verification of performance to use a continuous commissioning approach i.e. daily tracking and operational interventions to ensure the building meets its energy efficiency and NABERS goals. With changes in building use and changing performance of equipment, this approach has delivered major benefits.

It is estimated that continuous commissioning has contributed about 0.5 stars towards the NABERS performance of 530 Collins Street.



Above is the graph showing the estimated NABERS rating tracking towards and achieving the '5 star' target.

Two examples of the kinds of improvements made through continuous commissioning during the first year of M&V are as follows:

Changes in the use of building space changed the distribution of cooling requirements around a number of floors. We were able to determine that the control strategy used to balance energy use across the variable air volume and air handling units could be further optimized due to this change. This improved the energy performance across these systems.

It was also identified that a change in operational schedules had not been reflected consistently across the lighting and HVAC controls – vacant areas / floors were being conditioned. We corrected this anomaly and saved further energy.

M&V Methodology in detail

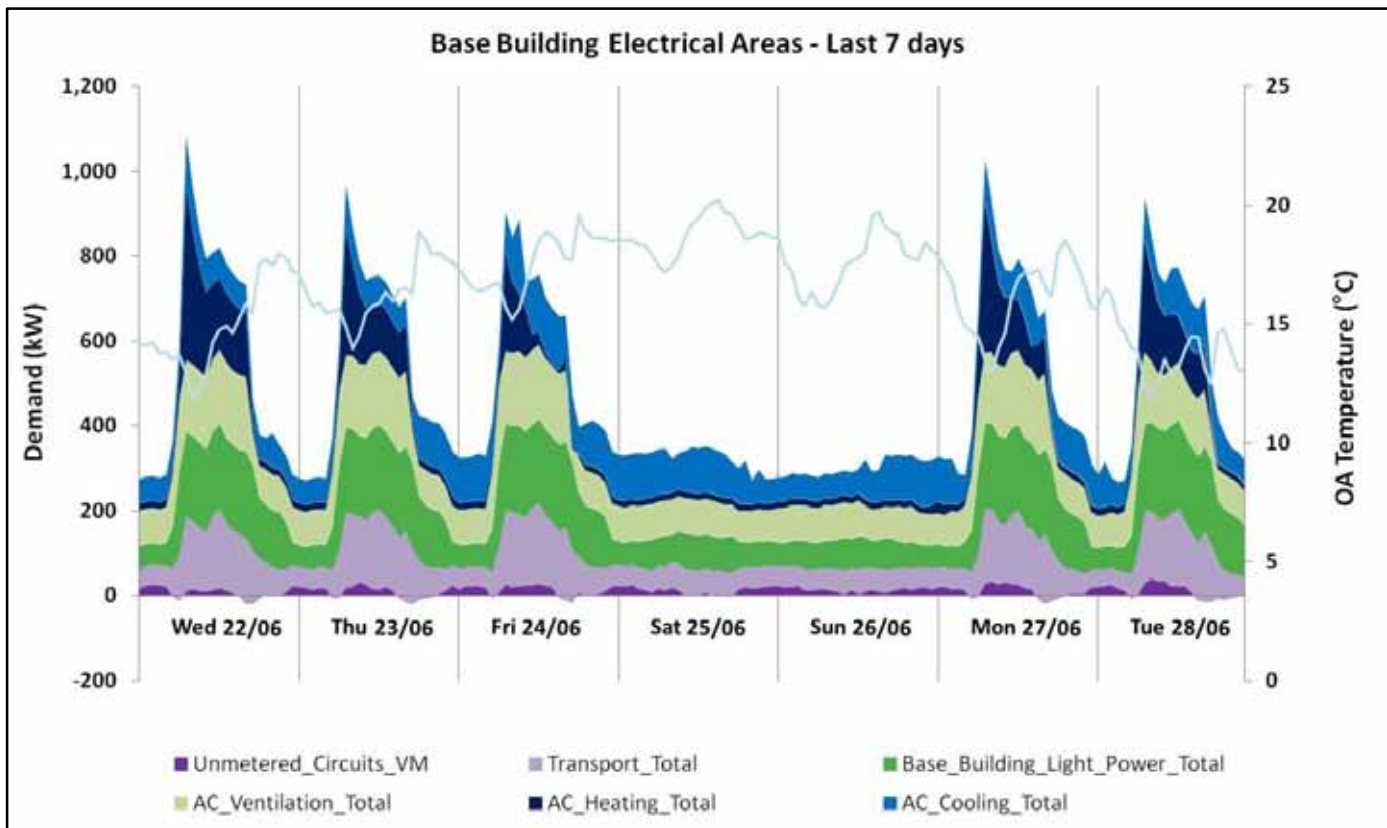
The M&V process was chosen to provide normalized data based on climate conditions, occupancy and changes to functional spaces in order to support reaching a 5 star NABERS energy rating.

Significant emphasis was placed in the initial collection of historical data so that an accurate benchmark could be established. The data required to perform M&V has included energy consumption and distribution, internal and external environmental conditions and building occupancy details.

“ An important outcome of this upgrade project was the improvement in energy performance of the building, good M&V planning ensured we knew how to measure improved performance and what improved performance would look like. M&V is a non-negotiable for the guarantee period of this project and will also ensure we can run the building at peak performance into the future. ”

Bruce Precious – National Sustainability Manager
– Operations, The GPT Group.

Data capture was achieved through an advanced BMS system and energy reporting package to continually monitor performance and provide the data for the M&V. Reports were designed to present relevant and concise information emailed to appropriate parties daily. This simple “pushing” of information ensured the M&V process become the easiest daily ritual.



Examples of reports that are periodically pushed to key stakeholders are:

- Daily reports for energy consumption and distribution.
- Immediate BMS alarms that automatically dispatch a technician. Eg. Cogeneration or Chiller faults
- Weekly tracking of the estimated NABERS rating
- A foyer dashboard to keep building occupants up to date.

Quarterly reports are collated which includes a summary of the EPCs performance, a financial summary highlighting the savings made and any operational issues that have affected the EPC.

Above is an example of a snapshot of electricity use by load type that quickly enables an operator to diagnose mis-correlations between electricity use and outside temperature.

**** Note:** An increase in natural gas use is reported. This is because electricity is now generated on site via the cogeneration plant. Overall, gas cogeneration is a more efficient way to produce electricity than burning coal to produce electricity. Gas also has the advantage of having significantly less greenhouse gas emissions when converted to electricity compared with coal.

The Parties involved and why they made the M&V decisions they did

The M&V process required close alignment between the key stakeholders in the project – the owners of the building, the GPT Wholesale Office Fund, the Facilities Manager, Jones Lang LaSalle and the Energy Services Company, Honeywell.

The M&V methodology was established during the design phase of the EPC. With such an ambitious performance target, it was crucial that the upgrade would incorporate the measurement and monitoring infrastructure that has enabled the joint team to drive the building performance to the targeted level.

The energy efficiency works were part funded via the Australian Government's Green Building Fund administered by AusIndustry.