



101 Miller Street Refurbishment

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Presentation Aims



- > To describe the approach taken to a refurbishment of a commercial office building with respect to the upgrade and enhancement of the building services.
- > Describe how the services were selectively replaced or upgraded.
- > Look at the decision to include a trigeneration plant (combined heat and power) at 101 Miller Street.
 - > Benefits
 - > Constraints
- > Potential application of natural gas generation and trigeneration on a wider basis as a short – medium term reduction measure.

101 Miller Street - Background



- > Built in 1992
- > Landmark North Sydney Office Building
- > 37,000 m² of Net Lettable Area, 38 floors
- > Whole building occupied by single tenant from 1992 – 2007.
- > Building Refurbishment planned for period July 2007 – July 2008
- > Conventional mechanical air conditioning plant with VAV and 1 off AHU per floor, electrical and lighting systems for high level grade building.



101 Miller Street - Background



- > Services generally in good or very good condition

- > Services
 - > Air distribution / VAV's in excellent condition
 - > Cooling plant and cooling towers good
 - > Lifts suffered accelerated wear and tear
 - > Lighting and electrical good

- > Tuning programme lifted ABGR Rating from 3 to 4 Stars through period 2002 – 2005.

101 Miller Street – Refurbishment Goals



- > **Sustainability Measures targeted by refurbishment**
- > GHG emissions target set well above NABERS Energy 5 Stars level
- > 40% potable water reduction on average office building
- > Commitment Agreement 5 Star NABERS Energy rating.
- > Registered with Green Building Council of Australia (Office Design Version 2)

101 Miller Street – Services



- > Lift System, major refurbishment and replacement.
- > Lighting – Office lighting replaced with T5 high efficiency lamps with electronic ballast.
- > Lighting control system with daylight sensing and potential movement detection
- > Mechanical Services
 - > Chiller and cooling tower replacement
 - > Outside air system upgrade to increase capacity
 - > Extensive use of variable speed drives.
 - > Additional isolation damper to allow zoning from half floor to quarter floor

101 Miller Street - Services

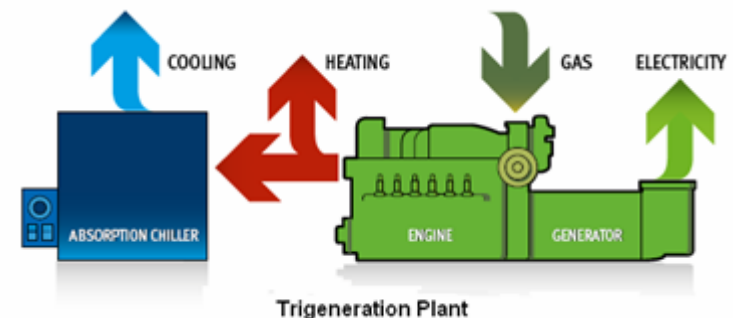


- > Low flow tap fittings and dual flush low volume toilets
- > Low volume urinals with individual sensing
- > Low VOC products used in joinery elements, paints etc
- > Lobby area uses recycled ironbark timber as feature panelling
- > Bicycle storage facilities and associated showers
- > Recycling facilities

101 Miller Street – Trigeneration



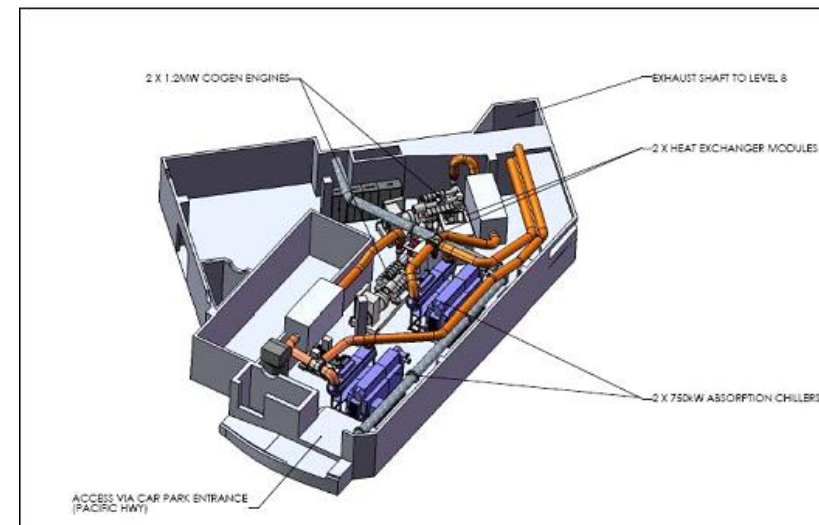
- > Emission levels targeted required additional measures beyond those already planned.
- > Mirvac previous experience with trigen in residential project in Sydney.
- > Electricity demand issues in North Sydney generated interest of supply authority planners.
- > Proven technology, high confidence that environmental outcome would be achieved.



101 Miller Street - Trigeneration



- > Outcome
 - > 2 x 1.5MVA Gas fired generators
 - > 2 x 750kWr Absorption Chillers
- > Delivery Mechanism
 - > Partner with Cogent Energy Pty Ltd to build, own and operate the trigen plant.
 - > 12 year supply energy supply agreement.
 - > Assistance of NSW Dept of Planning with integration costs.



101 Miller Street – Trigeneration Planning and Construction Issues



- > Difficulties in agreeing integration issues of trigen plant to the main supply grid resulted in export mode operation being rejected.
- > Without export mode operation generator size and operation limited by building demand profile.
- > Uncertainty over NOx level regulation. Cogent & Mirvac worked extensively with NSW Environmental Protection Agency to model NOx emissions and gain license to operate.

101 Miller Street – Trigeneration In Practice



- > The plant has been running full time for approximately 8-12 weeks.
- > Start up and running of trigeneration plant has generally gone very well.
- > We are continuing to review the balancing of the loads between the 2 off generators to ensure generators are optimally loaded.
- > The interfacing of the absorption chillers to the base building chiller plant is being fine tuned.
- > Working through energy metering and reporting requirements for emissions calculations

101 Miller Street - Conclusions



- > Existing buildings represents great opportunity for GHG reductions.
- > Careful and targeted upgrades can preserve the investment in existing buildings and deliver excellent energy and GHG efficiency results.
- > The application of trigeneration can provide low risk dramatic reductions in GHG emissions in the short to medium term.
- > Regulatory uncertainty and difficulties in planning integration with the wider power networks need to be resolved to provide a framework for greater implementation of combined heat and power applications.