

AXA Headquarters Case Study





THE CONCEPT

PROMOTING SUSTAINABLE URBAN DEVELOPMENT IN THE HEART OF MILAN

The new 19.000 m² development, now under construction in Milan, is a refurbishment of an existing building, close to the new Unicredit tower on Don Sturzo Street.

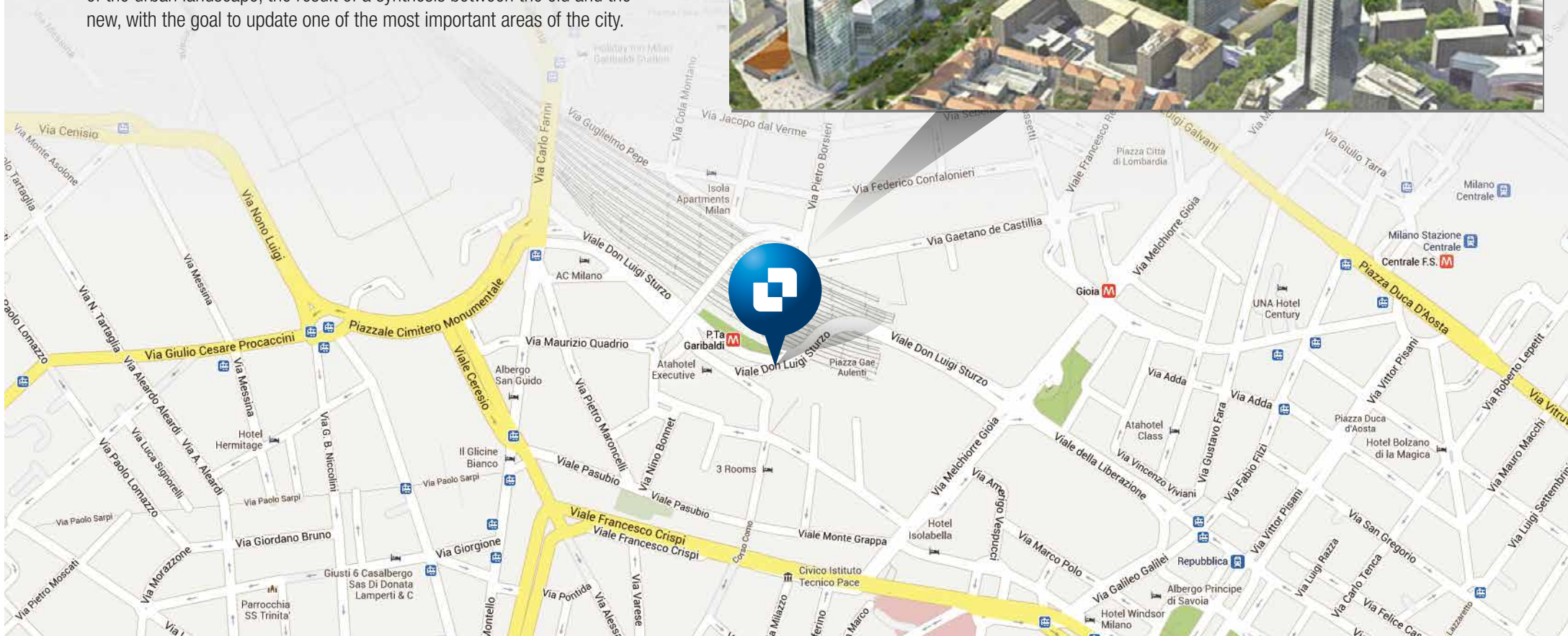
The new building will be erected in the gentrified district of Porta Nuova and will get LEED SILVER certification.

According to AXA Group, nowadays LEED certification represents an essential feature of real estate value. It is a key factor in attributing added value to real estate in terms of sustainability in the design and construction phase, as well as energy savings during the life span of the building. It is a strategic point also because being a voluntary protocol, LEED certification represents the explicit will to promote sustainable real estate with a strong focus on respect for the environment. Thanks to the adoption of efficient architectural and plant systems it is therefore possible to achieve reductions in running costs as well as in the impact on the territory and infrastructure.

THE URBAN CONTEXT

A PLACE TRANSFORMED

The building is located in a central and strategic area of Milan, near the Garibaldi Station, the new center of the city of fashion, at the crossroad between Don Luigi Sturzo street and Melchiorre Gioia street. The existing buildings in this area are characterized by a medium level of urban quality, with particular attention and respect to typological elements of the business hub of Garibaldi - Gioia area. This place is currently affected by an important urban transformation, generated by a major reinterpretation of the urban landscape, the result of a synthesis between the old and the new, with the goal to update one of the most important areas of the city.



THE ARCHITECTURAL PROJECT

AN EFFICIENT REORGANIZATION OF THE SPACE IN HARMONY WITH THE URBAN ENVIRONMENT

The architectural and artistic direction was followed by Studio Goring & Straja Architects, based in Milan.

In order to redevelop the property and improve the impact on the environment it was decided to reshape the contour lines with a new glass facade, enhanced by an ideal glass circular tower in the corner. The body of the building is developed on 9 floors above ground and 4 levels of basement and extends over approximately 13.000 m².

An efficient reorganization of the space and the addition of a new level, led the entire block to a more homogeneous and recognizable volumetric nature. The building design allows the windows to grow from the ground up to the roof.

Besides increasing the permeability and the brightness of the rooms, this choice improves the relationship between exterior and interior by creating continuity of material and strengthening the identity of the building.

Steel, aluminum, stone, and glass, are some of the materials used. It is a compositional choice aimed at finding a balance between the maximum geometric simplicity of the building and the maximum complexity of the surroundings.

"The operation has generated a major design challenge aimed primarily at achieving three objectives: maximizing the potential of the existing building by focusing resources on the most crucial aspects; making the building more homogeneous with the surroundings; expressing focus on environmental issues and energy savings (LEED Silver)."

Arch. Giacomo Sicuro
Studio Goring & Straja Architects





ENERGY EFFICIENCY AND ECO-SUSTAINABILITY

LEED SILVER GOAL AS AN EXTRA BOOST TO THE RESEARCH OF THE HIGHEST ENERGY EFFICIENCY

The project is featured by the solutions adopted in the design and the quality of life inside the building, but it has also high standards in energy performance. He is currently in pre-certification in the LEED silver.

The final design activities and the project and construction management, in addition to safety coordination both in the planning and execution have been followed by **General Planning Srl of Milan.**

“The plant design in this building followed energy saving philosophies on all fronts. Of course LEED silver goal gave an extra boost to the research of the highest energy efficiency of the building.”

Eng. Alberto Villa
General Planning S.r.l

WHY CLIMAVENETA FOCUS ON HVAC SYSTEM



As regards the air conditioning plant, which, together with lighting and mechanical ventilation systems, is always one of the more significant cost items from the point of view of energy units, efficient and innovative units have been selected, produced and tested under extreme conditions by Climaveneta.

Heating and cooling are provided by two multipurpose units **ERACS2-Q/XL-CA-E/S 2622** by Climaveneta.

In the Summer, only during peak-time, cooling energy is produced thanks to the integration of a supplementary heat pump **RECS/SL/S 1562** by Climaveneta.

The heat pump operation in the Winter is merely a back-up for one of the two multipurpose units.

Inertial tanks both on cold and hot circuits are installed further down from the multipurpose units.

The secondary circuits supplying the AHU coils and ceiling fan are powered by variable flow pumps.

The heating circuit during the Winter also powers the thermal fixtures in the washrooms.

The hot water circuit collector is provided with a detachment to service the domestic hot water pre-heating, whose production is guaranteed by a Climaveneta high-temperature heat pump **AW-HT/LN-CA-E** and two storage tanks accumulating 1,000 litres each.

The first water tank is heated by the circuit powered by the multipurpose units at just under 40°C. The pre-heated water then passes through the second boiler fed by the heat pump at 65-60°C.

An antilegionella program also allows for the powering of the preheated boiler with 65°C water.

Secondary circuits are designed to work at the following temperatures: hot secondary circuit (serving AHU, environment and preheating of sanitary hot water) at 40-45°C; secondary cold circuit serving fan coils at 10-15°C and a secondary cold circuit serving AHU at 7-12°C. The comfort of the environment is made possible by 4 pipe fan coils for horizontal installation,

“Heating by multipurpose units resets local CO₂ emissions and allows energy savings of about 40% compared to a traditional system based on a chiller and boiler”

Ing. Alberto Villa
General Planning S.r.l

with variable flow coil. The efficiency of the multipurpose units is even higher thanks to a control system especially designed for this installation. The units have been successfully tested at the Climaveneta labs, under the most extreme conditions.

The choice of variable flow and high efficiency pumps and the installation of enthalpy heat recovery units with thermal output of about 70% contributed to reducing CO₂ emissions into the atmosphere.

Technical choices have been made to maximize economical efficiency also in terms of water savings.

To that effect rainwater is collected to supply a dual network serving both sanitation and irrigation.

This network, combined with the installation of high efficiency water taps, allows the system to achieve 50% savings in drinking water with respect to traditional solutions.

Marble Arch House Case Study



Marble Arch House is a substantial high-specification mix-used British Land development addressing both the scale of Edgware Road as well as the conservation area in Seymour Street

Designed by Bennetts Associates Architects and enjoying an outstanding Central London location, Marble Arch House is conceived as a scheme comprising of 9.300 m² of offices, 4.500 m² of retail and ten residential apartments located in the adjacent 62-64 Seymour Street.

The major component is office space, with large floor plates parallel to Edgware Road. Overall, the project adopts a confident modern aesthetic, in

particular in the way it addresses views towards Hyde Park and solar control to the west-facing façade.

Marble Arch House is an example of a high-spec office development in Central London characterized by a progressive approach towards sustainability, and considering a lowest cost of ownership.



A wide-angle photograph of a bright, modern office space. The room features a high ceiling with recessed lighting and a floor with a light-colored geometric pattern. Large windows on the right side offer a panoramic view of a city with greenery and buildings. A glass door is visible in the center of the window wall.

Certification is essential in this development. The office development has achieved a BREEAM Excellent rating.

The residential accommodation is provided in a reconstructed and extended Victorian block which has achieved an Ecohomes Very Good sustainability rating.

As in all British Land developments, also in Marble Arch House, certification is just a part of a comprehensive, ISO 14011 certified, approach to sustainability and environmental management. Their Sustainability Brief for Developments affects the whole development process, turning their portfolio of buildings into an outstanding example of best practices in high quality, sustainable property development.

“Aiming for extremely low carbon dioxide emissions has affected all aspects of the design, from the glazing and solar shading, to the thermal mass of the structure, the adaptability of the mechanical services, and the choice of materials. The intention throughout has been to combine high architectural standards with sustainability.”

Rab Bennetts

Founding Director- Bennetts Associates Architects



“A sustainable approach to design and construction is essential to the delivery of quality buildings. We aim to lead the industry on the sustainability issues that really matter to our business and our stakeholders, setting challenging targets and supporting innovative initiatives.”

Nigel Webb
Head of Developments - British Land

SUSTAINABILITY APPROACH

Marble Arch House is an example of British Land’s approach to sustainable development, providing real economic benefits and demonstrating that green buildings are good for asset performance.

It is based on a holistic approach to development formalized in British Land Sustainable Brief for Developments, taking care of every aspect of the project, from efficient construction to cost and carbon emission reduction, managing environmental risks and conserving natural resources through energy efficiency, water efficiency and initiatives to reduce and recycle waste.

This vision is also achieved through the ability to attract high quality partners. British Land attains the highest international standards of sustainable design and construction within its supply chain and throughout the development process, selecting the most reliable partners worldwide that share the same sustainability approach.

Sustainability features at Marble Arch House include:

Extensive Green Roof Surfaces

The development will include 6.400 sq ft of green roof space, with a range of substrata so that a wide variety of wild grasses and hardy sedums can flourish. Similarly a planted wall will be installed, to further enhance the variety of species.

Water Efficiency

Water management as well as energy is a further key point in the Marble Arch House sustainability strategy. Toilets include occupancy sensing domestic water supply to minimize leaks.

Carbon Efficient Design

Predicted CO₂ emissions of around 21,3 kg per m² per year. This ambitious target is achieved through several design features such as solar control glass façades with light transmittance above 60%.

Following BCO specifications, they are conceived to increase natural daylight levels and reduce overheating and glare, thus minimising artificial lighting demand. This improves energy performance as well as quality of comfort, enhanced by a fantastic view towards Hyde Park.

'Cradle to factory gate' targets

Challenging targets for embodied carbon on major building elements, such as cladding and concrete frame, based on comprehensive environmental lifecycle assessment have been set for Marble Arch House, in compliance with British Land Sustainability brief for developments.

Excellent BREEAM ratings

Marble Arch House has been designed to obtain excellent BREEAM ratings, in compliance with British Land Sustainability brief, prescribing excellent BREEAM rating for all office developments.

High efficiency super low noise air source HVAC solutions

For British Land, investing in high efficiency, innovative systems based on leading edge technologies is key for obtaining a significant energy reduction for the whole building. Particular care has been taken by Hoare Lea for HVAC, based on a 4-pipe system equipped with leading edge technologies to achieve optimum performance and ideal flexibility.

Concerning central units the designers opted for 2 Climaveneta high efficiency TECS chillers featuring magnetic levitation compressors, as in many other British Land developments. This choice reduces the energy consumption by 40% compared to other solutions. The extra low noise fitting of these units strongly reduces noise emissions, contributing to the achievement of the microclimate objectives set for Marble Arch House by British Land Sustainable Development Brief.

Sustainable transport design

74 cycle spaces, as well as showers and lockers, to encourage bicycle use, with no car parking spaces provided.

Zero Waste to Landfill Policy

As all British Land developments Marble Arch House will also be managed according to British Land's unique concept aimed at minimizing the impact of the built environment, with no compromises on the comfort level, implemented with outstanding results in many other developments of their portfolio.

Comprehensive Energy Reduction Strategy

Energy reduction is a key factor for British Land. To address it, British Land has developed a comprehensive approach that integrates building development and management for highest efficiency.

During the development phase extensive effort is undertaken to minimize energy requirements and greenhouse gas emissions of the completed development through the adoption of the energy hierarchy aimed at: reducing the demand for energy, meet the remaining demands as efficiently as possible, supplying energy from low-carbon or renewable sources.

Once completed, the development is run according to an innovative method aimed at breaking down energy consumption

between landlord and occupier, identifying the share each stakeholder controls or influences.

Thanks to advanced metering, energy reductions resulting from innovations and best practice in managing the building can be easily associated to landlord or occupier. This encourages collaboration between the landlord and occupiers in operating the building efficiently, ensuring more transparency in their behavior and a better valuation of the accelerated payback of

the installed systems. On the other hand the adoption of advanced energy metering allows continuous measurement and precise identification of inefficiencies, fixing them as soon as they arise and going beyond the traditional fix and forget approach.

Marble Arch House will be managed according to this approach and will reap benefit of British Land's extensive experience in energy reduction gained applying this model to its portfolio.

Focus on HVAC System

Directly affecting the second step of British Land energy hierarchy - meet the remaining demands as efficiently as possible – the HVAC system plays a key role in Marble Arch House, as in any other of their developments.

Identifying low energy mechanical systems for the building, in particular for heating and cooling, has been a focus of the development team since project inception. Hoare Lea's design integrates leading edge components into a best practice HVAC solution for Central London's speculative office developments, strongly contributing to the ambitious carbon emission targets of the building.

The system is based on low emission gas boilers and two Climaveneta high efficiency air-source, magnetic levitation integrated inverter chillers on the roof, serving a 4-pipe distribution system.

Air source has been preferred by Hoare Lea, following the design concept of the whole building. For this project, water-cooled chillers with cooling towers were not viable due to the size of the office cooling load, limited space on the roof and additional maintenance requirements. A geothermal energy system was excluded because an underground aquifer was not easily accessible. CHP was also not a viable option due to the close proximity of residential properties and the development height constraint meaning an extensive flue system was not feasible. The office base load did not suit the running hours required to make a CHP system viable.

Climaveneta air-cooled chillers represented the best compromise. Their reduced dimensions fit the limited space on the roof, optimizing green space and reducing aesthetic impact. Very low

noise emissions of the units enhanced by an additional attenuation package, ensured the stringent acoustic emission targets of this project.

Air treatment is provided by high efficiency air handling units with thermal wheel heat recovery.

Given the necessity to ensure ideal space adaptability to the needs and specific requirements of future tenants, Hoare Lea has conceived a flexible system, especially as concerns internal distribution.

On each floor, HVAC options are integrated giving tenants freedom of choice between a traditional 4-pipe fan coil unit system, a passive chilled beam with displacement ventilation and trench heating system, a night time cooling option and an active chilled beam system. The Category A fit-out provides a 4-pipe fan coil solution to meet market demands.

Particular care has been dedicated to ensure that the central system will serve different coexisting distributing systems operating at different temperatures (8°C / 14°C for the fan coil and 14°C / 17°C for chilled beams) in the most efficient way, therefore with no compromises on performance.

This will be achieved by using an injection circuit on each floor.

"We designed to deliver British Land the most efficient and sustainable solution for this high specification office, employing in a creative concept leading edge technology and conventional solutions for these developments in Central London.

Previous positive experience with Climaveneta, their units' capability to cope with the stringent requirements of this project, combined with complete pre and after sales support oriented our choice for their units with magnetic levitation compressors."

Alex Dunn

Executive Engineer - Hoare Lea



Why Climaveneta

For the central air conditioning system of Marble Arch House office and retail space, Climaveneta's high efficiency TECS chillers have been specified by the consulting engineers – Hoare Lea.

These units are characterised by an oil-free centrifugal compressor that is radically innovative: magnetic bearings and integrated inverter motor control allow full and partial load efficiency levels to be reached, impossible for any other unit in the market.

The choice of the Extra Low Noise version provides the best compromise between silence and efficiency on the market. Compactness of key components and footprint optimized design results in significantly reduced dimensions thus addressing a further key factor in high-spec developments

Climaveneta is among the first manufacturers to apply this innovative technology to HVAC, with the first launch in the market back in 2006.

Since then significant R&D research as well as extensive on site experience, gained with hundreds of projects in the UK and worldwide, proved to be decisive to enable designers, landlords and occupiers to get full advantage of the opportunities offered in terms of high efficiency and fast payback by this technology, combining it with utmost reliability and complete after sales service.

A thorough supportive approach that resulted in a substantial market share in the UK and worldwide.

"Making sure that our developments are equipped with leading edge technologies, optimally integrated within the building and operated according to the most advanced methods in order to ensure the highest possible energy reduction plays a key role in our commitment to improve energy performance of each building in our portfolio.

Our positive experience with Climaveneta in many of our properties has led us to install their high efficiency chillers also in Marble Arch House. This choice strongly contributes to our sustainability effort and to the achievement of the high BREEAM ratings and energy performances set for this development."

Sarah Cary

Sustainable Developments Executive - British Land



Sheraton Mirage Resort & Spa Case Study



The concept

Energy Efficiency and reduced CO₂ emissions is no Mirage.

The Sheraton Mirage Resort and Spa is an icon of Queensland's Gold Coast, built during the region's 1980s development boom.

A recent multi-million-dollar refurbishment has not only returned the resort to its former glory, but has drastically improved energy efficiency too.

Built in 1987 the Sheraton Mirage Resort and Spa remains the Gold Coast's only five-star beachfront resort.

Fronting the Pacific Ocean on the naturally occurring Southport Spit, the resort continues to operate under the management of Starwood Hotels and Resorts, the parent company of the Sheraton

brand. After being purchased outright by Pearls Australasia in 2010, the property has undergone a stunning multi-million dollar refurbishment that has returned its 295 guest rooms, lobby, reception, porte cochere, bars and restaurant to their former glory.

Outside, the resort is equally spectacular with over three hectares of manicured tropical gardens surrounding a 5.000 m² system of lagoons and the magnificent 750 m² lagoon-style swimming pool that fronts the famous Gold Coast beach.



Energy Efficiency and Sustainability as overarching objectives

Starwoods are aware that to deliver a five star guest experience in today's market, the delivery of high levels of comfort and amenity come with the expectation that the resort is also fulfilling its environmental responsibilities.

Starwood's overarching objective with sustainability is to reduce energy and water usage. The "30/20 by 20" initiative has set a target of reducing energy use by 30 per cent and water use by 20

"At the end of the day, you like to think the majority of people want us to be green, and want us to do the right thing by the environment"

Mark Sexton
Sheraton Mirage Resort's - General Manager

percent by the year 2020 (from a 2008 baseline). Built over 30 years ago, the Sheraton Mirage Resort had lost its five-star edge and become an expensive and inefficient hotel to operate by 2011. Recognising the need for refurbishment, the resort's new ownership approved a \$26 million refurbishment program to take in all public spaces as well as guest rooms, bars and restaurant. To ensure the resort meets these targets, a range of works were

conducted that not only improved the resort's aesthetics and guest amenity, but also addressed energy efficiency. The refurbishment works included the installation of new LED lighting, sensors and controls; the replacement of guest room air conditioning controls and installation of movement sensors and window switches.

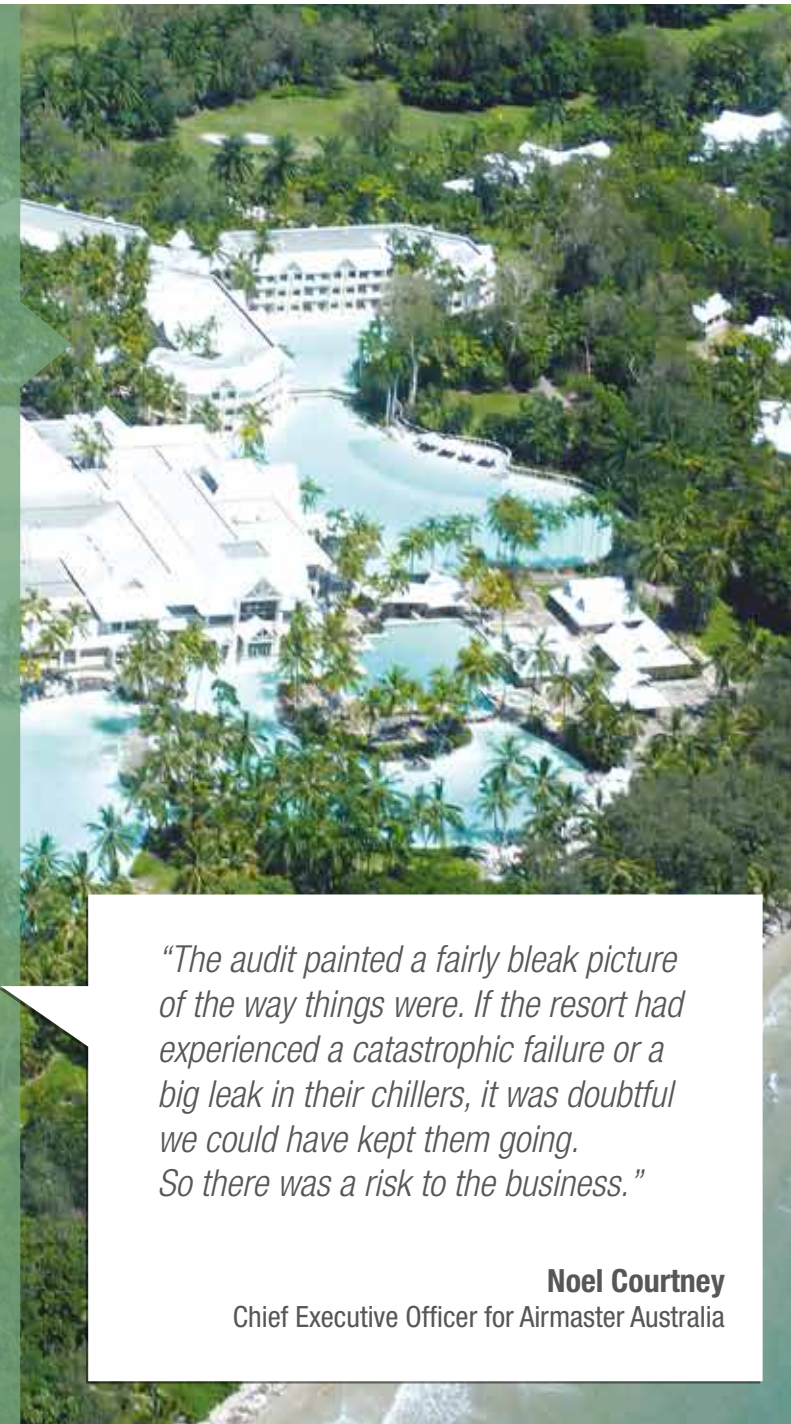
The resort's ageing mechanical services plant and building management system were not included in the original scope of works, but following a BMS failure prior to the busy Christmas period in 2012, these issues were quickly brought to a head. The failure resulted in the resort having to be manually operated until the problems were rectified three weeks later and caused a hefty repair bill.

Following this failure Mark Sexton, Sheraton Mirage Resort GM, appointed Airmaster, Climaveneta partner in Australia, to conduct a Level 3 Energy Audit.

Among the problems identified were a failing BMS and an existing chiller plant that was inefficient, prone to issues and had reached the end of its useful life.

The chillers were also operating on obsolete, ozone-depleting refrigerants R11 (phased out in 1996 under the Montreal Protocol) and R22 (currently being phased out).

In all, 30 energy savings measures were identified. At the top of the list were the chillers and building automation. Recognising the urgency, and with the resort well into its refurbishment program, Airmaster was asked to submit a proposal and budget.



"The audit painted a fairly bleak picture of the way things were. If the resort had experienced a catastrophic failure or a big leak in their chillers, it was doubtful we could have kept them going. So there was a risk to the business."

Noel Courtney
Chief Executive Officer for Airmaster Australia

New HVAC system design

Although a like-for-like replacement promised an immediate performance improvement, Airmaster and Climaveneta identified opportunities to deliver further savings through the installation of two water-cooled chillers combined with an air-cooled INTEGRA heat pump for simultaneous heating and cooling.

Thanks to the confidence gained across a number of installations, Airmaster had the experience to seize the advantages that Climaveneta's Integra units for simultaneous heating and cooling production would bring in this project .

These units are characterized by a clever three-vessel design and advanced control logic that ensures cooling and heating loads are perfectly met. When these are simultaneous, the unit exchanges evaporation and condensation heat with the system cooling and heating circuits respectively.

Where the cooling or heating load is constant, the result is either free heating or chilled water. When the load is not balanced, or when one of the two demands is missing, the chiller automatically switches to a third heat rejection source, either air or water.

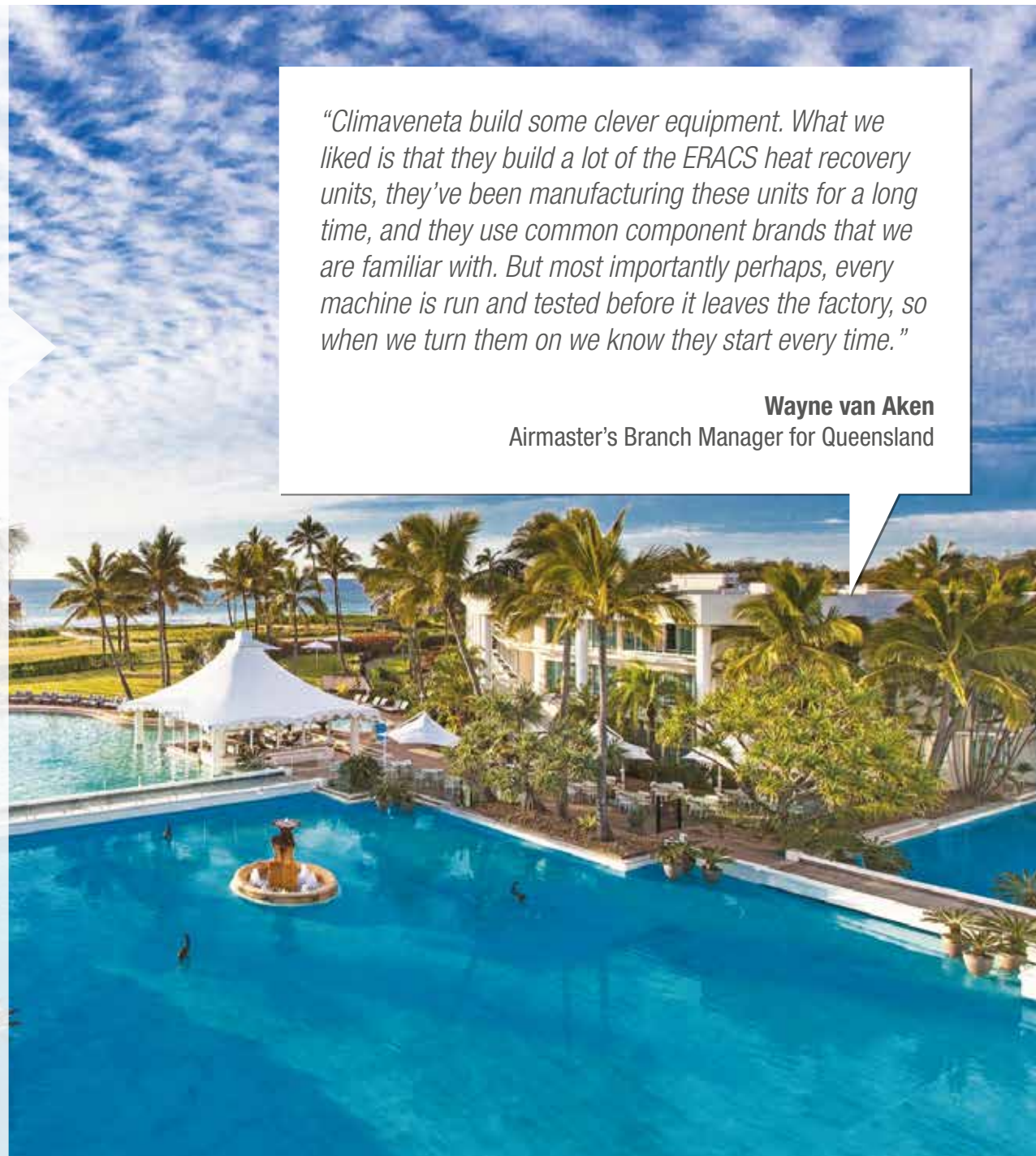
Following an examination of potential installation sites and relative costs of air-cooled units, Climaveneta and Airmaster moved to an alternative design featuring a water-cooled model that could be more easily retrofitted into the existing plant room.

Commonly used in Europe where well-water is used as a heat sink, Climaveneta and Airmaster decided to use the resort's three million litres lagoon as an integral part of the new solution.

Besides increased efficiency a further benefit of the water cooled chillers was simplified installation: it was still a three chiller installation, in identical positions within the plant room, so it kept the installation cost down and made all the connections relatively simple.

"Climaveneta build some clever equipment. What we liked is that they build a lot of the ERACS heat recovery units, they've been manufacturing these units for a long time, and they use common component brands that we are familiar with. But most importantly perhaps, every machine is run and tested before it leaves the factory, so when we turn them on we know they start every time."

Wayne van Aken
Airmaster's Branch Manager for Queensland





Free pool heating with heat recovery

The audit also identified the method used to heat the resort's pool as being highly inefficient. Required to be maintained at a constant 27.5°C year-round (as per Sheraton's worldwide brand standard), the resort pool was heated by an ageing 400kW gas-fired boiler.

One of five boilers servicing the site, the pool boiler, operated around the clock to maintain temperature, and was responsible for up to 75 per cent of the resort's total annual gas consumption - a cost the hotel's management was keen to be rid of. The pool's heating demand was quickly recognised by Airmaster and Climaveneta as an obvious target for the 55°C hot water produced by the ERACS multipurpose unit and regulated via a control valve and heat exchanger. The production of this hot water would in turn provide free cooling and with a cooling load of around 400kW during winter and up to 2000kW during summer months, promised to deliver significant electricity savings to the resort.

To optimise energy efficiency, Airmaster's design shifted the balance between high load and part load among the three Climaveneta chillers.

The two incumbent high-load 1290kW chillers were replaced with two 1220kW TECS water-cooled main chillers, while the incumbent low-load 580kW chiller was replaced with the slightly larger 640kW ERACS unit.

Simplyfied installation: from theory to reality

With the entire retrofit scheduled to be completed within four months, so as to keep interruption to the resort to a minimum, the team completed all preparation work in advance. This included the installation of new pipework, heat exchangers and pumps, to get the energy savings immediately as soon as the new chillers arrived on site.

The installation of each chiller was conducted within a five day cutover period whereby one chiller was replaced at a time, with the other two providing chilled water and redundancy to the site.

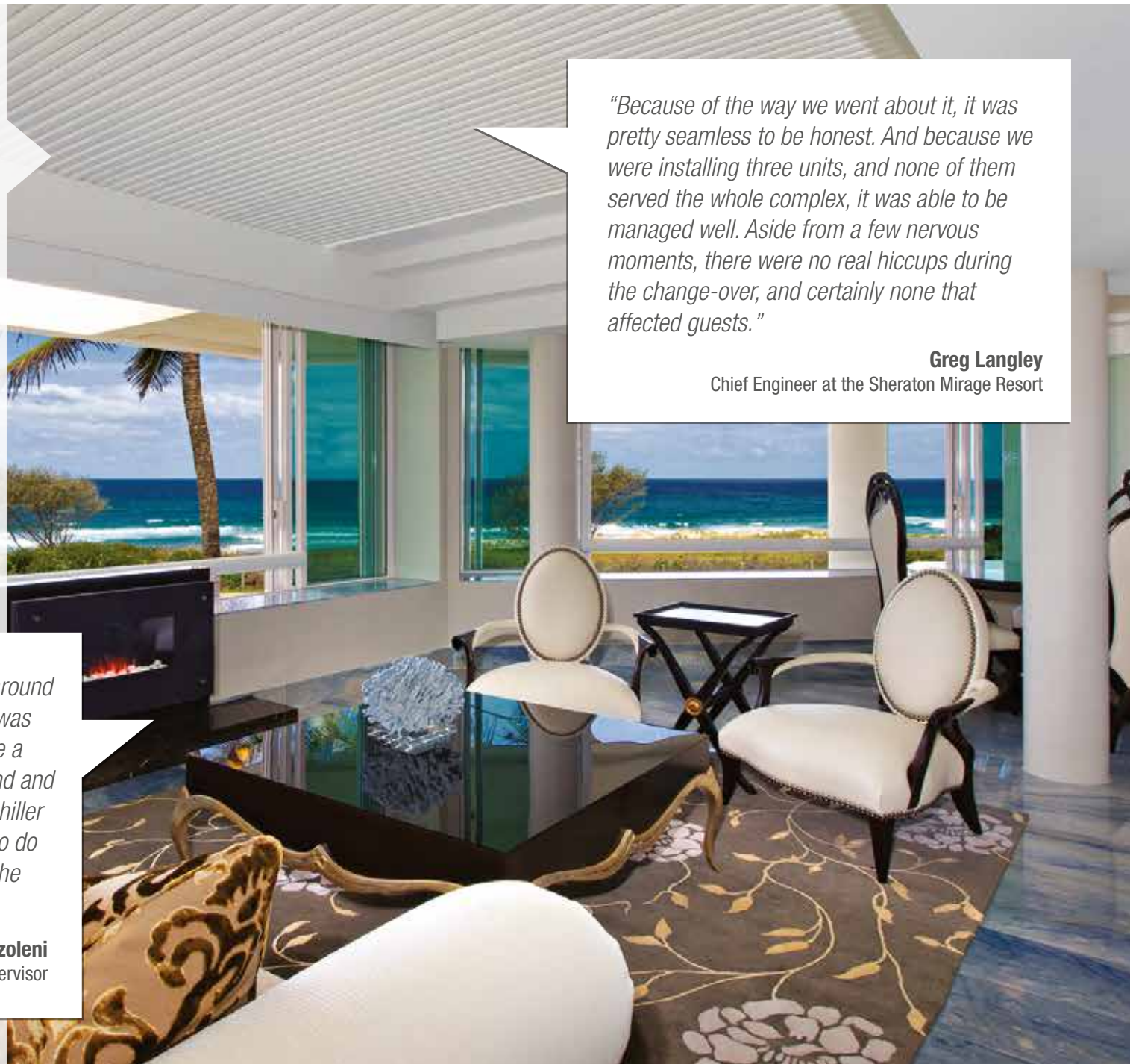
Disruptive or noisy work was scheduled around the hotel's occupancy levels, and often performed after hours or on weekends. Weekly project management meetings kept all stakeholders informed of the project's progress and helped address any issues or concerns.

"We had to be prepared to move the schedule around to work odd hours, particularly when the resort was fully occupied or had conventions on. It's not like a commercial building where you've got a weekend and where you can start at Friday 5pm and have a chiller up and running by 8am Monday. Here, we had to do things one at a time, and keep chilled water to the facility every day of the week."

Dominic Mazzoleni
Airmaster's Project Supervisor

"Because of the way we went about it, it was pretty seamless to be honest. And because we were installing three units, and none of them served the whole complex, it was able to be managed well. Aside from a few nervous moments, there were no real hiccups during the change-over, and certainly none that affected guests."

Greg Langley
Chief Engineer at the Sheraton Mirage Resort



clima PRO

● PERFORMANCE ● RELIABILITY ● OPTIMISATION

Improve your property's value and its appeal to tenants

Improve uptime and maintenance levels

Run the plant room at optimum efficiency

Optimise the Energy Performance of the Resort

A further highlight of the new HVAC system was the plant room optimization system: ClimaPRO.

Developed in partnership by Conserve-it and Climaveneta this system is a dedicated solution designed to take full control of the plant room, making sure that it always runs at optimum efficiency. As a matter of fact, Building Management Systems (BMS), typically installed in all modern buildings, are designed to integrate and collate data from various sub-systems which control specific areas or functions and represent a basic and generic solution to manage and optimize advanced air conditioning systems.

This was the case also at Sheraton Mirage and is where ClimaPRO made a difference. Resulting from Climaveneta's extensive experience in chiller and heat pumps manufacturing and control and from Conserve-it monitoring and programming know-how, this optimization system carves out the plant room from the BMS, ensuring full measurement, control, optimization and diagnostics functions, both at unit as well as at system level. On the other hand it perfectly integrates with the BMS providing the central system with all the required parameters for an easy and integrated control.

Based on the Niagara framework, the ClimaPRO chiller plant management system was the ideal solution to manage the complex cold and hot water conditions used throughout the resort for air conditioning, hot water production and the heating of the resort pool. Its advanced optimisation capabilities use sophisticated sequencing and load control, along with free cooling or heating production from the ERACS unit, to drive lowest cost of production of both the hot and cold water systems. In-built measurement and verification of the chillers and the complete plant allow for real-time continuous optimisation as well as fault detection and diagnostic capabilities.

By combining variable primary flow control, smart sequencing and lift management optimisation, it has been able to drastically reduce energy consumption at the resort. The choice to enhance the BMS with ClimaPRO, allowed to simplify the BMS design and provided the resort's management team with a dedicated solution that enables them to track energy consumption, see that conditions have been maintained and see where there are issues or opportunities for improvement. It also facilitated to upgrade the building control system with no interruption to the resort's services by splitting the project into two distinct parts, the BMS as general system for the whole building, and ClimaPRO as a plant room management system.

Sound Results

Six months since the installation of the new chiller set, and Climaveneta's design has already exceeded expectations. Ongoing commissioning and fine-tuning through the defects period will continue to improve the performance of the entire site.

The efficiency of the ERACS system has also easily met the resort's pool heating demand, but in doing so created the problem of not achieving enough free cooling at the start of the day to meet resort demand. This resulted in the need for one of the main chillers to operate.

In response, the system was reconfigured to pre-heat the site's 40,000 litre make-up water wells that supply domestic and heating hot water across the resort. By pre-heating the incoming town water in the make-up wells

"It's a lot of money that just came out straight away. As soon as the boiler was turned off, the gas man must have thought we needed a new meter!"

Mark Sexton
Sheraton Mirage Resort's General Manager

to 50°C, the resort's boilers are now operating at a significantly reduced load to achieve the 55°C domestic hot water required. This opportunity has also created more free cooling from the ERACS unit.

Whilst it is still early days, and commissioning continues, the energy savings delivered by the new chiller set and controls is proving significant.

For instance, gas consumption across the site has fallen by a staggering 60 per cent compared to the previous year.

According to ongoing energy analysis a

13%

Reduction was experienced in January 2014 compared to the same period in 2013.

This represents a monthly electrical energy saving of

93,255 kWh

"Given the size of the pool boiler that we took offline, we assumed that the ERACS unit would have to run longer in the mornings to heat the pool, which would give us more free cooling. But what we have found is that because we installed new heat exchangers and new pumps, and the plant is working to its optimum, we are heating the pool in just two to three hours."

Wayne van Aken
Airmaster's Branch Manager
for Queensland

These energy savings have also been delivered in the face of increased cooling load, with higher resort occupancy levels and above-average temperatures experienced on the Gold Coast with a higher number of cooling degree days.

Overall, the project's payback period of 3.8 years looks like being readily achieved. So far, Climaveneta units managed to realize all of the projected gas consumption savings.

It was also registered a significant reduction in electrical energy consumption, despite an 8% increase in occupancy and an 18% increase in thermal conditions measured through cooling degree day data.

Why Climaveneta

clima PRO

Following their vast experience as leading HVAC solution providers, Climaveneta has designed a highly specialised control and optimisation solution dedicated to HVAC.

As a matter of fact, Building Management Systems (BMS), typically installed in all modern buildings, integrate and collect data from various sub-systems which control specific areas or functions, and represent a basic and generic solution to manage the air conditioning system.

ClimaPRO, the Climaveneta dedicated solution for optimal control of the entire plant room, offers additional and unique functions that allow you to carve out the control of the plant room HVAC equipment from the BMS, thereby achieving an unchallenged quality of optimization.



TECS | VISION 2.0

Resulting from Climaveneta's experience in utilizing magnetic levitation technology in air-conditioning and process cooling industries, TECS Vision 2.0 air and water source chillers are the most efficient and reliable solution available in the market today. These units are characterised by an oil-free centrifugal compressor that is radically innovative: magnetic bearings and digital rotor speed control allow full and partial load efficiency levels to be reached, impossible for any other unit in the market.

Climaveneta is among the first manufacturers to apply this innovative technology to HVAC, with the first launch in the market back in 2006.



INTEGRA

Modern and complex building requests the simultaneous demand for heating and cooling during the year in order to ensure ideal comfort, due to the coexistence in the same building of areas dedicated to different functions, with very variable heat loads. INTEGRA units by Climaveneta, available both air or water condensed, are able to produce cold and hot water in the same time. They represent the evolution of the reversible chillers, and have been specifically created for 4 pipes systems.

The main feature of Climaveneta INTEGRA units is that in each period of the year they independently maximize energy cycle efficiency that generates hot and cold energy.

Maximum efficiency and no local CO₂ emissions, possibility to eliminate the boiler, with consequent advantages in terms of reduced footprint and plant simplification, chance to combine the unit with renewable sources are the main advantages INTEGRA units can take to the building. Finally all the INTEGRA units are LEED relevant, it means they contribute in getting credits for the green certification of the building.



Regent's Place Case Study

REGENT'S
PLACE



THE CONCEPT DELIVERING VALUE AND EXCEEDING OCCUPIERS' EXPECTATIONS

Regent's Place is a 13 acre, fully managed mixed use estate in London's West End. It comprises office buildings, residential buildings, retail spaces, landscaped gardens and a community theatre, with Regent's Place Plaza - a place to meet, eat, drink and spend time – at the heart of the estate. High quality spaces, enhanced by numerous public art installations and by

an array of regular events, connect the buildings, whereas a network of streets encourage links to the surrounding local area. Regent's Place is the result of a complete transformation that took place over the last seven years that turned the estate into a high quality place to live, work and play perfectly integrated with the West End of London.

"Today, occupiers increasingly want flexible, high-quality, open plan offices with larger floor plates, which are technology and environmentally friendly. Our office investments over the years have focused on high-quality buildings in the City and West End of London, combined with active property management "

Tim Roberts,
Head of Offices - British Land

A key part of this transformation project by British Land, one of the Europe's largest REITS, (real estate investment trusts) was the purchase of the western end of the estate from The Crown Estate in 2005.

The subsequent development of 10 and 20 Triton Street, which were completed in 2010, turned Regent's Place into a vibrant mixed use estate covering 140,000 m² of office, retail and residential space.

In 2013 British Land will complete the project delivering the North East Quarter, (NEQ), a further 47,000 m² of new office and residential space. Once the NEQ is complete, Regent's Place will be capable of accommodating over 14,000 workers and residents.

Being one of the largest and most successful developments in London, Regent's Place is a showcase of best practice in high quality, sustainable property development and management. Consistently with British Land's market leading approach, sustainable considerations have been put at the heart of all development and management strategies. This includes both design concept and choice of partners, as well as on site operations and estate management, oriented to the highest standards of service and based on close cooperation with the occupiers and residents.

This approach has resulted in numerous awards such as the "Biodiversity" award at the 2011 Guardian Sustainable Business Awards and the 2012 Royal Town Planning Institute "Sustainable Communities" award.



THE ESTATE AND THE BUILDINGS

THE REGENT'S PLACE MASTER PLAN, A PLACE TRANSFORMED

The Regent's Place mixed use development comprises commercial office buildings sited at the gateway to the new Triton Street, a residential building on Osnaburgh Street comprising of 154 apartments, a twenty storey tower with views over Regent's Park and private landscaped gardens, a community theatre (New Diorama Theatre), retail spaces, office spaces still under construction, external landscaping and public works of art.



The buildings at Regent's Place include:

- 1, 4 and 7 Triton Square
- 10 Triton Street
- 20 Triton Street
- The Euston Tower
- 338 Euston Road
- 350 Euston Road

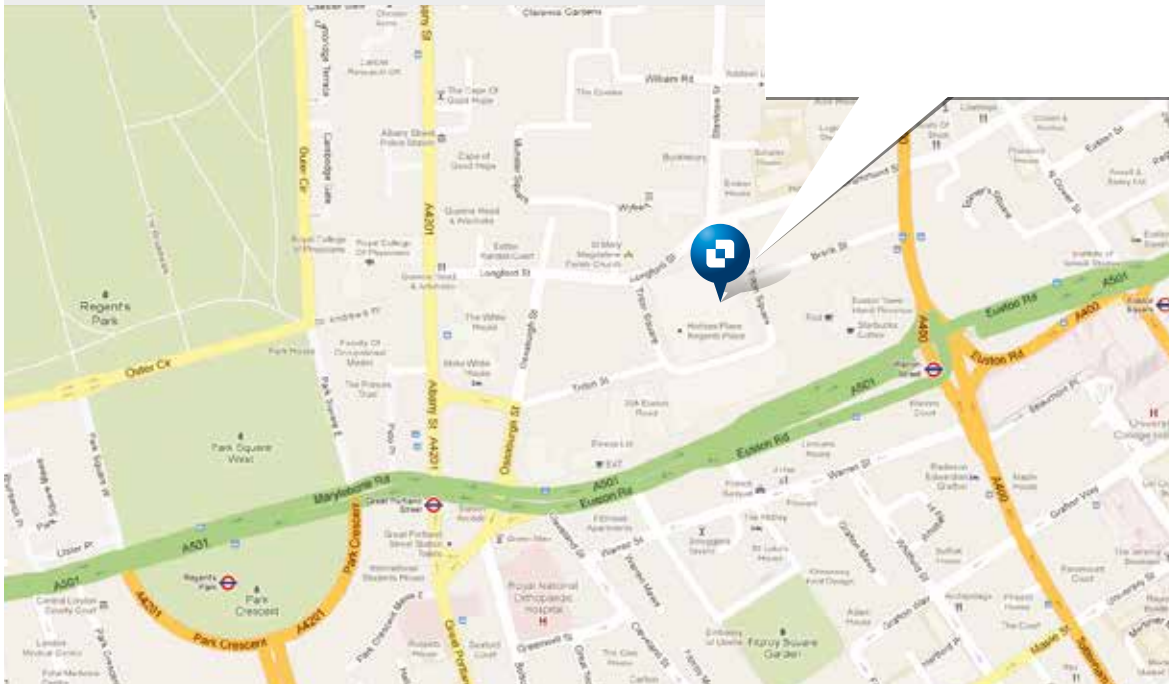
Buildings under development at the NEQ include:

- 10 Brock Street (offices)
- 20 Brock Street (residential)
- 30 Brock Street (offices)

This estate also includes 2 Triton Square, and One Osnaburgh Street a prime residential building.

Climaveneta has provided chillers for:

- 10 Triton street
- 20 Triton street
- 2 Triton square
- 10, 20 and 30 Brock Street part of The NEQ Development



SUSTAINABILITY AND ENERGY EFFICIENCY

BRITISH LAND HAS LONG BEEN COMMITTED TO PUTTING SUSTAINABILITY AT THE HEART OF ITS BUSINESS

Regent's Place is a perfect example of British Land's approach to drive energy reduction in their portfolio, providing real economic benefits and demonstrating that green buildings are good for asset performance.

It is based on a holistic approach to development, taking care of every aspect of the project, from efficient construction to cost and carbon emission reduction, managing environmental risks and conserving natural resources through energy

British Land sustainable approach in Regent's Place is focused on achieving:

✓ Excellent BREEAM ratings

Majority of the buildings on the Estate have been designed to obtain very high BREEAM ratings, with 10 and 20 Triton Street rated Excellent and One Osnaburgh Street rated Very Good in Ecohomes terms. The NEQ development is aiming for an Excellent BREEAM 2008 certification rating.

✓ BEST SUSTAINABILITY STANDARDS DURING DEMOLITION AND CONSTRUCTION

Best practice in recycling and waste management have been applied to the whole supply chain during demolition and construction. 24.6% of

efficiency, water efficiency and initiatives to reduce and recycle waste.

This vision is also achieved through the ability to attract high quality partners. British Land attains the highest international standards of sustainable design and construction within its supply chain and throughout the development process, selecting the most reliable partners worldwide that share the same sustainability approach.

construction materials used at Regent's Place have come from recycled sources. 100% of the timber was certified sustainable and over 85% of the development waste was either reused or recycled.

✓ CARBON EFFICIENT DESIGN

Regent's Place is designed to be up to 32% more carbon efficient than current standards, thanks to enhanced air tightness, high performance glazing, motion and daylight sensors, and electronic energy monitoring.

"One of our priorities at Regent's Place continues to be identifying innovative ways to reduce costs and save energy. We aim to ensure that occupiers and visitors to Regent's Place continue to receive a first class service as well as excellent value for money."

Geoff Jones
Estate Director
Regent's Place Management





✓ **HIGH EFFICIENCY AIR AND GROUND SOURCE HVAC SOLUTIONS**

For British Land, investing in high efficiency, innovative systems based on leading edge technologies is the first step in obtaining a significant energy reduction for the whole building. A particular care has been taken in the HVAC design by Watkins Payne Partnership.

Opting for Climaveneta high efficiency chillers featuring magnetic levitation compressors, both in 10 and 20 Triton Street, as well as in the NEQ development, the energy consumption due to central air conditioning has been reduced by 40%

compared to other solutions. Leading edge heat recovery solutions enhance the advantages of Climaveneta high efficiency chillers and make HVAC a decisive factor in Regent's Places sustainability.

✓ **PHOTOVOLTAIC INSTALLATION 20 TRITON STREET AND THE NEQ**

Besides reducing energy consumption throughout each design choice, parts of the Estate are equipped with a photovoltaic installation, producing over 15.000 kW/h each year. Hence a considerable amount of the energy supply required by the building is produced by renewable sources directly on site.

✓ **EXTENSIVE GREEN ROOF SURFACES**

With 1,750 m² of green roof, Regent's Place is an achievement in this respect. This choice encourages biodiversity and provides attractive areas for occupiers. The green roof design was an award winning, two- year green roof pilot project with ecologist Arup.

✓ **WATER EFFICIENCY**

Water management as well as energy is a further key point in the Regent's Place sustainability strategy. Around 2.4 million litres of rainwater are harvested every year, for toilet and urinal flushing as well as for irrigation purposes.

✓ ZERO WASTE TO LANDFILL POLICY

Regent's Place's energy savings and waste reductions are part of a unique concept aimed at minimising the impact of the build environment, with no compromises on the comfort level. In 2011, 200 tonnes out of 290 have been recycled, with the rest being sent for incineration with energy recovery.

✓ COMPREHENSIVE ENERGY REDUCTION STRATEGY

Energy reduction is a key factor for British Land. To address it British Land has developed a comprehensive approach to building management, that breaks down energy consumption between landlord and occupier, identifying the share each stakeholder controls or influences.

According to this method, developed in collaboration with the Better Building Partnership, only 14% of energy consumption of a building, due mainly to common parts, is controlled by landlords.

Whereas 36% is only partly influenced by the landlord and is due to shared services. The remaining 50% is controlled by the occupier, and directly depends on how they use the building. Thanks to advanced metering, energy reductions resulting from innovations and best practice in managing the building can be easily associated to landlord or occupier. This encourages collaboration between the landlord and occupiers in operating the building efficiently and ensuring more transparency in their behavior.

This method enables a better valuation of the real return of the additional investment, demonstrating the accelerated payback of the installed systems.

On the other hand the adoption of advanced energy metering allows continuous measurement and precise identification of inefficiencies, fixing them as soon as they arise and going beyond the traditional fix and forget approach. Moreover, such a complete view of the energy performance of the building and of each system fosters informed decisions about upgrades and refurbishments, as well as how the building performs in relation to original design assumptions. Finally this allows the management team to drive and later test changes in their management and in the occupier's behavior, based on real data collected.

At Regent's Place this has resulted in a landlord influenced energy reduction of 33%, with cumulative savings of 10.7 million kW/h. This has saved over £500,000 in energy costs and 4000 tonnes of carbon.



FOCUS ON

10 AND 20 TRITON STREET BUILDINGS HVAC SYSTEMS

10 and 20 Triton Street are the first two new buildings at Regent's Place that were completed in 2010.

Designed by Farrells, the buildings – 10 Triton Street with 18,500 m² of office space over nine floors and 20 Triton Street which provides 34,500 m² over ten floors – both achieved 'Excellent' BREEAM and EPC 'B' (Energy Performance Certificate) ratings.

Operating consistently within the sustainability strategy for the Estate, 10 and 20 Triton Street are designed to be over 30% more energy efficient than at the time of

development and share all the sustainability and energy efficiency choices highlighted above.

Designed by Watkins Payne Partnership, the HVAC systems are a highlight of these buildings. Based on low NOx emission boilers and on Climaveneta high efficiency chillers with magnetic levitation, the systems feature advanced heating and cooling systems.

To achieve the high target set by the British Land's sustainability brief, the design incorporates 4 pipe fan

coil units in the ceilings with variable air volume and variable water flow. Fan coil units feature EC/DC fans and the water pumps have VSD inverter motors and 2 port valves on FCU's. High efficiency gas boilers have also been installed. The air handling units have heat recovery heat exchangers and VSD fans. Climaveneta high efficiency TECS chillers have been installed with magnetic levitation VSD inverter drive compressors. The lighting has automatic occupancy controls and automatic daylight dimming control.





FOCUS ON NEQ DEVELOPMENT HVAC SYSTEM

As part of British Land's vision for Regent's Place, the delivery of the North East Quadrant (NEQ), which faces onto the Regent's Place Plaza, has always been a key component in completing the master plan for the Estate.

Construction has now started and the buildings will be finished in mid 2013, bringing a further 47,000 m² of office, retail and residential accommodation to Regent's Place. Again air conditioning is among the strong points of this building in terms of energy

efficiency and reduced environmental impact.

In this case Watkins Payne Partnership (WPP) opted for a combined heat and power generator integrated with air cooled high efficiency Climaveneta TECS chillers with magnetic levitation compressors, serving both the residential as well as commercial spaces with 4-pipe fancoil units with variable air volume.

The system is complete with air handling units with heat recovery heat exchangers and VSD fans.

Phil Draper,
Senior Sustainability & Technical Manager
Regent's Place Management

"The design by WPP will achieve 25% better performance than Part L regulations require which will result in a lower EPC value, better quality environment and a Benchmark building."

WHY CLIMAVENETA

For the central air conditioning systems of several buildings at Regent's Place, Climaveneta high efficiency TECS chillers have been specified by the consulting engineers - Watkins Payne Partnership. These units are characterised by an oil-free centrifugal compressor that is radically innovative: magnetic bearings and digital rotor speed control allow full and partial load efficiency levels to be reached, impossible for any other unit in the market.

The choice of the Extra Low Noise version, as result of a systematic design oriented to minimise the noise level, gives the best compromise between silence and efficiency on the market.

Climaveneta is among the first manufacturers to apply this innovative technology to HVAC, with the first launch in the market back in 2006.

Since then significant R&D research as well as extensive on site experience, gained with hundreds of projects in the UK and worldwide proved to be decisive to enable designers, landlords and occupiers to get full advantage of the opportunities offered in terms of high efficiency and fast payback by this technology, combining it with utmost reliability and complete after sales service. A thorough supportive approach that resulted in a substantial market share in the UK and worldwide.

TECS | VISION
2.0



Sarah Cary,
Sustainable Developments Executive at British Land says:

"Making sure that our developments are equipped with leading edge technologies, optimally integrated within the building and operated according to the most advanced methods in order to ensure the highest possible energy reduction plays a key role in our commitment to improve energy performance of each of our building of our portfolio."

"Installing Climaveneta high efficiency chillers in most buildings of Regent's Place contributes to this effort and strongly contribute to the high BREEAM ratings and energy performances of the buildings."



