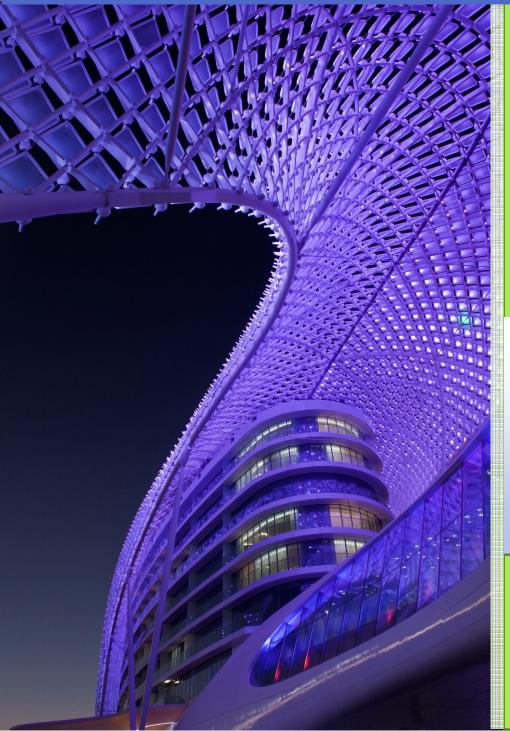


EWS-WWF CASE STUDY







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ABOUT VICEROY HOTEL GROUP

Viceroy Hotel Group delivers one-of-a-kind lifestyle experiences that bring together provocative design and intuitive service in some of the world's most sought-after destinations. Its two distinctive collections of properties – Viceroy Hotels and Resorts and Urban Retreats – redefine the very concept of boutique and luxury hospitality.

From a chic suite in the city's centre to a sumptuous villa on a secluded Caribbean beach, an urbane lounge for cocktails at dusk to a private cabana for a two-hour massage, every setting is one-of-a-kind. Viceroy Hotel Group reinterprets today's sense of history, modernity, tradition and innovation in a uniquely timeless.

Yet within each very individual environment, certain qualities are welcomingly consistent. Creativity, comfort and advanced service are the signatures of every Viceroy Hotel Group experience, with guest needs innovatively anticipated and graciously accommodated. Equally constant are the accolades our distinctive hotels earn on annual Condé Nast Travellers Gold Lists, Travel + Leisure Top 500 surveys, Departures Readers' picks, and the *New* the pages of York Times, Gourmet and Vogue.



From arrival to departure and back again, it's this blend of the indispensable, unexpected and imperceptible that makes each Viceroy Hotel Group property a top choice among many—and a destination unto itself.

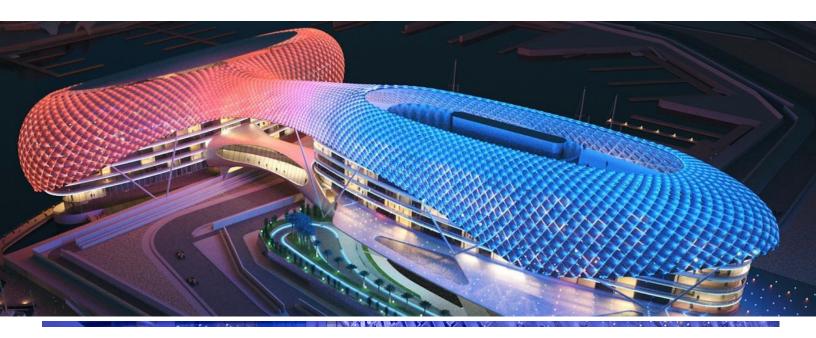


YAS VICEROY ABU DHABI

As Yas Island Abu Dhabi's premier hotel, Yas Viceroy Abu Dhabi sets the standard for exceptional service throughout its 499 impeccable rooms and suites, 12 innovative dining venues and lounges, and the sumptuous ESPA at Yas Viceroy Abu Dhabi. The interiors of this Abu Dhabi resort embody a contemporary fusion of elegance and momentum, created with sensuous curves and sleek lines.

Guests marvel at the incredible LED canopy that not only emits a concert of color and shade but also embraces the exhilarating Yas Marina Formula 1^{TM} Circuit, defining the Abu Dhabi hotel as a landmark across Yas Island and one of the world's most extraordinary destinations. Watch high-speed races and practices from the hotel daily or layout on the beach for a relaxing sunny day.

Delight in the art of cuisine at Yas Viceroy Abu Dhabi. When you are dining in the most exciting hotel in the world you expect the food to be nothing short of spectacular, and our tantalizing Abu Dhabi restaurants showcase the finest specialties from around the world. Choose from a colorful host of eateries, from the freshest seafood and sushi to modern Italian, regional Indian cuisine and a stylish array of bars and lounges. For fantastic cuisine throughout the day, we have the perfect Abu Dhabi dining spot for every taste.

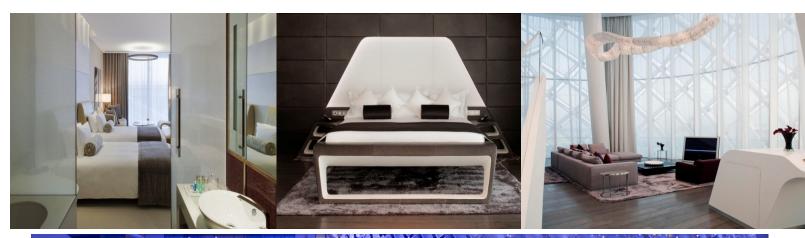




ROOMS & SUITES

From spectacular views to indulgent luxuries as well as well-appointed accommodation options, Yas Viceroy offers exceptional and sensually pleasing experiences. A tribute to aesthetic excellence, each room and suite is tastefully outfitted with custom furniture, incorporating contemporary art into the décor.

- 499 rooms and suites
- First-class technology offering customized mood lighting options, contact-free access, 42" LCD TV and centralized speakers in the bathroom.
- Facility panel offers easy and convenient connectivity to the guestroom LCD TV for iPod, music player and Xbox 360 or PS3.
- All room brings outside in, with floor-to-ceiling glass panels that offer superb views of the Yas Marina and Yas Marina Circuit.
- All-glass bathrooms allows light to filter through and are appointed with a luxury rain shower and designer bathtub.
- Deluxe rooms are spacious at 54sqm and are appointed with bespoke furniture and custom fabrics.
- Spacious suites range from 102sqm to 409sqm and offer exceptional views of the Marina and the Yas Marina Circuit, host of the Formula 1[™] Etihad Airways Abu Dhabi Grand Prix.
- Double-story exclusive presidential suites measure over 400sqm offering a lounge, private bar, full chef's kitchen, elegant dining room seating 4 up to 16 people and an outdoor terrace. Each suite also features private elevator access to a personal treatment room at ESPA at Yas Viceroy.





OTHER HOTEL FACILITIES

Twelve dining restaurant lounges & bars showcase cuisine from all corners of the globe. Ten meeting rooms and conference rooms with spacious Ballroom & perfunction area cater to all type of client needs.

ESPA has 9 treatment rooms with Hammam and gym facilities separate for male and female. We have two swimming pools of 200 &290 cu m, one on each Tower.

HOTEL INFORMATION AND FACTS

Yas Viceroy was built in the year 2008, the Hotel is owned by Aldar Properties PJSC & Managed by Viceroy Hotels and Resorts.

The hotel has two towers with 499 rooms

Hotel total area is 68700 m²

Number of Employee 500

Number of AC units: Air Handling Unit (AHU) is 42, Fan Coil Unit (FCU) is 845

Hotel Total Occupancy			
	Base Year	Implementation Year	
Colleague Count	53,560	48,607	
Number of Guest	109,810	130,186	
Food Cover *	83,288	93,268	
Contractor	9,574	11,440	
TOTAL	256,232	283,501	

HVAC requirements are met with District cooling provided by Tabreed. The bills for chilled water are received through ALDAR. Hotel has meters and sub meters for Water, Electricity and District cooling. Gas is provided by ADNOC. The meters are recorded on daily basis by engineering department.

 $[\]ensuremath{^{*}}$ See page 19 for food cover definition and assumption.





ENVIRONMENTAL STRATEGY

As a part of Yas Viceroy Abu Dhabi commitment to Environmental Health & Safety excellence; we strive to set new benchmark for Energy Management and we are committed to reduce our Hotel's overall carbon footprint.

We understand that Environmental stewardship is not a destination but a journey.

We focused on educating colleagues on savings that they can make in their respective areas. The EHS committee conducted training & awareness sessions on topics covering waste management, energy conservation apart from health & safety policies in the hotel.

Engineering team identified areas of improvement by adopting two prong strategies. Firstly solutions were recognized which can be implemented with little or no external help. A list of such project is showcased in the later part of this report; secondly we took expert advice from subject matter experts like Building Management System service provider and Room Management System providers.

The service providers were give task to optimize the performance of the system through operational efficiency improvement and upgrade with minimum investment. The same has resulted in solutions with better utilization of existing systems, efficiency improvement and implementation of projects with payback in less than 6 month from currant service providers.

For further enhancing our energy management programme we have conducted preliminary energy audits and we are in the process of appointing energy auditors who shall advice us on additional saving programs.





ENERGY MONITORING AND MEASURES



There are 5 Main electric meters to monitor and measure the hotel electricity consumption.



One meter to monitor and measures the chilled water consumption

One main gas meter for all hotel gas consumption and for further analysis and control there is gas sub meters for each kitchen and one for the boiler.

There are 3 water meters for monitoring and measuring both Tower A and B water consumption.





PROJECT SUMMARY

PROJECT SUMMERY LIST

- Water Pumping Station.
- Tower A&B back of house hot water pump circulation.
- Boiler system modification.
- Energy saving light retrofit.
- Extract Fan Rationalization.
- Water Aerators and flow restrictors.
- Building management system upgrades.

WATER PUMPING STATION

For our water treatment, we filter the raw water to be transferred into the water tanks through multimedia and the cartridge filters average 2 for each. Treated water/cold water is then pumped to the 2 buildings through 4 sets of Ultra Violet system by 4 groups of Variable Frequency Drive driven pump sets. The total capacity of the raw water tanks is 934.02 cu m and the treated water tanks = 359.3 cu m. The process to refrigerate water; cold water is changed by chilling the water via two sets of plate heat exchangers, tanks and pumps are utilized for each tower to accomplish this process to maintain the temperature average of 22-24.



We inherited separate raw water pumping stations for Tower A & Tower B Back of House areas. After analysis we have rationalized the use of raw water pumps. Now both tower A & Tower B are receiving water from 1 set of 3 pumps and other set of 3 pumps are made redundant, thereby saving us electricity.

Tower A & B BOH Hot Water Calorifier Bypass					
Date Installed	Old Consumption 1.1.1.1				
4 Jan 3000 Liter with 6 with 3 calorifers running running					
50 % Saving					

TOWER A & B BACK OF HOUSE HOT WATER CIRCULATION LINE



Starting from January 2013 Viceroy Abu Dhabi adopted new solution to reduce the number of hot water circulation pumps in its two building. We saved $3.6x2\ k$ watt hour from January onwards.

Tower A & B Hot Water Circulation Line Bypass					
Date Installed	Old Consumption New Consumption				
4 Jan 2013	3.6 kW with 4 pumps running Total 14.4 KW	3.6 kW with 2 pumps running Total 7.2 KW			
50% Saving					

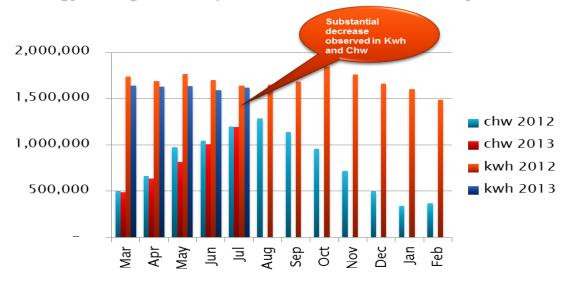


BUILDING MANAGEMENT SYSTEM UPGRADES

Our building management system is powered by Honeywell EBI R400.2 equipment supplying, controlling and monitoring the energy of 269 B.O.H FCUs, all AHU, VAV (Variable Air Volume box), chilled water pumps, car park extract fans, ecology units, calorifier 3 way v/v and refrigeration water 2 way v/v. Further details on savings on chilled water system please refer to Attune Advisory services that we subscribed from Honeywell. There are 5264 licensed points in use.

We subscribed better utilization of our BMS resource by opting for Honeywell Attune advisory service, which was absent in the benchmark year. We got our BMS data monitored by remote centre of Honeywell who advised us on corrective areas and potential to save energy. We worked out on the ΔP settings of various end chilled water circuits, kept the unoccupied rooms on higher set point (26 C) and saved on chilled water consumption.

Energy Savings After Implementation Of Attune Advisory Services



The graph shows the difference in energy consumption before and after implementation of the Attune Advisory Services Energy Savings Program starting March 2013

The cooling and heating system for 2 main pools on top of each tower (TA - 200 cu m & TB - 289 cu m) and 2 lap pools in Marina Wing (44 cu m) was carried out by 3 way valves to improve auto pool water temperature at 29 C.



EXTRACT FAN RATIONALIZATION

In regards to the heating, ventilation and air conditioning system there are 84 extract fans in the hotel. We have 11 extract fans in our car parks and their function depends on the level of carbon mono oxide. The 22 ecological units are used for kitchen exhausts and 42 Air Handling Units provide air-conditioning to our 7 restaurants, lounges and lobby, 12 meeting/board rooms and ballroom. A total of 845 Fan Coil Units are used for the 499 guest rooms and office space while 15 fresh air handling units provide fresh air, expel the exhaust and saves energy with the aid of a heat wheel.



We installed timers in all ecology units and extract fans and rationalized their operation to suit load thereby saving electricity. We not only cut down on the number of car park extract fans in night time but also modified the duty

Smoking Area Extract				
Date Installed	Old Consumption	New Consumption		
12 Dec 2012	33 kW with 3 extract running	11 kW with 1 extract running		
66% Saving				

Prior to December 2012 all the car park extract fans were used everyday non-stop all year round.

rotation.



BOILER SYSTEM

Hot water processed through 3 automatic fire tube boilers with 1320 KW for each boiler where the temperature is maintained at 80 C and 17 Calorifiers (each 3000 litres) as secondary side where the temperature is maintained $55-60^{\circ}$ C for the users.

In the benchmark years all the boilers were run in simultaneously to achieve the set point however in the benchmark year we worked out that it shall be economical to switch off two boilers and run just one to improve on overall boiler system efficiencies. We modified the usage pattern of the boilers and started to use manual on-off based on demand thereby savings are achieved on gas consumption.

By reducing uniting the circle of hot water in Viceroy Hotel Abu Dhabi, the team could reduce the usage of the boilers that produce & maintain this hot water in the storing calorifiers.



We switched off two boilers and run just one to improve on overall hot water system efficiencies. We modified the usage pattern of the boilers and started to use manual onoff based on demand there by savings are achieved on gas consumption.

Boiler Operation			
Date Installed	2 Boiler are switched off Summer month and low occupancy		
7 Jul 2012	Only one boiler is running and consuming 1320 kWatt		
Average GAS Saving 14%			



AERATORS AND FLOW RESTRICTORS

We have installed flow restrictors in rain shower heads and hand showers which reduce the flow more than half in hotel rooms, restrooms, and kitchens & back of the house areas. We managed to reduce consumption from 13 litres per minute to 4 litres per minute in kitchens and from 51.43 litres per minute to 21.43 litres per minute in the staff restrooms saving thousands of litres since February 2013.



Tower A & B Kitchen Tap Aerators				
Date Installed	e Installed Old Flow Rate New Flow Rate			
12 Feb 2012	eb 2012 13 liters per 4 liters per minute			
70% Saving				

Tower A & B Staff Restroom Auto Taps				
Date Installed	Old Flow Rate New Flow Rate			
12 Feb 2012	51.43 liters per 21.3 liters per minute minute			
58% saving				





Tower A & B Guestroom Shower Area Aerators				
Date Installed	Old Flow Rate New Flow Rate			
11 Feb 2012	11.8 liters per minute	4.73 liters per minute		
60 % saving				









Tower A & B Guestroom WC Area Aerators				
Date Installed	d Old Flow Rate New Flow Rate			
11 Feb 2012	15 liters per 7.5 liters per minute minute			
50% Saving				

ENERGY SAVING LIGHTS

One of the major initiatives at Yas Viceroy is the maintenance of our LED lighting system replacing the old halogen lights in the lifts and on the grid shell of the hotel. Some of the areas are shown below.

Canopy Light from Halogen to LED				
Date Installed	No. of Lights	Halogen Wattage	LED Wattage	
30 July 2013	60	70	8.5	
87% saving				



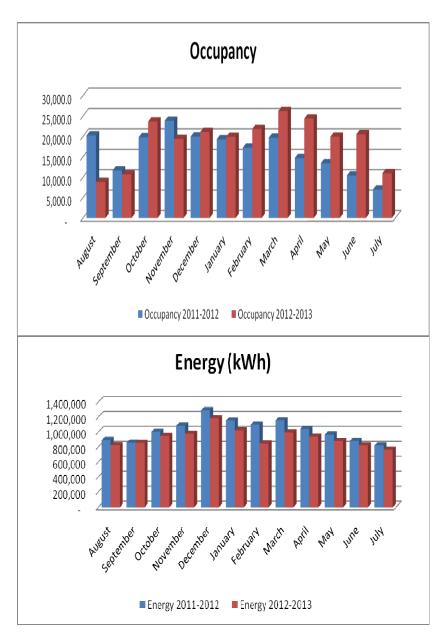


Lift Light from Halogen to LED				
Date Installed	No. Lights	of	Halogen Wattage	LED Wattage
30 July 64 50			50	4.5
91% Saving				



ANALYSIS & GRAPH

ENERGY



The first graph is showing the occupancy increase by 14% on average on the implementation year (June 2012 to July 2013) compared to previous year however the Energy Consumption has dropped as shown in the Energy Graph above

ENERGY HIGHLIGHTS

Total Energy Saving over a Year:
11.91 %

Yearly Tones of CO2 Saved for Energy: 2239.47 tco2/year

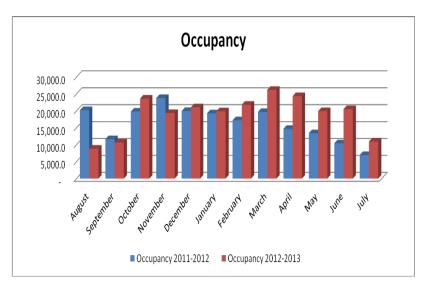
Cost Saving for Energy over a year: AED 788,707.00

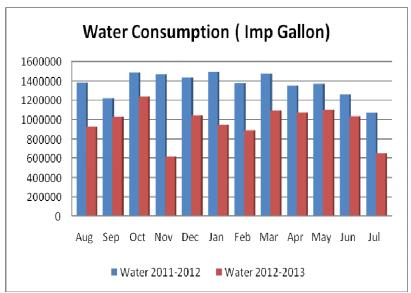
Energy Consumption Per Person: 154.97 kwh/year/person

Reduction of Energy consumption per person: 15.51%



WATER





As it is clear from the above graphs that while the occupancy increased by 14% on an average during the current year as compared to the benchmark year, water consumption has reduced from 88 g per occupant to 83.3 g per occupant.

Yas Viceroy is committed to further reduce the carbon footprint by investing in technology and by further enhancing operational efficiencies.

WATER HIGHLIGHTS

Total Water Saving over a Year:
13.9 %

Yearly Tones of CO2 Saved for Water: 239.95 tco2/year

Water Consumption Per Person: 55.12 IG/year/person

Reduction of Water consumption per person: 13.93 %



ASSUMPTIONS

The following assumptions are taken to arrive at Equivalent Number of Guest for the calculation of the Total Occupancy:

- 1. Employees and Contracted staff:
 - a. Total number of working days in hotel per year is 271 days (deducting 30 days annual leave, 12 days public holidays and 51 Fridays) or 22.58 days/ month.
 - b. Average working shift comprises of 8 hrs/ day thus the count is divided by 3.
- 2. The Guest food Covers: Is set of food assortment consumed by one guest during a meal that is prepared in house, where energy and water is consumed from perpetration of the food till cleaning of the dishes. In order to convert the Food cover to equivalent occupancy; as per standard practice every 4 food cover consume same amount of energy and water that consumed by one guest. Therefore food Covers are divided by 4 to neutralize to Number of Guest.
- 3. Number of Guest assumed that the guest is staying 24 hr in the hotel.

As the employee meals were prepared outside the hotel by outsource catering company during the base line year, while for nine months in the implementation year the employee meals were prepared inside the hotel, this process increase the water consumption in the implementation year. This difference between the base line year and implementation year should be neutralized for comparison purpose.

For water consumption neutralization the following assumptions has been made:

Each employee meals prepared in house: 20 Litres of water per meal is consumed for Efficient Kitchen Rating as per the Australian Standards, please refer: http://www.sydneywater.com.au/sw/your-business/managing-your-water-use/index.htm



LESSONS LEARNED

Energy monitoring provides valuable data to help in energy saving, in addition to uncover problems in existing systems and/or operation issues, also help for future planning. A simple example for that if you have water leak in a hidden place this will show increase in the daily consumption of the water.

Installation of high efficiency system does not guarantee energy saving. Systems must be integrated in a manner that allows for efficient operation. The attuning of the building management system is a good example in optimizing the operation of the HVAC equipments for more energy saving.

Educating employees about the need for energy conservation, while additionally promoting behavioral modifications of staff, both coupled with energy measures within facilities, can all systematically make a big difference regarding the hotel facilities becoming more energy efficient, with reduction in costs. At the same time sharing success is very important factor which keep all employee motivated and geared up for achieving continuous and improved energy saving.

Using a variety or resources, and general efficiency techniques and methodologies that could be reasonably implemented in day to day functions within the hotel will have an immediate effect on energy savings and costs. Energy conversation plan is not a static process and need continuous efforts and improvement.

Planning ahead is a very important factor for any success, in particular for energy saving, starting from budgeting, implementation, evaluation and improvement. Planning ahead will convey the importance and significance of energy conservation within the hotel's co-workers and peers to get their support and interest.



FUTURE PLANS

To achieve more results the hotel will be adopting total energy saving plan which focus and emphasis on continued reduction of energy costs. The hotel is in the process of appointing energy auditors to determine what types of energy efficient measures will be implemented in the future, as well the hotel conducted preliminary energy audits which determine more potential area for energy saving, the below point is highlight for some of the area which will be considered in the future energy saving plan:

- Optimise operation of FCUs in plant room areas
- Optimise RA fan power by providing VFD to Corridor AHUs
- Optimise Ecology units power consumption utilising existing two speed motor and BMS controls
- Fresh air optimisation in select FAHUs
- Eliminate throttling in Spa Waterfalls pump by reducing speed with available VFD
- Optimise pumps operation for water feature # 2 with available VFD by reprogramming PLC and interconnection of pumps
- Resize cold water transfer pump to actual requirement filter pressures
- Spot light replacement at selected corridors
- Landscape lighting replacements
- Optimising control logic for car park lighting

Our intention is to focus on balancing energy usage, to help reduce the carbon footprint of the hotel facilities and manage budgetary concerns and costs, without affecting the facilities and services quality with structured approach to realize and achieve these goals through a combination of energy conservation measures and upgrades



CONCLUSION

Implementation of energy efficiency and conservation measures in the hotel's daily operations is essential for reducing energy consumption, as well as costs, which can conceivably, if achieved, re-direct savings to potentially fund energy programs and/or future energy upgrades. Energy efficient measures can be applied against various areas such as lighting, temperature control, infrastructure, purchasing, renewable energy, and operation optimization.

Employee awareness is the key fundamental part of the plan. Educating employees about the need for energy conservation, while additionally promoting behavioral modifications of staff, both coupled with energy measures within facilities, can all systematically make a difference in energy efficient, and reduction in costs.

The conservation programs and its content is not intended to reduce basic necessities, such as lighting, heat, air conditioning, safety, or overall day to day operational characteristics required as necessities in meeting performance standards and quality of the daily activities within the hotel. However, it is intended to promote and/or provide solutions to perform the hotel required services, in the most cost effective and energy efficient manner regarding energy conservation.