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# Being energy efficient

*PW* looks at ways to reduce carbon footprint in villas using renewable energy

The Dubai Integrated Energy Strategy (DIES) 2030 mandates that, energy (or more specifically electricity) consumption in Dubai needs to be reduced by 30 per cent over 2010 business-as-usual levels, by the year 2030. For this target to be achieved, every consumer in Dubai needs to participate actively. DIES 2030 also sets the target of 15 per cent of Dubai's energy to be served by renewable energy by 2030. Overall, the aim is to reduce the carbon footprint of Dubai. Considering that it consumes over 28 per cent of the electricity generated in Dubai, the residential sector is a major stakeholder in this process.

Significant efforts need to be put into this sector, especially at individual consumer levels, if Dubai's energy efficiency and renewable energy goals are to be achieved. Basic conservation initiatives at the central air-conditioning plant and common heating, ventilation and air conditioning (HVAC) airside distribution systems can yield reductions of 10 to 30 per cent, alleviating the need for individual apartment occupants to aggressively contribute.

Villas on the other hand, have a greater opportunity to contribute to both energy efficiency and renewable energy goals of DIES 2030 quite effectively, if planned and executed in a smart sustainable manner. Unlike occupants of commercial complexes and residential towers, a villa occupant has more control over an energy efficient equipment.

## Renewable energy

In order to achieve the 15 per cent renewable energy target, Dubai Electricity and Water Authority (DEWA) has already launched the Sheikh Mohammad bin Rashid Al Maktoum Solar Park with a current target of 200 MW, to be followed by an additional 500 MW in 2016. In addition, DEWA has also opened up the grid to private renewable energy generators, through an established process, supported by adequate and necessary training for consultants and contractors, from their end. This now allows individual villa owners to convert their available rooftops and above surface car parks, to micro solar photovoltaic power stations. Much on similar lines to what has been happening in several European countries for years, from a technical angle.

Given that villas come in all shapes and sizes, it is perhaps best to analyze this in the context of a three-bedroom villa of approximately 5,000 sq. ft. in built-up area. Such a villa will typically have about 15–20 TR of AC equipment, potentially a mix of package, split and window air conditioners. The annual electrical energy required to operate the villa's AC system would be roughly 80,000 kWh, or less.

The electrical energy required for operating lighting and other equipment are separate from this. Given the climatic condition of Dubai, where HVAC energy consumption is about 60 – 70 per cent of the total electrical energy consumption, the overall energy required to operate such a villa would be in the range of 120,000 kWh/year.

## LED lights

This energy requirement can be significantly reduced if the villa utilises LED lights for all its lighting requirements; Energy Star labeled washing machine, refrigerator, microwave and laptops; and energy efficient AC units. Additionally, all external lighting should be converted to solar photovoltaic (SPV) with individual small battery storage units. These are relatively cheap and readily available.

Given that supply water itself is quite warm for most part of the year, solar water heating for such a villa size is not a strict recommendation. With these measures, barring the solar water heating, the actual energy requirement in the villa can be easily brought down by 20 per cent, equating to a reduced annual energy requirement of approximately 96,000 kWh.

Such a three-bedroom villa would have about 2,000 sq. ft. of free roof space, which should be sufficient for 15 kW of SPV panels. At an average availability of 8 hours of sunshine or daylight every day in Dubai, this should generate 44,000 kWh of electrical energy, or 50 per cent of the villa's annual requirement. Of course, one would argue that the electrical energy generated by the SPV panels is not necessarily available while it is needed, for example during winter daytime, hardly any energy is consumed in villas as the AC system is mostly not operational. And in summer, the SPV system may not be able to generate, as much energy as is needed even when the sun is shining. So how do we address the excess and the shortfall?

## Overcoming shortfall

The first and recommended one, is to take advantage of DEWA's opening up of the grid. Which means simply push any excess SPV energy into the grid and at times of shortfall, the villa will draw the deficit energy from the grid. This eliminates the need for storage and excess sizing of the SPV system. One has to of course go through the appropriate process laid out by DEWA and engage the approved consultants and contractors in order to get the system installed and commissioned. Excess energy pushed into the grid will be financially offset against the energy drawn from the grid.

The second option is to install a battery storage system to store the excess energy from the SPV system, to be extracted when the sun is not available. In the olden days, this would mean hazardous and large battery systems in an isolated place in the villa. With the advent of Tesla's Powerwall battery pack system, this can now be aesthetically wall mounted.

A 50 per cent reduction in a villa's conventional energy consumption is thus very possible and with it, a 50 per cent reduction in its carbon footprint. ■

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Sougata Nandi's work over 17 years has helped reduce carbon emissions in excess of more than 200,000 tonnes. He has implemented several energy and water conservation projects across the UAE and his work has won him and his organisations several awards in recent years including the pretigious Emirates Energy Award multiple times.