Is it possible, in he short term, to make savings and reduce the environmental impact of electrical power generation on construction sites in the United Arab Emirates.

The construction industry and more specifically the temporary site installations on construction projects are responsible for environmental impacts that include the use of water and energy resources, waste and greenhouse gas emissions. However, the past years global warming, renewable energies ans sustainability have been hot topics. The entire world is facing those issues including the construction industry. In the coming years, actions should be taken to make energy production in the world more efficient ans sustainable.

As of today, the most popular electrical power generators on construction sites are conventional diesel generators. Diesel generators are incredibly reliable, they can generate electrical power in any weather condition. They are modular and easy to install and dismantle. But diesel generators have an efficiency closely related to the load. At lower load and for cases where the load is highly variable, the specific diesel consumption of diesel generators increase drastically. This results is higher operating costs and of course more greenhouse gas emissions! Construction sites are the perfect example where such situation occurs.

The construction industry in the United Arab Emirates is a big energy consumer, for instance on the ongoing project of the Royal Atlantis Resort and Residences in Dubai, the energy consumption for the site offices (5,500 m²) was 270 Mwh for the month of August 2017. The entire electrical energy on this project is generated with diesel generators running in parallel. A study conducted on the Royal Atlantis Project has shown that, since May 2017, the average monthly cost and fuel savings are about 74% by connecting in parallel the generators. This configuration allowed to avoid 700 tons of CO2 emissions over the period from May 2017 to November 2017.

But what are exactly diesel generators running in parallel? Well, it is quite simple. Instead of covering the entire power demand with a single generator – another flexible approach to meet the power requirements – is to have two or more generators of variable output. The generators are connected in parallel with a synchronizing panel to achieve a maximum power output at the time of peak demand and achieve a higher efficiency at the time of lower demand. The results of higher efficiency are lower operating costs and a reduced environmental impact.

Next to diesel generators operating in parallel, renewable energy solutions are emerging and becoming more and more efficient and affordable. The potentiel of solar energy is huge all over our planet. In a year, about 885 million terawatt hours of solar energy reaches the Earth surface, that is 6,200 times the commercial primary energy used by mankind in 2008 and 4,200 times the energy mankind will consume in 2035. It would be unfortunate not to exploit that potential.

The volatility of solar energy, the high cost of energy storage systems and highly variable power demand make it difficult to imagine an entirely renewable power generation on construction sites in the next years. However, in the meantime renewable energy sources can be associated with conventional energy sources to form what is called a hybrid generator.

The average solar irradiance in the UAE is twice more than the solar irradiance in Belgium. Solar energy represents the greatest opportunity for renewable and cost-effective energy in the Middle East. The aim of another study carried out on the Royal Atlantis Project was to explore if installing photovoltaic modules to cover a part of the energy demand of the temporary site offices could be profitable.

At the beginning of the study, it was noticed that the curve of solar irradiance over the day is similar to the load profile of site offices. Therefore, a well sized photovoltaic generator shoud allow to use 100% of the generated energy six days a week. This means that no energy storage would be required. The only day in he week solar energy could not be used entirely is Friday, as it is an off day for the site employees, the power demand is obviously lower. The investment in a 50-kilowatt peak solar generator feeding a regular site office in UAE (approx. 1,000 m²) would be returned over a period of three years. A 50-kilowatt peak PV generator would cover in average 25% of the monthly energy demand. The average duration of a construction project in the UAE is three years. This means that solar generator would generate free energy, covering 25% of the demand on another project !

The studies conducted on the Royal Atlantis Project helped the contracting companies to answer the question raised at the beginning of this article. The sustainable power generation technologies available on the market would undoubtedly allow cost savings and help reducing the environmental impact of energy production in the short term on construction projects in the UAE.

Royal Atlantis Resort and Residences, Dubai

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