FEATURE

Towards a solar-powered era

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Why has Malta not yet reaped the benefits of solar technology? The answer lies in another question: "How much do we believe in it?"

I will here try to explain the potential that exists in at least one form of solar energy, basing my argument on real-life experience in the conversion of solar light to electricity.

A solar photovoltaic system mainly comprises solar cells, which convert light energy to electricity that can be stored in batteries or fed into the grid through an inverter.

The generated electricity could be used immediately or exported to the grid. In both cases, this would contribute towards lowering the electricity bill of the consumer.

By placing solar systems on rooftops one avoids the use of land that is scarce and expensive in Malta. Moreover, the roofs in Malta are flat, which implies that the solar modules can be placed in such a way as to maximise their output.

Photovoltaic applications that were so far restricted here to research and demonstration systems will soon be available for everyone to install, according to the regulations to be set by the Malta Resources Authority.

Besides the demonstration projects, there are so far only two privately owned solar grid-connected systems in Malta, one at a residence in Madliena (it has been operating since May 2002) and another in a Marsa factory, installed in September 2002.

Three different solar systems are also in operation at the Institute for Energy Technology. The oldest grid-connected photovoltaic system in Malta is the 1.8 kWp stationary plant installed on the institute's rooftop in Marsaxlokk.

Over the past six years, the system produced over 10,000 units of electricity, which reduced the institute's electricity bill by 60 per cent. This is roughly equivalent to two-and-a-half years of electric consumption of a home housing four persons.

This amount of free solar electricity has also saved burning 1,100 gallons of fuel oil at the power station, to produce an equivalent amount of electricity for end-use. Moreover, it has saved the environment 13 tonnes of carbon dioxide, 260 kilogrammes of sulphur oxides, 16.2 kilogrammes of nitrogen oxides and five kilogrammes of particulate matter.

An increasing number of multi-level buildings are replacing the older traditional two-storey terraced houses, due to space limitations, high land cost and greater demand for smaller dwellings.

In turn, less roof area per household would be available for installing solar systems. Moreover, the older buildings that may be adjacent to these high-rise constructions would have less effective sunny areas on their roofs due to shading.

In such cases, solar tracking may be attractive since it would maximise on the production of energy from solar radiation in a limited space.

Moreover, one can produce enough electric power with a lower number of solar modules and lower capital costs. Solar tracking operates best under clear sky conditions and this matches the weather conditions in Malta where rainfall is minimal.

Another advantage of tracking systems is that since only few solar modules are installed on one tracker, a system of trackers can be easily distributed independently in the sunny areas of the roof.

The second system at the institute comprises six solar modules that are mounted on a tracking device and connected to the grid through an inverter.

This system has so far produced 1,500 kWh. It has intercepted 20 per cent more solar radiation than the stationary system per unit area and produced 60 per cent higher final yield per installed Watt of PV module.

Its efficiency was also 40 per cent greater than the stationary system. This implies that in order to produce a certain amount of electric energy, up to 40 per cent less roof area would be needed.

When comparing between two systems having equal output energies, the tracking system would have a 20 per cent lower capital cost than a stationary one.

The ongoing research will further be used to confirm these results on a long-term basis.

The third solar system that was installed few weeks ago will study the performance of the state-of-the-art palm-sized inverters, which is the future of photovoltaics in the world.

Ideally, a solar module would produce AC power to match our everyday needs. This small inverter makes this a reality, so much that the solar panels can now be termed as "AC modules".

The flexibility that such an inverter gives to a solar system makes it ideal to take full advantage of each and every corner or space where the sun shines.

By employing AC modules, architects can literally make use of single solar modules to match their design needs. Most importantly, such an inverter will eliminate the need for checking on mismatching of modules or partial shadowing of system.

It would now become easy to choose different module sizes and colours and blend them into a single architectural work piece, with no negative impact on system performance.

It is five times more efficient to heat water by means of a solar heater rather than using a solar electric system. Although the prices of solar heaters have dropped considerably, they are not as popular as one would expect, and this brings in the role of advertising, which so far has concentrated only on savings on the electricity bill.

Solar heating systems provide security to the supply of hot water. Incentives by the government might help to promote them but it will not be enough until everyone agrees that the answer to the key question is a yes; that we believe in solar technology.

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