

# The 'next big thing' in energy

With the increased focus on renewable energy, storage is coming of age, writes **M Ramesh**

Last fortnight, Solar Energy Corporation of India (SECI), the government-owned company tasked with development of the solar energy sector in the country, issued a tender for 100 MW that the successful bidders would set up in the solar park at Kadapah, Andhra Pradesh.

The tender was unique, because for the first time it brought in 'storage'. It said that the developer should put up, in addition to the solar plant, a 2.5 MWhr capacity storage unit for every 50 MW of solar. SECI will soon announce similar tenders for 200 MW of solar for Karnataka. The company would therefore cause 15 MWhr of energy storage set up in the country.

This is unprecedented. There was one call for 'expression of interest' in March, for setting up a wind-solar hybrid plant with 1 MWhr of storage, but that was only a EoI and for a smaller capacity. The only comparable storage capacity in the country is the 10 MWhr battery array that the American company, AES, is setting up in Haryana for its collaborator, Panasonic.

## Nothing new

Storing electricity is nothing new, as anyone who recharges his phone battery knows. People store electricity in inverters at homes and, in the recent years, many telecom towers have discarded their diesel back-up and installed battery packs instead. According to the Indian Energy Storage Alliance (IESA), in the last two years, Lithium-ion batteries worth about \$500 million have been bought for use in

Indian telecom towers. So what is new about the SECI tenders and AES venture? In one word: size. The MW-scale storage units indicate that India has stepped up into a rarefied field of hoarding up large chunks of electricity.

The advent of large-scale energy storage has been on the cards for some years now. In India, as anywhere in the world, it is inevitable. You can't engender a solar revolution without storage—otherwise, you will still need grid power after the sun sets. You cannot have distributed energy supply, such as micro-grids, without storage. Energy storage is the heart of electric mobility.

## Storage is fundamental

Furthermore, storage is fundamental to balancing demand and supply in a large grid. When you have large capacities of wind and solar pumping fickle electricity into the grid, 'storage' is a big friend, for you can store excess energy in it and drain it when generation from wind and solar dips. As such, 'storage' has been the 'next big thing' in energy for the last half-decade or so.

However, storing vast quantities of energy has been a challenge. Until recently, if you wanted a large back-up energy source, you bought a Cummins or a Powerica diesel generator—the energy lay stored in the fuels. In very few places in the country another trick was employed—they pumped water into a high tank when the demand for power was not much, and ran it down to turn the turbines and produce electricity when the demand rose. But such 'pumped storage' facilities can't be put

up everywhere. Storing energy electrochemically in compact battery packs of sizes ranging from as small as television sets to as large as shipping containers has been the subject of intense research globally in the last few years. The efforts are coming to fruition and 'storage' is the 'in-thing' globally. By symbolising the 'arrival' of big-ticket storage in India, the SECI tender shines a light on the vast number of activities in this area that are gathering momentum now.

For instance, our government is working towards bringing a National Energy Storage Mission. On the anvil is the setting up of an Energy Storage Research Institute. The IESA is working with the US-headquartered certifying and validating agency, Underwriters Laboratories, to evolve standards for storage systems. The Alliance is also working towards setting up an 'energy storage-focused incubator'. IIT Bombay is in the process of setting up a Centre of Excellence for Electrochemical Research—essentially for storage.

## Keen on India

Foreign storage companies are keen on tenting up in India. Last year, the US-based Imergy Power System, which makes 'flow batteries', said it would provide battery back-up to SunEdison's solar-powered mini-grids. Another US flow battery company, Vionx Energy wants an India presence. (Flow batteries are large systems that work on the principle of movement of electrons between two sets of electrolytes; they are re-chargeable, last about 20 years and can store enough energy for several hours of discharge.) Panasonic has said it wants to provide battery back-up, albeit of smaller size, to ATMs, so the

machines function even if there is a power outage. The Chinese company, BYD, is interested too. For companies such as these, the SECI tender is a positive signal.

India seems to be on the cusp of a 'storage revolution'. A recent study of the IESA estimated that Indian market for storage in 2015 was 4.4 GW, with home inverters accounting for 60 per cent of it. The study said that between now and 2022, India will set up 70 GW/200 GWhr of storage. Batteries for replacing diesel generator sets and for maintaining grid stability alone will be a 4-6 GW market, says Dr Rahul Walawalkar, Executive Director, IESA, and President of CES India Pvt Ltd.

The anticipated rapid fall in costs will help, he says. Today, Li-ion batteries cost around \$350 a kWhr, but experts (such as those in General Motors) expect it to decline to \$100 by 2022. Incidentally, the conventional lead-acid batteries already cost only that much, but they do not last long—about 1,000 cycles, compared with 3,000-5,000 cycles for Li-ion.

Another (simpler) way of looking at costs is the levelised cost of energy that is taken out of the batteries. Walawalkar says that Li-ion batteries give out kWhr at an average cost of ₹10-12 over their lives; this, he says, will decline to ₹5 in three years. Few can miss the parallel between 'storage now' and 'solar five years back'. Solar power cost ₹17-18 a kWhr in 2010, it is less than ₹5 today, and is expected to go down further.

Against the backdrop of such developments, the AES system of 10 MWhr and SECI's 15 MWhr mark a milestone. The year 2016 will go down in the energy history of India as the time when large-scale storage systems began to be deployed, which is truly epochal.



**Big save** The advent of large-scale energy storage has been on the cards for some years now. In India, as anywhere in the world, it is inevitable

## CLEANTECH CLASSROOM

### Energy storage capacities

Energy storage capacities are expressed in two forms—watt and watt-hours—usually, in terms of MW and MWhr. While MWhr is like 'volume', or how much energy the tank can hold, the MW number is the maximum possible 'flow' out of the tank, or, discharge. The two numbers together tell the capacity of a system.

**How are energy storage capacities expressed?**

### How is their cost expressed?

Costs or prices are typically expressed in \$ (or rupees) per kWhr.

Another storage terminology that needs to be understood is 'deep discharge'. This refers to how much energy in a battery can be drained off before the battery should be recharged. The deeper the discharge the better the economics of the system, but in today's technologies no battery can be drained off 100 per cent.

**What is deep discharge?**

## THEY SAID IT

Once the renewable infrastructure is built, the fuel is free forever.

AL GORE  
AMERICAN POLITICIAN AND ENVIRONMENTALIST



## GREENVIEW

BY DIPANKAR

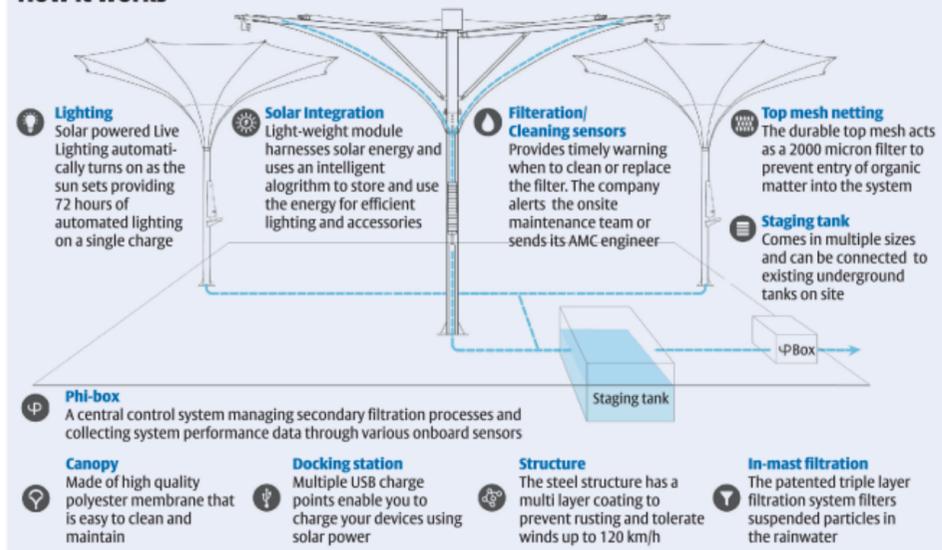


## The inverted beauty

Ultra Chaata, a smartly designed inverted umbrella made by Thinkphi, captures and purifies rainwater, uses solar energy to light itself while allowing you to enjoy the outdoors. Thinkphi is a clean technology company set up in 2015 to build aesthetically pleasing yet simple products that save the earth's most valuable resources



### How it works



### The need for it

Almost 60% of major cities are open spaces. But few rain water and solar harvesting solutions exist for open spaces

India needs 7.3% annual growth rate in power generation over the next 20 years

22 out of 32 major cities have a water supply gap

## CLEAN FUN

Some facts on: Geothermal energy

**Geothermal energy** got its name from the Greek words: **geo** (earth) and **therme** (heat), and is in fact Earth's heat.

In the first century AD, the Romans conquered Aquae Sulis, (now Bath, Somerset, England) and used the hot springs there to feed public baths and underfloor heating

Paleo-Indians used hot springs for cooking, refuge and respite

In olden days, hot springs were neutral zones where members of warring nations would bathe together in peace

Heat used for geothermal energy is stored 4,000 miles within the Earth's core and its temperature may reach over 5000 degrees Celsius. That's 50 times hotter than that of boiling hot water!

Retail chain IKEA uses geothermal energy to cut down costs and reduce its carbon footprint

Geothermal energy gives 18% of Iceland's total electricity

## From pet to paint: personal recycling is now making its mark

A recycling machine developed by Biocrux India — and made locally — targets the end-consumer

### PREETI MEHRA

Next time you guzzle a beverage, you could also have the pleasure of recycling the pet bottle yourself.

You would just have to put it into the Biocrux plastic bottle crushing and flaking machine lying in the corner and be assured that the recycled flakes will find their way as an additive to alkyd, enamel or lacquer paint or as resin.

Pitched as the 360 degree solution for plastic waste, the recycling contraption has been developed by Biocrux India. It has been locally designed, fabricated and assembled to be

used at the point of consumption.

"That is the USP of the Biocrux machine. It is meant for consumers to personally recycle the pet bottle once they have polished off its contents. It is ideal for public places, tourist spots, malls, fairs — wherever consumption is happening. We have installed it at the Elephanta caves in Mumbai where it is serving the public well," says Ajay Mishra, the Founder Director & CEO.

A chartered accountant who has worked in companies like Lakme Lever, L'Oreal India and Reliance Industries, Mishra decided to go it alone after what he witnessed in Mumbai during

the devastating July 2005 floods where plastic bottles were overflowing and choking all the sewage channels. Living out his passion he began to spend weekends creating a machine that would turn the bottles into a useful substance.

He was soon joined by Aresh Sarkar, a polymer engineer who had rich experience in paints company Akzonobel for over 7 years. Now Managing Director of Biocrux, he believes in the virtue of frugality and the vision of open innovation.

The first Biocrux machine was installed in 2012 in Mumbai's Inorbit Mall. Today the contraptions are present in Pune and Bangalore as well and hope to reach another four to five cities before the financial year is over.



A Biocrux machine

"Bisleri was the first company that liked the product and came forward to sponsor the machines. Now others

have also shown interest and installed them, starting a "PET neutral" drive among the employees. Biocrux India ensures that flakes from these are going to the right channel for recycling in the most sustainable way. Our approach saves a lot of CO2 emission in recycling, reduces transportation cost, fuel by 9-10 times on handling these wastes, saves two-thirds water compared to recycling process," says Mishra.

He laments the state of waste management today and points out that two-thirds of the country's wastes are going to dump yards. He has found that municipalities exhaust 70 to 90 per cent of their budget on the logistics of waste clearance with almost no funds, time or energy spent on sustain-

able disposal. "Two-third of India's PET bottles are not getting recycled, these are either thrown or sometimes re-filled with water for drinking and reselling.

The company, apart from providing the Biocrux machines, is now embarking on the second phase of the recycling by finding different uses for the flakes that are produced. It has already succeeded in using it as a paint additive. "We are also looking at the possibility of turning the flakes into polyester yarn, or creating dust bins with it or using them to build temporary shelters. The 360 degree cycle must be completed. The aim is that there is no reuse, no misuse of PET bottles and they do not land up in the landfills".