



**GOLDEN
JUBILEE
SPECIAL**

Energy Headlines

ENERGY NEWSLETTER OF MNIT, JAIPUR



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THE LITRE OF LIGHT



What does it take to light up a million slum homes in Philippines ?

If you're thinking about a hundred million dollar budget, serious technical expertise, skilled professionals, a huge task force and a time span of more than a year, you could not have been more wrong.

What about used plastic bottles, water, a little amount of bleach, rivet, metal sheets, sand paper, epoxy, little training, five minutes and less than 1\$ per house. The result being a 60 watt bulb-like lightning system which functions perfectly, in at least daytime.

True, this cannot challenge the next

WATER AND BLEACH BEING USED TO PRODUCE A 60 WATT DAYTIME LIGHTING EQUIPMENT

gen LED's. Accepted that their functionalities will be limited to daytime. But in a country where 40% of the population lives off less than 2\$ per day and the rising cost of power leaves many unable to afford electricity, is it not something miraculous? Not only does it specifically address the needs but essentially everyone is able to afford it without worrying about continuous expenses.

This project, "Litre of Light" was launched by the My Shelter Foundation, a Philippines based NGO.

These lights have got attention from normal folks and engineers alike , and have caught on in some places. The question is, that will this simple and beautiful idea ignite the



spark for more such ideas that that are sustainable and yet accessible to all.

Source: www.cleangreentech.org

Besides being super effective, this form of light proved to be inspiring too. A team of 3 students from MNIT, Abhishek Leel, Abhinav Bansal and Sakshi Goyal, took up the task to install some of these bot-

tled water lights in the slums of Jawahar Nagar. There they found that the cost of installing one such bottle comes under less that Rs. 35. The bleach is used in very small quantities only for the purpose of keeping

the water clean and bacteria free. Running cost is zero and these are very long life. So, if you feel inspired from it and want to undertake such initiative, tell us at mnit.energyheadlines@gmail.com



13 YR OLD COPIES NATURE TO IMPROVE SOLAR CELLS

Thirteen year old Aidan Dwyer was walking in the woods in New York and noticed a spiral pattern to tree branches. Aidan realized **the tree branches and leaves had a mathematical spiral pattern that could be shown as a fraction**. Soon he also realized the mathematical fractions were similar to the Fibonacci sequence. "On the oak tree, the Fibonacci fraction is $2/5$, which means that it takes five branches to go twice around the trunk to complete one pattern. Other trees with the Fibonacci leaf arrangement are the elm tree ($1/2$); the beech ($1/3$); and the willow ($3/8$).

The 7th grader came to the conclusion that nature used such a pattern to collect maximum sunlight. So, he constructed two side by side solar arrays - one a typical flat-panel array, mounted at 45 degrees, and the



second array based on the Fibonacci pattern of an oak tree. He put both outside. To his amazement, during the month of December, **the tree design made 50% more electricity**. He discovered that the Fibonacci pattern helps deciduous trees, efficiently track the Sun and collect the most sunlight even in the thickest forest, on the cloudiest days. If an object blocks the light to a flat panel array, it stops producing energy. But, the Fibonacci pattern allows some solar 'leaves' to collect sunlight, while others are in shade. Plus, the Fibonacci pattern helps the leaves on a tree to

avoid shading each other. Snow and debris slide off as well. Aidan is currently building tree arrays based on the other Fibonacci patterns of the elm, beech, willow and almond trees.



The American Museum of Natural History has awarded Aidan a Young Naturalist Award for 2011.

Source : www.inspirationgreen.com

KILLING HEAT DEATH

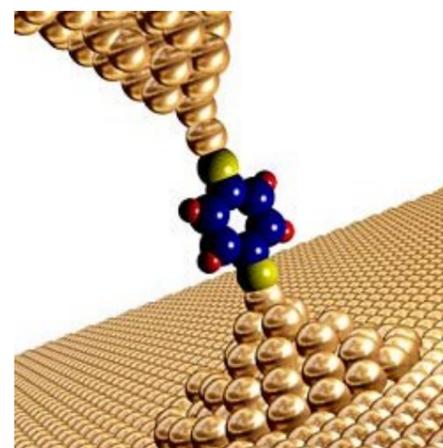
Researchers at the University of California, Berkeley, have successfully generated electricity from heat by trapping organic molecules between metal nanoparticles. The discovery is a milestone in the quest for efficient ways to directly convert heat into electricity.

"An estimated 90 percent of the world's electricity is created through this indirect conversion of heat. In the process, 2/3rds of heat is wasted and released at an unusable temperature", said Arun Majumdar, UC Berkeley professor and principal investigator of the study. "If even a fraction of the lost heat can be converted into electricity in a cost-effective manner, it can amount massive savings on energy, fuel and reduced CO₂ emissions. "Utilizing this

wasted heat has been a major focus of research into thermoelectric converters. Such converters rely upon the Seebeck effect, where a voltage is created when the junctions of two different metals are kept at different temperatures.

However, such thermoelectric generators operate at a paltry 7 percent efficiency compare to the 20% efficiency of the conventional heat engines. Moreover, such converters are made up of exotic, expensive metal alloys, making them too costly and impractical for widespread use.

The new UC Berkeley study marks the first time the Seebeck effect has been measured in an organic molecule, laying the groundwork for the development of more cost-effective thermoelectric converters. "The goal



is to make things out of materials that are more abundant and more easily processed," said study co-author Rachel Segalman, UC Berkeley assistant professor. Organics are cheap and can be processed easily.

Source: newscenter.berkeley.edu

SOLAR PANELS THAT WORK IN THE DARK



"How do we attack important problems? Pose the right question."—Donald Sadoway

Well...it can almost see in the dark. Scientists at the Lawrence Berkeley National Laboratory have announced a new high-efficiency solar cell design that handles pretty much the entire solar spectrum. Moreover, it can be manufactured using ordinary low-cost processes that are currently in use.

Harnessing the Full Spectrum for Solar Power

The semiconductors in a conventional solar cell captures light from one part of the spectrum. The new solar cell uses different materials, stacked in layers, that respond to different wavelengths. Here, the trick is to create an intermediate energy band within the gallium arsenide nitride alloy. This third band enables the semiconductor to respond to low and



mid-energy wavelengths as well as the more "energetic" parts of the spectrum.

Lowering the Cost of Full Spectrum Solar Cells

The advantage of gallium arsenide nitride is that it is very similar to a conventional semiconductor, gallium arsenide, and it can be produced with a commonly used fabrication method.

Full Speed Ahead to Full Spectrum Solar Cells

The Lawrence Berkeley breakthrough represents just one path to increasing the efficiency and lowering the cost of solar cells. Over at Ohio State University, a full spectrum solar cell is also under development, and Stanford is working on cutting efficiency loss due to high temperatures. And then of course there's low cost solar paints on the horizon, new solar cell fabrication methods, and the use of low-cost materials for concentrating solar power...well, it may be just a bit too soon to say goody-bye to "yesterday's energy" but we're sure on our way.

Source: www.greenwala.com

DONALD SADOWAY

What's the key to using alternative energy, like solar and wind? Storage -- so we can have power on tap even when the sun's not out and the wind's not blowing. Donald Sadoway, a researcher at MIT, is keen to show us the future of large-scale batteries that store renewable energy. As he says: "We need to think about the problem differently. We need to think big. We need to think cheap."

At MIT, Donald Sadoway has been working on a grid-size battery system that stores energy using a three-layer liquid-metal core. With help from fans like Bill Gates, Sadoway and two of his students have spun off the Liquid Metals Battery Corpo-



ration (LMBC) to bring the battery to market.

"With a giant battery, we'd be able to address the problem of intermittency that prevents wind and solar from contributing to the grid in the same way that coal and gas and nuclear do today." The problem at the heart of many sustainable-energy systems: How to store power so it

can be delivered to the grid all the time, day and night, even when the wind's not blowing and the sun's not shining?

The 3 layered battery miracle that Donald is working on uses, "liquid metal". It is not only inexpensive but incredibly efficient.

At one of the famous TED (Technology, Entertainment and Design) conferences, Donald reveals how he got the idea and his future plans with the battery system and how with his company he tries to make it accessible to all. The talk is themed "The missing link to renewable energy".

Source: www.ted.com



ALTERNATIVE ENERGY DIY

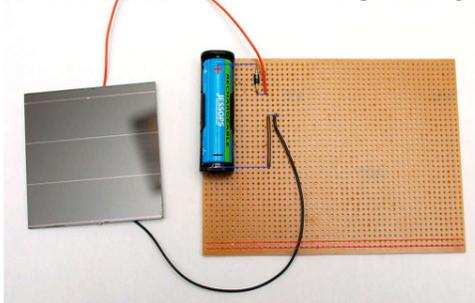
About time we took up the task of saving mother earth on our hands. This particular website <http://www.instructables.com/group/alternativeenergy> could be of great help in this particular matter. It has instructions about quite a few “Do It Yourself” alternative energy devices and equipment ranging from a little complex wind turbines and solar chargers to simple batteries and handheld devices that even a 10 year old could make. True some of them do require certain knowledge about mechanics and electronics, but then what are we engineers for ?



CARDBOARD SAVONIUS WIND TURBINE



HANDHELD SOLAR POWER SUPPLY



SOLAR BATTERY CHARGING

The device at instructables include wind turbines made from a Pringles box, handheld solar power supply, portable solar battery chargers, biodiesel processors, even a bicycle pedal power i-pod charger auto rechargeable batteries, solar powered car radio and many more cheap and easy to create stuff that could actually be used on a daily basis. You can also participate in forums where users post their ideas for simple DIY green energy tips. Besides if you’ve got an idea for a the same, post it on the forums there and someone or the other just might come up with a good solution for implementing or improving it.

FROM READER’S PEN



India records world-beating green energy growth- Guardian, UK

India’s green energy sector is going all out. A “52%” record growth to the amount of 10.3 billion USD. Such a huge growth, that dwarfed the rest of the world’s significant economies was largely powered by significant contribution by the solar sector. "India's record performance in 2011, and the momentum it is carrying into 2012, is one of the bright spots in the clean energy firmament," concluded BNEF chief executive Michael Liebreich.

At the 6th RENEWABLE ENERGY EXPO 2012, INDIA, which is being cited as Asia’s largest congregation on renewable. India as a destination

for global investors in being marketed as -

- Global rank 8th for investments made in clean energy technologies
- Global 3rd best investment destination in renewable energy sector
- **Jawaharlal Nehru National Solar Mission (JNNSM) aims to generate 1 GW of grid connected solar power by 2013, 5 GW by 2017 and 20 GW by 2022. The mission also envisages 500 MW of grid-tied CSP by 2013 and 10 GW by 2022**
- Indian clean energy sector is a US \$20bn opportunity annually

- The installed capacity for wind energy has grown at a CAGR of 19% to reach ~14 GW in FY 11
- 7 of the top 10 global wind turbine manufacturers have manufacturing facilities in India
- The total potential of small hydro power and biomass energy is estimated at 15GW and 18 GW respectively
- Cleantech sector has the potential to generate 10 mn jobs in India by 2025

WAY TO GO INDIA !!!!!

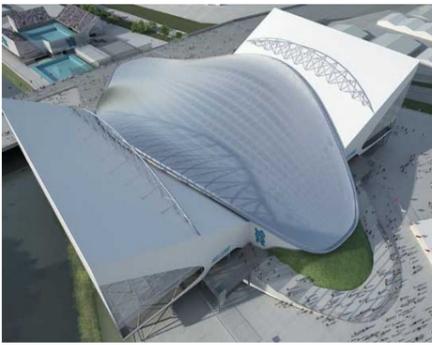
GREEN BUILDINGS OF LONDON OLYMPICS'12

The 500-acre Olympic Park constructed for the London 2012 Olympics is home to nine brand new sports facilities. With the enormous task of keeping tens of thousands of spectators cool, lights on, and bathrooms in good working, the London 2012 Organizing Committee had set out to build their new facilities with energy efficient, sustainable, and recyclable designs. Here's a rundown on how the London 2012 Olympics was cutting down the watts and water to keep the games clean, green, and energy efficient.



First up, is the **Velodrome**, one of the most sustainable buildings ever built for the Olympic Games. The building contains the indoor cycling track, and it was built to hold 6,000 people and keep them cool in the summer with a completely natural ventilation system using outside air. In addition, the Velodrome uses natural lighting during the day to supplement fluorescent lighting, saving a lot of energy. Did we mention it collects rain water for its main water usage with its sloped roof?

Right next to the Water Polo Arena is the brand new **Aquatics Center**. The wave-inspired interior ceiling of the venue is spectacular to look at. Two temporary wings, with the capacity to hold 17,500 spectators, were built sustainably for the arena so once the games are completed, they can be removed, allowing the facility to be used by the London community.



The Olympic Park's new **Basketball Arena** is perhaps one of the most interestingly designed sports facilities, as it's one of the largest ever built for temporary use. In terms of design, it's more of a tent or scaffold that's entirely sustainable like the Water Polo Arena. Its steel frame, constructed in only three months, is covered in 20,000 square meters of white, recyclable PVC fabric. All of these materials can be taken down and reused after the Olympic Games.



Next there's the **Water Polo Arena**, the first ever dedicated Water Polo venue built for the games. The 5,000 person capacity arena holds a 37-meter pool and a uniquely sloped roof (from 25m down

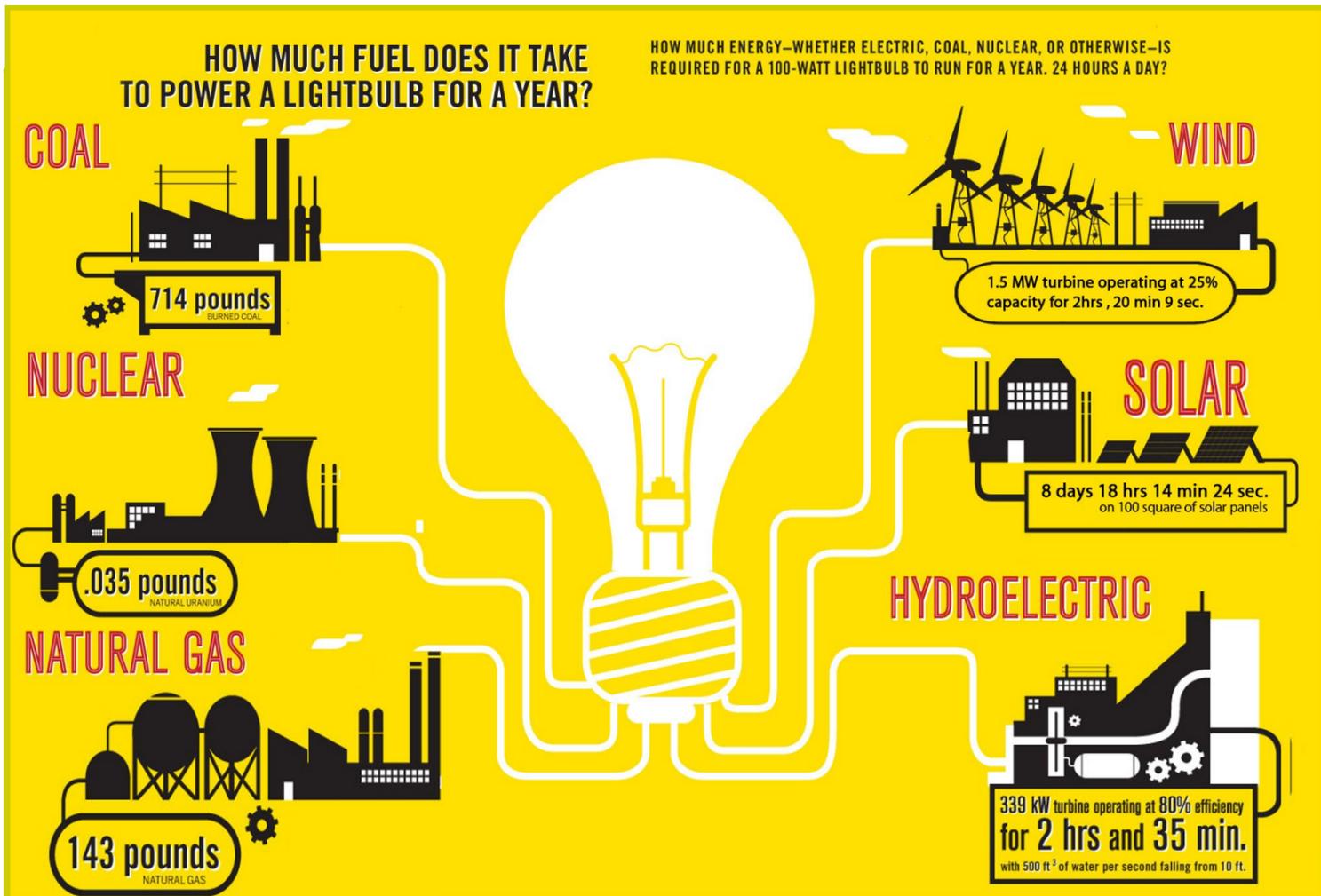


to 6m). But more interestingly, the arena was built sustainably such that it will be torn down immediately after the games, and the materials reused for construction. The building is made with Polyvinyl chloride material, or PVC, which is easily recyclable.



The **Copper Box** is likely one of the most efficient buildings in the Olympic Park. It was used for various exciting court-worthy events. Why is it named the Copper Box? The boxy building has 3,000 square meters of copper (mostly recycled) on its exterior faces, giving it that nice bronze sheen. In terms of sustainability and energy efficient design, the Copper Box has 88 pipes that bring in natural daylight, saving an annual 40% on lighting costs. Also, much like the Velodrome, the roof collects rainwater on its roof for the use of waste management (toilets), which will also cut water costs by 40% per year.





THE ECO FRIENDLY RICKSHAW

With virtually all modes of transport going the hybrid way in Chennai, here's news that could make the rickshaw a possible mode of public transport. Twenty-six-year-old Sivaraj Muthuraman, a Tirupur-based innovator, has built a 'hybrid' rickshaw called the Eco Free Cab, that runs on solar battery and pedal power. This invention entered the India Book of Records under the Science and Technology Category on Saturday.

A three-seater vehicle that can run a distance of about 150 km per battery charge, the Eco Free Cab has a top speed of 45 km per hour. Vivek Raja, adjudicator, India Book of Records, said, "If we can control the process of burning fuel, pollution can be brought down drastically. Such inventions go a long way in controlling



the greenhouse gas effect. Sivaraj's invention, hence, is laudable."

Speaking to City Express, Sivaraj said, "About two-and-half years ago, I felt that someone must breathe life into the rickshaw. It was then that I took this up as a project. Rickshaw-wallahs, have more or less disappeared and must be provided training on how to use the vehicle and be provided with a means of livelihood."

As of now, the biggest challenge that he faced with the project, Sivaraj

cites lack of public encouragement. "My neighbours were baffled when they saw a prototype of my product in our parking lot. People thought I had gone mad," he remembered. "Soon, it turned into curiosity, with people wanting to take photographs sitting in it!"

Explaining the difference between the Eco Free Cab and other hybrid and battery-operated vehicles, Sivaraj said, "Conventional battery-operated vehicles are expensive, even costing to up to Rs 4 lakh. In comparison, an Eco Free Cab would cost only about Rs 80,000. Thus, the vehicles are cost-effective and are of low maintenance." Just the kind of public transport we need right now.

Source : www.ibnlive.in.com

THE OFF-GRID PORTABLE HOUSE OF RECYCLED STEEL



This Homestead House is an off-grid prefab concept made from recycled steel by designer Michael Jantzen.

The house makes use of prefabricated, commercially available steel which makes it both low in cost and extremely modular. In fact, it makes the size and shape of the structure completely customizable - not to

mention really tough!

And the house is fully recyclable as it can be easily torn down and erected in different location.

Within the tough outer steel shell is another structure made of a lighter gauge material. The inner shell is insulated by ground up newspapers and magazines. Now you can feel less guilty about receiving the print edition of TOI.

Adding more feathers to its green cap is the fact that this system is completely off-grid. It has its own photovoltaic solar panels and a small wind turbine. The climate inside is controlled via passive so-



lar. The arches also collect rainwater which can be directed to above or below ground storage. Above ground storage would also be solar heated.

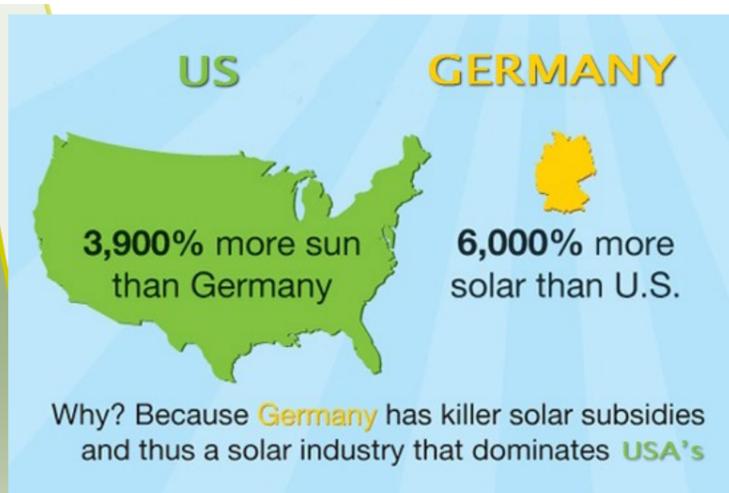
Made of prefab and recycled materials and totally self-sustaining, this is probably a house that may become a common sight in near future.

Source : treehugger.com

WISE

During the summer vacation of 2012, after 6th Semester examination, 10 students from different departments of MNIT were working at different leading universities in Germany on cutting edge technology. Their visit, including travel and stay was funded under WISE (Working Internship in Science and Technology) Scholarship given by German Academic Exchange Program (DAAD). For the next year, i.e. 2013, announcement for the same is shortly going to be released. For more details visit <http://newdelhi.daad.de>.

FUN FACT



Answers to the quiz of EH volume 5 issue 3

1. Masdar City, Abu Dhabi
2. The Environment and Research Institute (TERI), Gurgaon
3. Jinshawan Tower, Inner Mongolia, China

There was only a single correct entry by -Devesh Sharan Pandey, M. Tech., MSE

credits

Ibrahim Katthawala (3rd Yr. Mechanical Engg.)
 Navdeep Agarwal (3rd Yr. Mechanical Engg.)
 Ashish Bijarni (3rd Yr. Mechanical Engg.)
 Amit Tongia (3rd Yr. Mechanical Engg.)
 Anshuman Awdhesh Kumar (2nd Yr. Mechanical Engg.)
 Dr. -Ing. Jyotirmay Mathur, Head, Centre for Energy and Environment

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