



Energy Headlines

ENERGY NEWSLETTER OF NIT, JAIPUR



This Issue

Solar at Night	P.2	Eminent Energy Personality	P.2
Solution to Power Shortage	P.3	Reader's Column	P.3
Conferences Alert	P.4	Comic Sense	P.4

'ARTIFICIAL LEAF' MAKES FUEL FROM SUNLIGHT



Researchers led by MIT professor Daniel Nocera have produced something they're calling an "artificial leaf": Like living leaves, the device can turn the energy of sunlight directly into a chemical fuel that can be stored and used later as an energy source. The artificial leaf — a silicon solar cell with different catalytic materials bonded onto its two sides — needs no external wires or control circuits to operate. Simply placed in a container of water and exposed to sunlight, it quickly begins to generate streams of bubbles: oxygen bubbles from one side and hydrogen bubbles from the other. If placed in a container that has a barrier to separate the two sides, the two streams of bubbles can be collected and stored, and used later to deliver power: for example, by feeding them into a fuel cell that combines them once again into water while delivering an electric current.

The artificial leaf is a thin sheet of semiconducting silicon — the material most solar cells are made of — which

turns the energy of sunlight into a flow of wireless electricity within the sheet. Bound onto the silicon is a layer of a cobalt-based catalyst, which releases oxygen, a material whose potential for generating fuel from sunlight was discovered by Nocera and his co-authors in 2008. The other side of the silicon sheet is coated with a layer of a nickel-molybdenum-zinc alloy, which releases hydrogen from the water molecules. Now that the "leaf" has been demonstrated, Nocera suggests one possible further development: tiny particles made of these materials that can split water molecules when placed in sunlight — making them more like photosynthetic algae than leaves. The advantage of that, he says, is that the small particles would have much more surface area exposed to sunlight and the water, allowing them to harness the sun's energy more efficiently.

Ultimately, he sees a future in which individual homes could be equipped with solar-collection systems based on this principle: Panels on the roof could

use sunlight to produce hydrogen and oxygen that would be stored in tanks, and then fed to a fuel cell whenever electricity is needed. Such systems, Nocera hopes, could be made simple and inexpensive enough so that they could be widely adopted throughout the world, including many areas that do not presently have access to reliable sources of electricity.

Nocera's ongoing research with the artificial leaf is directed toward "driving costs lower and lower," he says, and looking at ways of improving the system's efficiency. At present, the leaf can redirect about 2.5 percent of the energy of sunlight into hydrogen production in its wireless form; a variation using wires to connect the catalysts to the solar cell rather than bonding them together has attained 4.7 percent efficiency. (Typical commercial solar cells today have efficiencies of more than 10 percent). One question Nocera and his colleagues will be addressing is which of these configurations will be more efficient and cost-effective in the long run.

Another line of research is to explore the use of photovoltaic (solar cell) materials other than silicon — such as iron oxide, which might be even cheaper to produce. "It's all about providing options for how you go about this," Nocera says.

Source: <http://web.mit.edu/newsoffice/2011/artificial-leaf-0930.html>



MOLTEN SALT AND ROCKET SCIENCE TO MAKE SOLAR WORK AT NIGHT

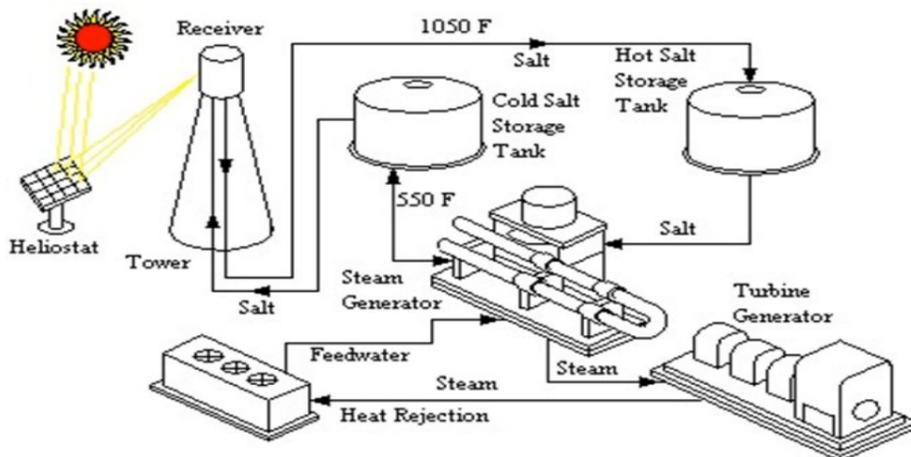


"We can't conserve our way to energy independence, nor can we conserve our way to having enough energy available. So we've got to do both." - George W. Bush

To fulfill any dreams of living in a world powered by the sun, there needs to be some sort of solution for storing energy gathered during the day for nighttime. And that solution might be molten salt.

Molten salt, for those scratching their heads, is simply a good conductor of heat. A new power plant will use nearly 20,000 heliostats--basically very focused mirrors--aimed at a focal point in a tower, which will heat up salt to a steamy 1,050 degrees Fahrenheit. Pump that salt near some water and you get enough steam to run a turbine. Hold that salt at that high temperature and then put it near water later and you get power when the sun isn't out.

The Department of Energy just poured \$737 million of loan guarantees into the Crescent Dunes Solar Energy Project in Nevada. It's being run by rocket scien-



tists from Pratt and Whitney, who are no doubt putting their expertise with high temperatures to work in the plant.

Once complete, it's going to generate 110 megawatts, powering 43,000 homes and canceling out about 20% of the emissions of a coal power plant. Not much of an impact yet, but it's just a proof of concept. If this plant works and

delivers solar energy even when the sun isn't shining, we can expect to see towers full of molten salt dotting the horizon, along with the wind turbines. A clean power future means there will be many tall things on the horizon.

Source: www.fastcompany.com/1754512/

RAJENDRA KUMAR PACHAURI-THE "NOBEL" GUY



Rajendra Kumar Pachauri was born on 20 August 1940 in Nainital, India. An economist and environmental scientist of immense reputation, Dr. Pachauri is presently the

Chairman of Intergovernmental Panel on Climate Change (IPCC). He is also the Director-General of TERI (Tata Energy Research Institute) - an institute dedicated to sustainable development. R.K. Pachauri was in the limelight recently when IPCC along with the former US Vice President Al Gore, won the Nobel Peace Prize for 2007 and Dr. Pachauri received the award on behalf of IPCC.

Mr. Pachauri did his graduation from La Martiniere College in Lucknow. He started his career at the Diesel Locomotive Works (Varanasi) serving various managerial positions. Dr. Pachauri went to North Carolina State University, and did his MS in Industrial Engineering (1972), PhD in Industrial Engineering and PhD in Economics.

Because of his extensive knowledge and expertise, Dr Pachauri has been nominated to innumerable international and national committees and boards. On the international level, he had been the Member of Board of the International Solar Energy Society (1991-1997), World Resources Institute Council (1992), while Chairman of the World Energy Council (1993-1995), President and then Chairman of the International Association for Energy Economics

(1988-1990), and the President of the Asian Energy Institute (Since 1992).

Pachauri conceptualized and launched Lighting a Billion Lives Initiative in 2005 to bring electricity to energy starved rural areas of India through solar energy. The initiative has taken solar energy to remote places like Sunderbans, West Bengal and Thar Desert, Rajasthan.

In the year 2001, R.K. Pachauri was honored with the Padma Bhushan, one of the highest civilian awards of India, for his contribution to the field of environment. Dr. Rajendra has also written about 21 books, numerous papers and articles. Rajendra K. Pachauri was awarded 'NDTV Global Indian of the Year' for the year 2007.

Source: www.wikipedia.com





Energy-use per capita in the ten countries of greatest use, is almost 300 times more than in the ten countries of least use .

ADDRESSING RURAL POWER SHORTAGE PROBLEMS INNOVATIVELY

Helpless situation

Power shortage is nothing new to India. “Though our country claims to have developed in terms of science and technology, erratic power supply or complete breakdown for hours together has almost become routine today,” says Mr. Chandrakant Pathak, inventor and manufacturer of non-conventional energy equipment in Pune. To address such significant problems, he developed a method for generating electricity using an old bicycle and bullock cart.

Explanation

Explaining how to generate power from a bicycle, Mr. Pathak says: “Take any bicycle and remove the mudguard and tyre-tube from the rear wheel. Attach a double stand to the cycle so that it remains stable in one place.

Fix a V shaped belt (commonly available in automobile shops) from the rear rim and connect it to the dynamo or alternator kept on the carrier of the bicycle. A 12 volt dynamo, alternator or brushless D.C. generator are easily

available in the market. An hour of pedalling generates about 36 watts (12 volt X 3 amp) that can power three C.F.L. lamps (4 watts) approximately for three hours or three L.E.D. lamps (two watts) for five to six hours.”

Called Vanarai

This portable device named Vanarai can be easily carried to the field or placed near any water body (5 to 7 m from ground level) and the pump can discharge 30 to 40 litres of water per minute. Regarding power generation from bullocks the innovator says, “for a moment, bullocks can provide approximately 15 horse-power energy.” The power generating machine from two bullocks consists of differential gear box and pulleys and is kept at the centre. The bullocks are made to rotate around the machine in the same way as the earth rotates around the sun. They complete two rounds in approximately one minute. “Any bullock cart having wooden, iron or rubber tyre wheels is useful for this purpose,” he explains. A

brushless D.C. generator of 12 Volt capacity can be fitted on the backside of the cart and helps in charging batteries. A pulley fitted on the inner side of the wheel is connected to another one on the generator. A V belt speed is attached to the pulley generating a voltage of 12 volt D.C. and 4-5 A current.

Suitable

This mechanism is especially useful in irrigation or for supplying water to a village. Besides this a small flour mill or grass chopping machine can be run using this energy. “Similarly we can float a small wooden platform in the canals for irrigation purpose with a rope tied to it. Using bearing and shaft, a small turbine wheel can be put on the floating platform. It will run on flowing water. If a pulley or small gear box is fixed to the shaft of turbine wheel, 200 watts of power can be generated,” he says.

Source: www.thehindu.com/sci-tech/agriculture/article2494125.ece

FROM READER'S PEN - RESOURCE MANAGEMENT IN BUILDING INDUSTRY



As a matter of fact, Building Industry is considered among the costliest industry on the entire Globe and simultaneously, this industry has got the abundance of its unique prototyping with several of the error and imperfection in the final output with respect to the desired output. Moreover, the output of this industry is usually supposed to be long lasting for an average duration of around 100 years and during this entire phase of its existence, the expectations from the building keeps on changing from generation to generation. This expectation has basically got two types of outcome i.e., either staying with dissatisfaction or leading to creation of a considerable quantity of debris, causing the wastage of resources.

In 1972, a Dutch citizen Prof. John Habraken (Head, School of Arch, MIT, 1975-81), came out with the concept of Open Buildings. Basically, he referred Open Buildings as a concept for modular designing of building block, using building skeleton and its Infill system, so that buildings can be redesigned by avoiding the formation of debris. But yet the aspect of High Performance of the building was unresolved. Almost, three decades later, in 2006, Dr. Kent Larson (Head, Changing Places Group, MIT Media Lab), came out with the solution for the Higher Building Performance through the rapid prototyping of smart home ‘The Place-Lab’, where he focused on how to create an Intelligent built-up environment.

Now, in the current time, it is very much required in the society that resource conservation should be carried out in such a way that efficiency should remain high in both of the terms i.e., for resource management and building performance. Moreover, if the promoters of the building industry will be focusing on the overall modular designing of the building in such a way that some particular building unit should be used again and again, by changing its orientation, direction, side, etc, then might be the concept of mass customization can entirely revolutionize this industry.

Submitted by-

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Alumni MNIT- 2006 Batch, Visiting Scientist at Carnegie Mellon University



100 WAYS TO SAVE THE ENVIRONMENT

... In continuation with the last issue

In Your Office

49. Copy and print on both sides of paper.
50. Reuse items like envelopes, folders and paper clips.
51. Use mailer sheets for interoffice mail instead of an envelope. Use mailer sheets for interoffice mail instead of an envelope.
52. Set up a bulletin board for memos instead of sending a copy to each employee.
53. Use e-mail instead of paper correspondence.
54. Use recycled paper.
55. Use discarded paper for scrap paper.
56. Encourage your school and/or company to print documents with soy-based inks, which are less toxic.
57. Use a ceramic coffee mug instead of a disposable cup.

Ways To Protect Our Air

58. Ask your employer to consider flexible work schedules or telecommuting.



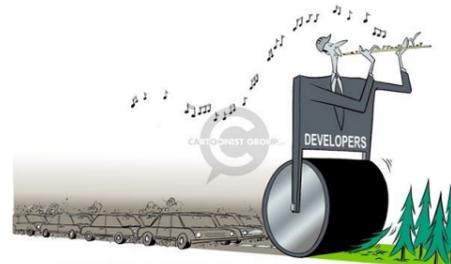
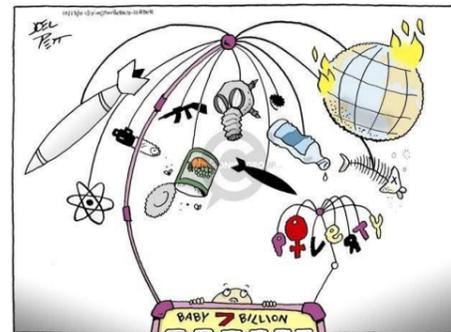
59. Recycle printer cartridges.
60. Shut off electrical equipment in the evening when you leave work.
61. Report smoking vehicles to your local air agency.
62. Don't use your wood stove or fireplace when air quality is poor.
63. Avoid slow-burning, smoldering fires. They produce the largest amount of pollution.
64. Burn seasoned wood - it burns cleaner than green wood.
65. Use solar power for home and water heating.
66. Use low-VOC or water-based paints, stains, finishes and paint strippers.
67. Purchase radial tires and keep them properly inflated for your vehicle.
68. Paint with brushes or rollers instead of using spray paints to minimize harmful emissions.
69. Ignite charcoal barbecues with an electric probe or other alternative to



- lighter fluid.
70. If your cook-stove is more than 5 years old, get its efficiency checked. It may require maintenance/replacement.
71. Walk or ride your bike instead of driving, whenever possible.
72. Join a carpool or vanpool to get to work.

To be continued in the next issue....

COMIC SENSE



CONFERENCES ALERT

Conferences Abroad

International Conference on Clean and Green Energy (ICCGE 2012)

website: www.iccge.org/cfp.htm

Date: January 5-7, 2012

Location: Hong Kong and China

Renewable Energy Investment & Grid Development Strategy

website: www.canadianinstitute.com/renewable

Date: January 30-31, 2012

Location: Toronto, Ontario, Canada

Conferences within India

Smart Energy International

website: www.gridweekasia.com/2012/

Date: January 16-18, 2012

Location: Mumbai, Maharashtra

All India Conference for engineering and science (AICON 2012)

website: www.crescentservices.org/aicon

Date: January 20-21, 2012

Location: Durg, Chhattisgarh



Decode this and send the answer to us to win a Parker pen.

QUIZ

- Which is the largest Green building in India?
- At which university was the Earth Institute established in 1995?
- The credit for the creation of most powerful solar panel goes to whom and what is its efficiency?
- What does LEED stand for?

Send your entries to mnit.energyheadlines@gmail.com

Answers to the Quiz in Volume 4 Issue 04

- 1) Volkswagen Group
- 2) Pan-American Highway
- 3) Large Hadron Collider at CERN in Geneva, Switzerland
- 4) The Thyagaraj Stadium, Delhi

We received only a single correct entry. Following is the name of the winner.
Sabyasachi Ghosh, III Yr. B.Tech,

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credits

Shubham Khandelwal (6th Sem, Mech Engg)
Anshul Sharma (6th Sem, Mech Engg)
Ankur Kumar (6th Sem, Mech Engg)
Soumya Mukherjee (6th Sem, Comp. Engg)
Sahil Dave (6th Sem, Civil Engg)
Saurabh Mittal (8th Sem, Mech Engg)
Dr. -Ing. Jyotirmay Mathur, Coordinator,
Centre for Energy and Environment

