



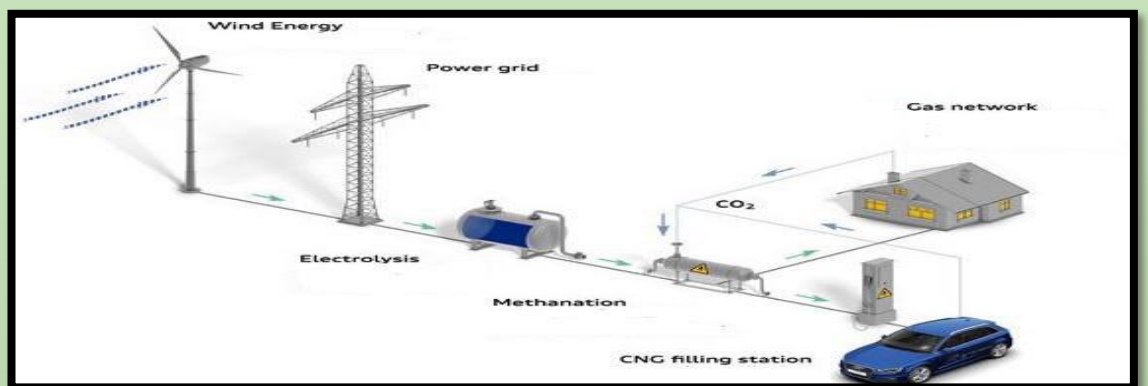
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**Latest Energy and Environment News**

- France became the first country to make it mandatory for the newly built commercial buildings to cover roofs with vegetation (or photovoltaic panels).
- Denmark has achieved 140 % of its energy demand from wind power on 10th July. Moreover it has exported all of its excess power to neighboring countries— Norway and Germany.
- U.S.A. has unveiled 'Clean Power Plan'- a historic step to cut the carbon pollution driving climate change ahead of 2015 UN Climate change conference.

**E-diesel : A New Approach to Sustainable Transport**



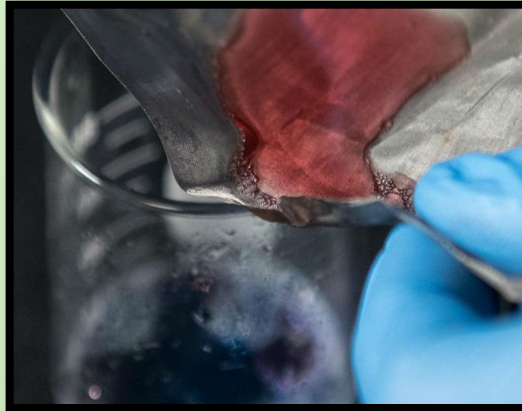
German car manufacturer Audi has reportedly invented a carbon-neutral diesel fuel, made solely from water, carbon dioxide and renewable energy sources. They have named it 'e-diesel' which uses - rather than emits - carbon dioxide. The carbon-neutral fuel contains no sulfur or fossil oil. If it catches on and is produced for a mass market, it could make internal combustion engines much cleaner in the future. The facility in Dresden, a German city, operates according to the power-to-liquid principle and uses green power to produce a liquid fuel called 'blue crude'. Blue crude is the base product of e-diesel, which is created using a three - step process. The first step involves harvesting renewable energy from sources such as wind, solar and hydropower. They then use this energy to split water into oxygen and pure hydrogen, using a process known as reversible electrolysis. This hydrogen is then mixed with carbon monoxide (CO), which is created from carbon dioxide (CO<sub>2</sub>) that's been harvested from the atmosphere. The two react at

high temperatures and under pressure, resulting in the production of the long chain hydrocarbon compounds that make up the blue crude. Once it's been refined, the resulting e-diesel can be mixed in with current diesel fuel, or used on its own to power cars in a more sustainable way. Analyses have shown that the synthetic fuel is not only more environment friendly, but also has superior combustion when compared to fossil fuels. The overall energy efficiency of the e-diesel is 70 percent. Engines powered by e-diesel run quieter and emit less pollutants. Audi has also set up a pilot plant in Dresden, Germany, operated by clean tech company Sun fire, which will pump out 160 liters of the synthetic diesel every day in the coming months. The creation of the fuel is a huge step forward for sustainable transport and it is going to make a crucial contribution to climate protection and the efficient use of resources, and to put the fundamentals of the 'green economy' in place. **Source:** [www.sunfire.de](http://www.sunfire.de)



## Nanotechnology : A Solution for Oil Spills

Researchers in the US have developed a new type of stainless steel mesh that attracts and traps oil but lets water pass through. In lab tests, researchers mixed water with oil and poured the mixture onto the mesh. The water filtered through the mesh to land in a beaker below. The oil collected on top of the mesh, and rolled off easily into a separate beaker when the mesh was tilted. The work was partly inspired by lotus leaves, whose bumpy surfaces naturally repel water but not oil. To create a coating that did the opposite, researchers mimicked this bumpy surface texture by spraying drops of silica nanoparticles onto a piece of stainless steel mesh. The team then coated this bumpy surface in an oil-repelling substance made from polymer molecules embedded with surfactants -



compounds that are the commonly used active ingredients in detergents, soaps, emulsifiers, and foaming agents. And after that, the mesh perfectly separated oil molecules from water molecules.

Because the coating is only a few hundred nanometers (billionths of a meter) thick, it is mostly undetectable. To touch, the coated mesh doesn't feel bumpier than uncoated mesh. The coated mesh is a little less shiny, though, because the coating is only

70 percent transparent.

The researchers chose silica in part because it is an ingredient in glass, and they wanted to explore this technology's potential for creating smudge-free glass coatings. For this, the team is now working on 90 percent transparency.

What's really promising about this mesh is that it's made from non-toxic, fairly cheap, and readily available materials, and a large portion of the mesh could be produced for around a dollar per square foot.

The unassuming piece of stainless steel mesh doesn't look like a very big deal, but it could make a big difference for future environmental cleanups. It can potentially clean up an oil spill with a net and curb harms to local ecosystem.

**Source:** [www.phys.org](http://www.phys.org)

## Solar Cells produce Fuel and Electricity

Researchers at Eindhoven University of Technology, Netherlands have invented a new type of solar cell that can convert liquid water into clean hydrogen fuel ten times more effectively than any other technology, and uses 10,000 times less precious material in the process.

The secret to these new prototype solar cells are gallium phosphide nanowires, which can split water into its hydrogen and oxygen components far more cheaply and efficiently than the batteries and semiconductor materials that have been used in the past.

Researchers investigated the potential of gallium phosphide (GaP) used in the production of red, orange, and green-colored LED lights, and has shown great potential in terms of its electrical properties. But gallium



phosphide is expensive to produce, and when used in flat sheets, it's not capable of absorbing sunlight as efficiently as needed for a viable solar cell system. So the researchers tried producing a grid of tiny gallium phosphide nanowires measuring 90 nanometers thick and 500 nanometers long, and integrated with existing solar cell technology. This immediately boosted the yield of hydrogen by a factor of ten to 2.9 percent.

They also ended up using 10,000 times less gallium phosphide than the precious material required to build solar cell with flat surface. That makes these kinds of cells potentially a great deal. In addition, GaP is able to extract oxygen from the water so then it will be like a fuel cell in which solar energy can be stored temporarily.

Researchers are trying to figure out how to increase the yield of their gallium phosphide grids so that their solar cells can meet this 15 percent battery yield.

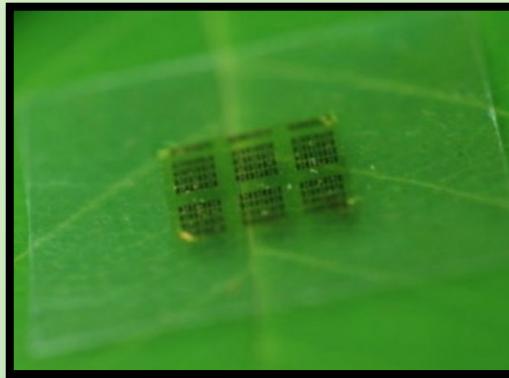
The dream is that one day we'll be using nothing but the boundless energy of the sun to not only power our homes, but our cars, trains, and buses too.

**Source:** [www.Sciencealert.com](http://www.Sciencealert.com)

## Biodegradable Computer Chips made from Wood

Portable electronics - typically made of non-renewable, non-biodegradable and potentially toxic materials - are discarded at an alarming rate in consumers' pursuit of the next best electronic gadget.

A team of University of Wisconsin-Madison researchers has collaborated with researchers in the Madison - based U.S. Department of Agriculture Forest Products Laboratory (FPL) to develop a surprising solution: a semiconductor chip made almost entirely of wood. The majority of material in a chip is support. Less than a couple of micrometers is used for everything else. So the researchers have replaced the normal support layer of a computer chip, with cellulose nanofibril (CNF). CNF is a strong and transparent biodegradable material that's derived from wood



when you break it down to its nanoscale fibers.

The research team has spent over a decade trying to figure out how to get the surface of a biodegradable material smooth enough to work as a support layer for the chip, and with the capacity for thermal expansion. They found that CNF worked the best for this over the petroleum based polymers they tried. Wood is a natural hydroscopic material and could attract moisture from the air and expand. With an

epoxy coating on the surface of the CNF, researchers have solved both the surface smoothness and the moisture barrier.

This wood-based chip can perform just as well as existing gallium arsenide- based microwave chips. They have made 1,500 transistors in a 5-by-6 millimeter chip. Typically for a microwave chip of that size, there are only eight to 40 transistors. The rest of the area is just wasted.

Mass production of microwave chips makes it very cheap but gallium arsenide is environmentally toxic, particularly in the massive quantities of discarded wireless electronics. So the flexible and bio-degradable nature will make wood based chip an attractive option for electronics companies in the future.

**Source:** Nature Communications

## New Light runs using Force of Gravity

Although many of us take for granted the fact that we can simply hit a switch and be flooded with artificial light, around one billion people in the world still live without electricity. This means a lot of people are relying on dangerous and expensive kerosene lamps to provide them with light to study, work and cook after dark.

But a team of engineers from the UK has now come up with a new device called Gravity Light that runs simply using the force of gravity.

The set-up is pretty simple, the whole thing works a bit like a pulley - initially a 12 kg of weight needs to be added to one end of the bead cord (this can be a bag of sand, rocks, whatever is available), and then that weight is lifted up by pulling down on the lamp attached to



the other end.

Due to gravity, the weight slowly descends back down to the floor, transforming potential energy into kinetic energy as it drops. This kinetic energy then powers a drive sprocket and polymer gear train that lights up the LED as it goes. Once the weight gets to the floor, the light goes out and the process needs to be

repeated, but each pull provides around 20 to 30 minutes of light, depending on how high the weight is lifted up in the first place. Of course, the best thing about gravity is that it's free, so once the initial investment has been made, the lights literally cost nothing to run.

The light itself will only cost around US\$10. This is a whole lot cheaper than kerosene lamps, which not only pose a high fire risk and spew out carcinogens, they also burn through about 30 percent of a family's income.

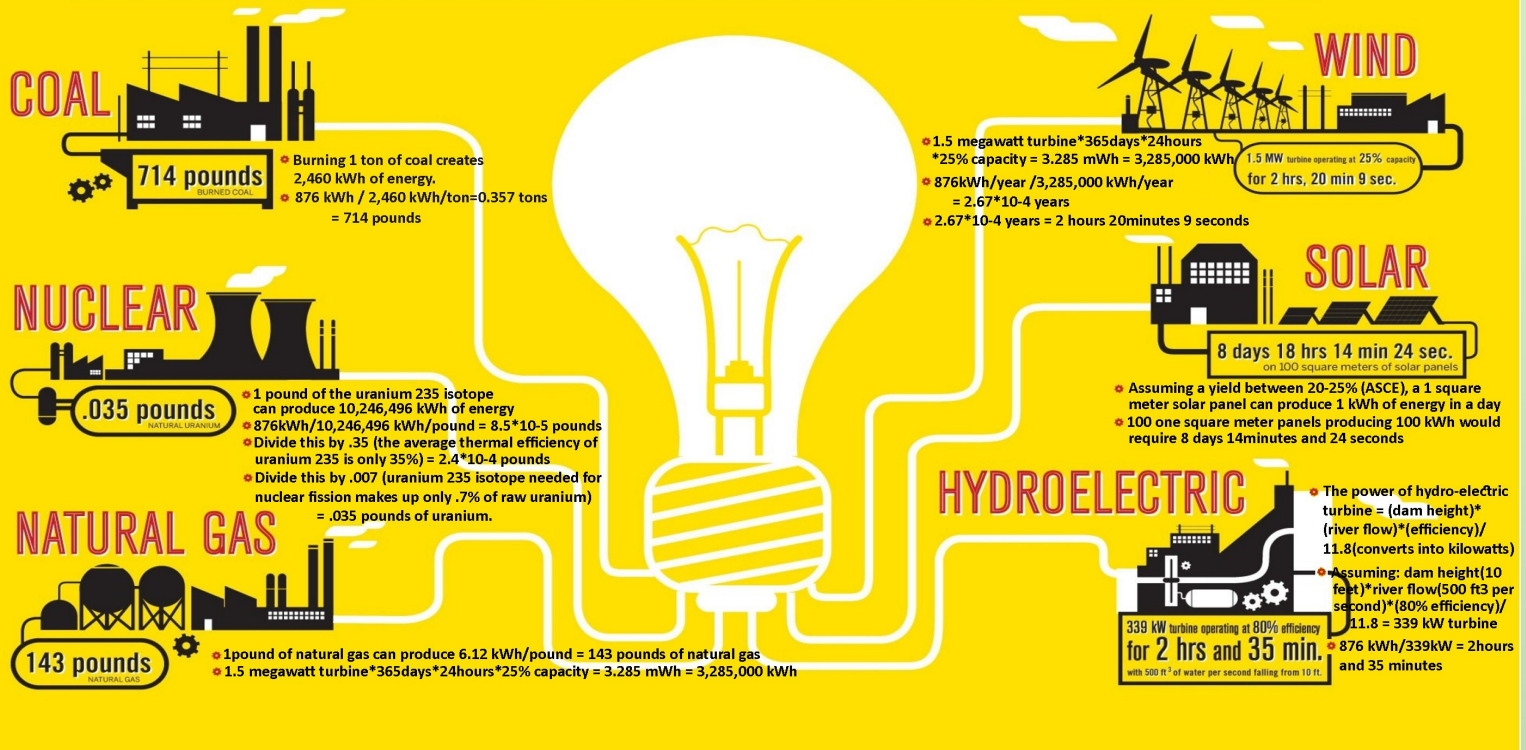
Gravity Light will be initially targeted to families in developing countries and the team is hoping to provide local jobs by creating and selling the lights over there.

**Source:** [www.gizmodo.com](http://www.gizmodo.com)

## HOW MUCH FUEL DOES IT TAKE TO POWER A LIGHTBULB FOR A YEAR?

HOW MUCH ENERGY—WHETHER ELECTRIC, COAL, NUCLEAR, OR OTHERWISE—IS REQUIRED FOR A 100-WATT LIGHTBULB TO RUN FOR A YEAR, 24 HOURS A DAY?

Kilowatt-hour (kWh) = unit of energy equal to 1,000 watt hours  
A 100-watt light uses 0.1 kilowatt-hours worth of energy in an hour  
How much energy does an electric 100-watt lightbulb use a year?  $0.1 \text{ kW} \times 8,760 \text{ hours in a year} = 876 \text{ kWh}$

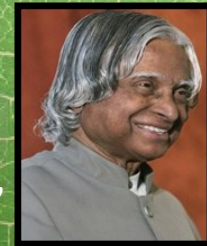


### COMIC SENSE



### TRIBUTE

**"You have to dream before your dreams can come true."**



– Dr. APJ Abdul Kalam

Energy Club pays tribute to Late Dr. APJ Abdul Kalam

### QUIZ

1. How high is the current rate of biodiversity loss compared to the natural rate?
2. Which hazardous component of electronics is likely to become more common in high-tech trash?
3. What makes the circuit board one of the most sought after pieces of e-waste?

Send your entries to [energyclub@mnit.ac.in](mailto:energyclub@mnit.ac.in)

Winning entries to win exciting prizes.

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