

Sadhika Kumar – Top 10 Green Technologies that Give Us Hope for a Sustainable Future

Read the top 10 list of green technologies. Answer the 10 questions and complete the summary!

1. GREEN ARCHITECTURE

Green architecture has the capability to cut down urban resource use dramatically, and making urban expansion sustainable. Green architecture allows for buildings to be constructed in a way, that they make use of existing natural light and ensure adequate insulation, so as to reduce energy consumption. Such construction practices, will reduce energy use in lighting and by reducing the amount of heat lost to the outside, eliminate the need for heating. Moreover, the construction materials will be sourced from urban waste and landfills. This technology, in the near future, will allow for all buildings to be “passive”, not requiring significant additional emissions for their production and use.

1) How does green architecture reduce energy consumption?

2. WASTE-WATER ELECTRICITY GENERATOR

Engineers at Oregon State University have invented a hybrid electricity-generator, which involves use of waste water. They have been able to combine two distinct power generation technologies – microbial fuel cells and reverse electro dialysis, to produce a system that uses waste water to produce electricity. The generator has the capacity to produce enough electricity to not only power water treatment, but also significantly contribute to the main power grid. As such, when scaled up, this technology will form the basis of energy-water sustainability, which is crucial with the escalating scarcity of natural resources.

To read about waste-water energy generator: <http://oregonstate.edu/uo/ncs/archives/2012/aug/major-advance-made-generating-electricity-wastewater>

2) Why is using wastewater to produce electricity a good use of resources?

3. NEW NUCLEAR MATERIAL

Nuclear energy has huge potential, but due to the dangers associated with radioactive waste, the energy source has not been exploited to its potential. Currently, uranium – nuclear power reactors use only 1% of the potential energy available in Uranium, and the rest remains as radioactive waste. However, other materials such as Thorium exist, which can replace Uranium and allow nuclear power to reach its potential. There is less waste associated with Thorium based fission, as all of the thorium mined is in the isotopic form needed for the reactor. Furthermore, thorium is also more abundant in earth’s crust. The reason why it has not replaced uranium is cost. But, R&D in this sector is gathering momentum, and scientists are hopeful that the technology will become cost-effective in the near future.

To read more about Thorium sourced nuclear power: <http://web.mit.edu/12.000/www/m2016/finalwebsite/solutions/fission.html>

3) Which element uranium or thorium maximizes the nuclear power of the element?

4. WASTE-SOURCED BIOFUEL / PYROLYSIS

We are always on the prowl for smarter ways to recycle our trash, and I think it is safe to say, that I think we found it. Technology is now able to turn biomass waste such as paper, grass or wood chips into gas and eventually ethanol. The processes for conversion, also uses much less water and has a smaller carbon footprint than traditional ethanol production. Several pilots are to be launched soon in the UK and Canada and Australia, with companies building standardised, easy to install plants, that will eventually allow municipalities around the world to begin turning garbage into cleaner biofuel.

Plants are significant stores of carbon, and deforestation is a huge contributor to greenhouse gas emissions and consequently climate change. Forests can still be kept standing, but agricultural and food crops cannot. As such, a process called PYROLYSIS has been invented, which allows for offsetting some of the carbon release associated with agriculture. If agricultural residue is burnt in a controlled, low-oxygen environment, then not only can you reduce greenhouse gas emissions, but it results in an end product of charcoal. The potential of this technology is huge, especially due to its dual benefits.

To read more about companies involved in such technologies: <http://pacificpyrolysis.com/about.html>

- 4) **Biomass technology turns garbage into fuel. Name 2 other reasons is biomass technology a good thing for the environment?**

5. BIOMIMICRY

Biomimicry has given the rise to self-healing materials. The self-healing materials will have the capability to “heal” themselves when cut, torn or cracked. This in turn will give longer lives to most consumer goods, and thereby reducing the demand for raw materials and waste.

To read more about self-repairing concrete: <http://www.asknature.org/product/cd6ff82750db9c9c7490b071e5a6b4d4>

- 5) **Why would biomimicry be great technology for airplanes, cars, rockets, or other forms of transportation?**

6. ELECTRIC AUTOMOBILES

No conversation regarding green technologies for the future is complete without the mention of electric cars. A step up from regular electric cars, wireless technology will be able deliver electric power to moving vehicles. All electric vehicles will come installed with devices that will be able to receive power remotely via an electromagnetic field broadcast from cables installed under the road. Such vehicles are currently undergoing road tests in South Korea, and their production will definitely alter some of the perceptions associated with electric cars.

To read more about wireless electric automobiles: <http://spectrum.ieee.org/green-tech/advanced-cars/the-allelectric-car-you-never-plug-in>

- 6) **What is the benefit of a wireless electric car?**

7. CARBON CAPTURE

Carbon capture, or the process of storing carbon underground, has immediate appeal. However there have always been uncertainties associated with this process including risks associated with storage and leaks. However, two new molecules have been identified that will help to make carbon capture more safe, efficient and cost-effective. ZIFs and amines are two special cage-like molecules that have been shown to work particularly well under real world conditions, and processes have also been put in place that will allow for fast reproduction of these molecules.

To read more about ZIFs: <http://www.energyboom.com/emerging/uclas-zif-carbon-capture-crystals-smoke-stacks-best-friend/>

To read more about Amines: http://web.anl.gov/PCS/acsfuel/preprint%20archive/Files/47_1_Orlando_03-02_0012.pdf

- 7) **What are the two new molecules that may make carbon capture a reality?**

8. MOLTEN SALT STORAGE

Molten salt, when used in solar energy production, can be useful in storing energy for future use. The surplus heat during the day, can be used to heat large amounts of salt, which has the ability to absorb and store significant amounts of heat. This salt can then be used to generate steam, and run an electric turbine in the absence of the sun, thus making solar energy a more viable option for replacing non-renewables.

To read more about molten salt storage in solar power generation: http://news.cnet.com/8301-11128_3-57333789-54/molten-salt-keeps-solar-power-flowing/

- 8) **Salt can absorb and store huge amounts of _____ energy which can then be used to store solar energy.**

9. ARTIFICIAL PHOTOSYNTHESIS

Photosynthesis is the process by which trees soak carbon dioxide from the atmosphere, and convert sunlight into energy. As such, engineers and scientists are trying to develop a technology that will use sunlight and carbon dioxide to produce energy. This technology will have the dual benefit of reducing carbon dioxide levels while also producing renewable fuel. Scientists have proven that the technology is feasible, but problems still lie in scaling up. Captured carbon storage and efficient conversion of solar energy into electricity are challenges that, if overcome, will definitely pave the way of success for this technology.

To read more about this: <http://solarfuelshub.org/about/>

9) *What is the purpose of photosynthesis?*

10. SMART METERS

Smart grids and smart meters will allow us to use our scarce resources like electricity and water more efficiently. Smart meters for electricity, will allow to use our appliances more efficiently, while also reducing our energy bills. So for instance, they will allow us to program our washing machines to run only during off-peak energy demand hours. Similarly, smart grids for water can help utilities save water by reducing leakages etc. As such, these devices have huge potential in smoothing out demand and ensuring more efficient supply and thus allowing us to obtain more utility from existing resources.

To read more about smart grids: <http://www.edf.org/climate/smart-grid-overview>

10) *How would having a "smart" meters help the consumer?*

Summary:

Pick the technology that will be most important in the future from the list and give me 2 reasons why you chose it: