

SOLAR ENERGY CFUW 5 minute talk. 25 September 2008 - Solar Energy.

Last year we talked about how we as individuals could reduce our carbon footprint

But To really reduce carbon emissions we must consider alternatives to producing electricity from fossil fuels.

- These fall into two camps:
- **renewables** such as wind, solar, hydro, tidal, geothermal and biomass
- and **nuclear**.
- The degree to which each of these sources can meet our demand for low-carbon energy is among the most important and fiercely debated issues in climate-change policy.
- It is a complex area – a mix of technology, economics, and politics.

GERMANY has made a decision to switch to renewable energies. In 2001 they employed 100,000 people in these industries, by 2007 240,000 and the projection is 500,000 by 2020.¹ This is an example of political will and job creation as the economy changes.

- They expect to generate 50% of their electricity by 2050 from renewables.
- The key to their economics is that a house with solar panels can send back electricity on to the grid AT A GUARANTEED PRICE PER Kw hour and their bill is offset with the credits.

Other important factors to consider with renewables:

- **Generating time:** demand for electricity varies during the day so energy has to be stored which can be difficult in the case of solar.
- **Reliability:** wind power for instance, has to be backed up with other sources for when the wind doesn't blow.
- **Public safety** – nuclear being a case in point.
- **Roll-out time** – every year wasted in not converting to renewable energy is bad news for the climate.²

Energy is measured in WATTS. **Watts and their derivative terms** (kilowatts, megawatts) are measures of the rate of power being delivered or consumed.:

100 watts = the power used by a strong incandescent light bulb.

1000 watts = one kilowatt. Estimates of a typical household use is 1 – 4 Kw taking into account peak demands.

SOLAR POWER.

All our energy ultimately comes from the sun but solar power is about devices that convert sunlight directly into electricity or heat.

¹ Sources: Invest In Germany, German Environment Ministry, and German Solar Industry Association reported in The Globe and Mail 22 March 2008 B4.

² Henson, Robert. The Rough Guide to Climate Change. London. Penguin Group. 2006:294

- Overall, solar power currently is costly but hopefully will change as demand increases.
- In some locations, though, tax structures and other factors make solar power roughly competitive with other sources.
- Solar is also usually the cheapest way to get electricity to the 2 billion people, mostly in the developing world, who have no access to power lines.³
- Kenya is one of the largest importers of solar cells because most people are not on a grid system.
- **Passive Solar Techniques** have been used for centuries, such as orienting windows towards the south; putting water tanks on the roof and painting them black (Israel, Lebanon, Cyprus etc.). Now used in new building designs and construction many of which can be found in Vancouver.⁴

There are two forms of solar energy:

THERMAL COLLECTORS. Use sunlight to create heat rather than electricity.

- These are most commonly roof-mounted plates used to provide domestic hot water.
- Tubes that carry water (or, in some cold climates, antifreeze) are sandwiched between a glass top and a back plate, which is painted black to maximize heat absorption.
- The fluid heats up as it flows through the collector and then proceeds to the hot water tank.
- The whole process is typically driven by a pump, though there are also passive systems in which the heated water produces its own circulation.⁵

CHINA has 5 million sq. metres of solar water heaters (50% of the world market) that are used by over 1,000 factories and 30 million consumers, and the volume is growing rapidly.⁶

SOLAR CELLS (also known as **photovoltaic** or **PV** systems) use sunlight to split off electrons from atoms and thus generate electricity.

- A typical PV cell is about 10 x 10 cm (4 x 4") and a standard PV "array" consists of 400 or more such cells.
- In small numbers, PV cells are ideal for small scale needs such as patio lights. The City of Kelowna is equipping the community's parks, paths and other public spaces with solar-powered LED lighting technology. Each unit is a self-contained solar light. See the City of Kelowna website. www.cityofkelowna.ca.
- With 10-20 PV arrays and a sunny climate, you can power an entire household. Okotoks, a town south of Calgary, has the largest solar-heated residential subdivision in North America where 52 houses use an innovative solar and underground heat storage system. www.okotoks.ca.

³ Lovins, Amory B. "More Profit with Less Carbon" in Scientific American September 2005:74-83

⁴ Design Centre for Sustainability. University of British Columbia, Vancouver. 2006

⁵ Henson 296.

⁶ Dauncy, Guy. *Stormy Weather: 101 Solutions to Global Climate Change*. Gabriola Island, BC. 2007:231.

- A few hundred arrays can be linked for large industries or utilities. Ken Zweibel, James Mason and Vasilis Fthenakis set out a plan for the entire United States to provide over 65% of their energy needs from solar arrays that was published in *Scientific American*, January 2008 edition.⁷ The plan required a high investment initially with huge savings in the future.
- Despite its northern latitude, Europe has embraced PV power in a big way. Solar panels do not require constant sunshine, they can use the light of daylight.
- Several large solar plants in Germany can each generate five or more megawatts.
- SPAIN – recently passed a law requiring all new buildings to include solar energy.
- The world’s largest PV facility, at 11 megawatts of capacity, was built in 2006 in southern PORTUGAL.⁸
- CANADA: Timinco makes high quality refined PV grade silicon used in the manufacture of solar cells. The Canadian solar industry, lured by money and markets, is working in Germany and other European countries that give general incentives to the industry.⁹ Arise Technologies of Waterloo is building a PV factory in Germany. The Canadian Solar Industries Association has a website.

One of the world’s biggest solar technology corporations is China’s Suntech Power. They are working with the University of New South Wales in Australia who are the leading researchers of solar technology. The company founder, says that half of China’s factories will eventually run on solar power.¹⁰ www.sun-tech.com

The challenge is finding efficient storage units to store energy for when it is needed. But that is another story.

Let me leave you with these thoughts:

- Think of the challenges that researchers were faced with when developing the computer from the huge data storage units to the personal computer that sits on your desk - and the flash drives that can store 4GB
- Researchers say that they are taking baby steps, in part because the industry is not mature
- The technology winners have not been determined
- And the costs are still high.
- But these are all the things you expect as a revolution happens.

Next Focus Canada and solar energy and then wind energy.

⁷ Zweibel, Ken, James Mason, Vasilis Fthenakis. “A Solar Grand Plan” in *Scientific American*. January 2008:64-73

⁸ Henson 296.

⁹ Reguly, Eric. “Germany’s Power Play” in *The Globe and Mail*, 22 March, 2008:B1, B4-5

¹⁰ “China’s Five Richest” in *The Globe and Mail*, 26 May 2007:A1 and A17