Stanford eCorner

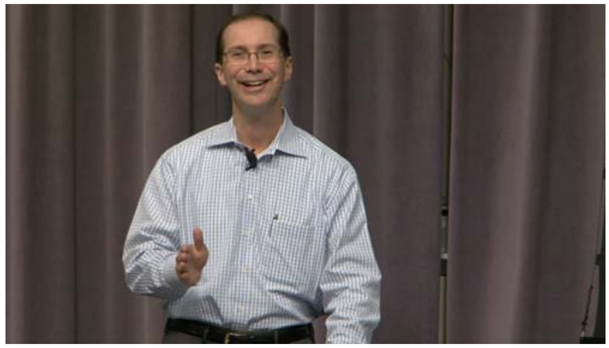
A Cogent Argument for Solar Energy

Bill Gross, *Idealab &eSolar*

February 23, 2011

Video URL: http://ecorner.stanford.edu/videos/2664/A-Cogent-Argument-for-Solar-Energy

Idealab Founder Bill Gross lays out a clear and thoughtful explanation for solar energy being the best possible source for the planet's growing energy demands. He illuminates the reality of current energy usage, the socio-economic factors that will impact future needs, and the limitations of other non-fossil fuel energy options. Gross is chairman of eSolar, an Idealab spin-off that focuses on making solar energy cost-competitive in the global marketplace.



Transcript

So many of you have seen this before. This is symbolic of man's intense energy usage. Let me tell you some specific numbers. So, the whole planet uses 15 terrawatts. Continuous use, 24 hours a day, 15 terrawatts are being used to provide the energy to all of the humanity. If you divide that 15 terrawatts by about seven billion people, you get about 2200 watts per person. So, every single person alive on the planet is using 2200 watts all day long, 24 hours a day, to power our lifestyles. Now, those of us in this room are using a lot more than 2200 watts. Many people in deep parts of India are using 50 watts. Those of us in this room are probably using more like 10,000 to 20,000 and if we fly a bunch, probably more like 30,000.

If we use a lot of air conditioning and drive a lot, maybe more like 50,000. So, 50,000 watts all day long just making our lives comfortable. And we're mostly burning stuff to do that. Just to get a sense of the energy a typical family has 24 horses running for them at full out all day long, producing energy, if you just convert it to horsepower. We don't really think about the energy because it burns somewhere else to make our electricity. The fumes go somewhere else. The electrons come over copper so we don't see any of it. The big pipelines that bring stuff over is mostly hidden from us. We go to the gas station. All the tanks are underground.

We fill our tanks and drive around. So, we don't see it. If we were actually taking care of and feeding 24 horses constantly, we would sort of be more aware of the energy usage. But we don't. We've done a good job of making it invisible to us. Another interesting statistic on what's happened just in the last few years. In the United States, there is now 1.8 people per household and 1.9 cars per household. So, we have more cars per household than we do people. We love taking our bodies, wrapping them in two tons of steel and moving it somewhere else. If you think about how much energy we're doing to carry that two tons of steel along with our bodies, it's just unbelievable.

And yet, we just do it because it's relatively inexpensive. You always come up with a good way to make it not cost that much. Now, the problem is, if we run out of stuff that's going to cost a lot. It's going to cost a lot of resource battles, a lot of fighting. Here's why I think we're going to have some of those challenges. Jump forward to 2050, it's estimated that we're going to need 50 terrawatts. The 50 terrawatts is not so much because of the population growth, because people believe the population growth is going to slow down and we'll only be about nine billion people by 2050. So, even with conservative population growth, we're going to need 50 terrawatts because we're lifting so many people out of poverty. And the first thing people want when they get lifted out of poverty is they want their car. They want their plasma screen.

They want their iPhone. iPhone doesn't use that much energy. They want all the electronics that we have and all the electricity production that we have. If you take the number of people in the planet times somewhat closer, not quite our least end of the living but even a little bit, you'll get to 50 terrawatts. So, there's a 35-terrawatt gap between the 15 terrawatts we're burning right now and where we need to get. There's only a limited number of places that can come from. Of course, we can burn things to get there. But we're going to run out of things we can burn. So, there's only a limited number of places. There's nuclear, geothermal, wind, tidal, biomass and solar.

Each of these only can contribute about two or three terrawatts. The reason why it can only contribute that much is because you build a nuclear power plant, a gigawatt nuclear power plant. If you build one nuclear power plant every other day for the next 35 years, you'll only get to a number sort of in this order. It takes about seven years to permanent nuclear power plant because you're not going to build one every other day. So, you just can't get 35-terrawatt gap from nuclear, from any of these. For geothermal, you can put a geothermal power plant at every single site on earth where there's heat underground and you get about two terrawatts. I'm not saying we should do it, we have to do it. But you don't get 35 from there. The same thing with wind. You go to every single high-wind location on the planet, put a wind turbine, every single one, and you get relatively low, three terrawatts.

Tidal power, biomass. If you go make a biomass plant, almost everywhere where we grow food, you can get to these three terrawatts, still only a tenth of what we need. The sun, however, strikes the earth with 15,000 terrawatts, a thousand times we're using right now, 500 times the 35 terrawatts we need. It's the only one that can really make up that kind of gap with a very tiny fraction. And yet, why don't we do it? It's because it's too expensive. If you go back and look, solar is the most uniform natural resource. Maybe except for air and dirt, solar is evenly distributed across the whole planet. The very, very top of the planet, the very, very bottom of the planet, there's not much sun. But almost everywhere else, there's enough sun to do this with. And everybody gets it.

It's not like scarcity like other of our natural resources. The sun goes to everybody. So, it's a really fair resource as well. But it's very, very hard to convert cost-effectively. It also takes a relatively small amount of land. People talk about how much land it takes. But you can power the whole United States with a square of 83 miles by 83 miles. You wouldn't put it all in one spot. You spread it around. It's a relatively doable amount of space.

Of course, you can power all of Europe with a square about the same size, actually a little smaller, in the northern Sahara Desert. So, you can really practically make it happen if we can get the cost right. The problem has been that it has been too much. Earlier this decade, solar was costing about four times other ways of making electricity, for example. Now, it's down to about two times. We've made a lot of progress in the last eight years since this chart came out or the last nine years. But it's still two times too expensive. So, the way solar has been going so far, it has only been with subsidies. I really believe that solar energy is just a novelty until it can beat the price of fossil fuels without subsidies. There is a lot of interest around the world.

But the governments don't have the money. And the amount of money is too great to be able to subsidize the gap between the cost of fossil fuels and solar. But once you cross the prize of fossil fuels with solar, then it will take off wildly because then it will be an enormous profit opportunity. Even if you beat the price of fossil fuel-generated electricity by 100th of a cent, that will be unbelievable. You don't even have to buy a lot because it's a commodity. You buy the commodity by a little bit and then just have people flock to that because they can make a profit there. So, there's an unbelievable opportunity if you could just get that last factor of two out. People are working on it.