Baby Lauren and the Kool-Aid

First the good news. Jake, our son's first child and our third grandchild, has a baby sister. Jake is excited about this, as you can see in Fig. 1. Jake is always enthusiastic and a gentle giant for his age (top 1% in size, projecting to eventual 2 m height, if you believe long extrapolations), who thinks he can protect his baby sister (Fig. 2).[1]

What Jake doesn't know is that today's adults, unless they have a sudden change of heart, are preparing to leave him and other young people a dynamic mess out of their control.

This is an odd situation. It is a wonder to see instinctive, sometimes frantic, reactions of many species as they try to protect their young from dangers. One would think that the intelligent species would have become particularly good at providing protection for their young, and that a democratic system would give that function high priority. But as our paper #3 ("The Case for Young People") makes clear, governments are failing to protect the rights of young people to inherit a planet that preserves creation and preserves their equal opportunity for good lives.

A facile explanation would focus on the 'merchants of doubt' who have managed to confuse the public about the reality of human-made climate change. The merchants play a role, to be sure, a sordid one, but they are not the main obstacle to solution of human-made climate change.

The bigger problem is that people who accept the reality of climate change are not proposing actions that would work. This is important, because as Mother Nature makes climate change more obvious, we need to be moving in directions within a framework that will minimize the impacts and provide young people a fighting chance of stabilizing the situation.

Fig. 1. Lauren age 2½ days and Jake age 2½ years.

[1] His parents have a different perspective. Jake has an extreme peanut allergy, which gives his parents nightmares. On his third birthday (the photos here are a bit dated; he was 2½ in Figs. 1 and 2) they had to rush him to the hospital because, as it turned out, he was allergic to the balloons.

Fig. 2. Lauren age 2½ days and Jake age 2½ years.

Let me try to provide some insight about the problem via personal experience and simple charts for the United States and the world.

When I received two large awards last year (the Sophie and Blue Planet Prizes), I decided to divide the proceeds (after taxes and paying off a home equity loan) between education funds for my grandchildren and installation of renewable energy systems. Here is a preliminary report on how the renewable energies are working out.

We put solar panels (11.3 KW) on our barn at a cost of $72,312. It was neither the cheapest nor most expensive system, but it received good references when we visited several installations. Pennsylvania provided a $17,500 rebate and the federal government a 30% tax credit.

What made it too good to be true was a third subsidy, Alternative Energy Credits – one AEC for each MW-hour of energy generated. AECs are sold to utilities that are required by Pennsylvania to have a certain number. The AEC price when we signed up for our solar system would have given us about $4000 per year, thus paying off the system's cost within 5-10 years.

It was too good to last. Before I could sell a single AEC, the price collapsed more than 75% and seems likely to go lower. Our electric bills did decrease more than half, but there are still charges even though we generate more power than we use. It took months before the utility was satisfied with the paperwork and installed a two-way meter, allowing us credit for power generated. I need a longer baseline and more information to make an overall assessment. It still may eventually pay for itself, because of the large subsidies and the fact that electric rates are going up fast (10% last year, 6.6%/year projected). Utilities blame the increases in part on renewable energy requirements; if that is true, the majority of people without renewable energies are in effect providing another subsidy. I will do a more quantitative accounting in the future.

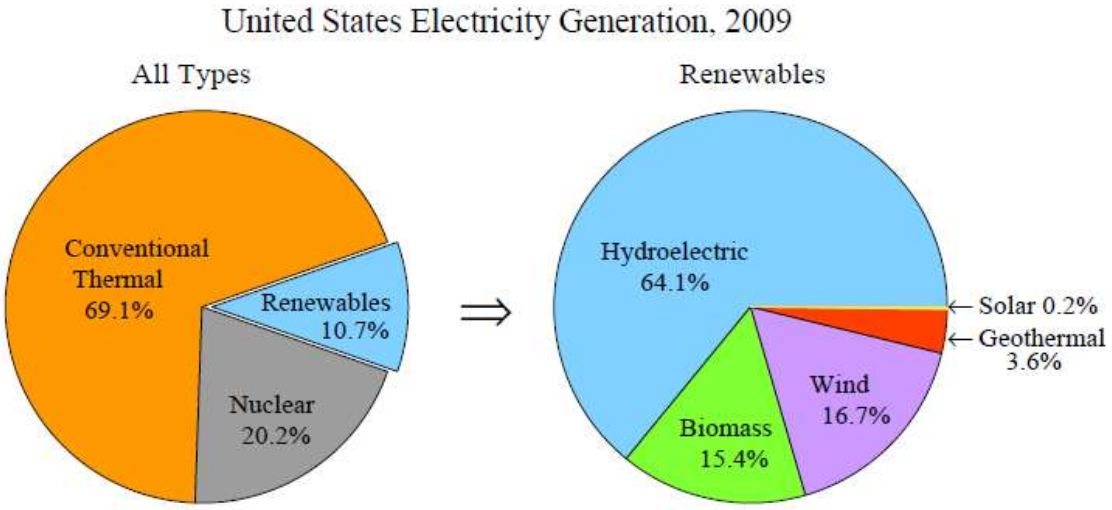

Fig. 3. Energy sources for U.S. electricity. Conventional thermal is coal + oil + gas.[2]

The story is not quite as good for the solar panels on my daughter's house. Their roof is smaller than our barn's, so more efficient (and expensive) panels were purchased, yielding almost as much power as for our barn. Cost was about $75,000. By the time the project started the PA rebate had decreased to $12,500 (it is being phased down – it is now $7,500). The disappointment to me (and her) was the collapse of the AEC market. If the ~$4000/year that existed at time of purchase had held up it would have provided her a nice monthly income, but by the time electricity began flowing the AEC return was small. Nevertheless, the meter readings will allow Sophie and Connor to learn something by making appropriate graphs and do experiments to test the effectiveness of different actions aimed at reducing their electric usage.

I will do a more quantitative analysis after the record is longer. These specific examples provide one perspective, but the economics varies with location and with many other factors, so we should not over-generalize based on specific examples.

There is a consensus that renewable energies need to be part of the solution to the energy security and climate matters. But we must be realistic about their contribution. So now let's look at the progress of renewable energies after several years of strong government incentives.

United States and World Electricity Generation

Figure 3 shows United States electricity generation by source in 2009 based on EIA International Energy Statistics. Renewable sources provide 10.7% of the electric energy. But as the pie chart on the right shows, almost two-thirds of this is hydroelectric. Wind has grown to almost 17% of the renewable energy, so it is approaching 1.8% of U.S. electricity. Solar power is only 0.2% of the renewable portion or 0.02% of electricity.

Figure 4 shows the global breakdown in 2008. Renewable energies provide 19% of electricity, but most of the renewable energy is hydroelectric. Wind provides 1% of global electricity and solar energy less than 0.1%.

[2] Source: EIA International Energy Statistics => Electricity => Generation
http://www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm?tid=2&pid=2&aid=12

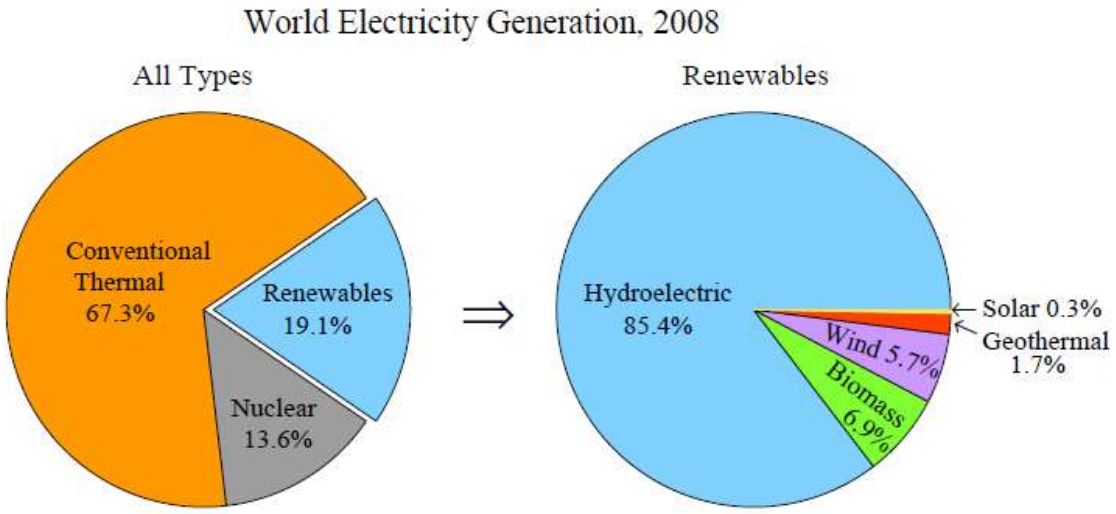

Fig. 4. Energy sources for global electricity. Conventional thermal is coal + oil + gas.[2]

Renewables may be small, but they are growing rapidly, exponentially, right? Fig. 5a reveals that growth of electricity in the past two decades in the U.S. has been mainly from fossil fuels. Fig. 5b and 5c expand the scale to show the growth of non-hydro renewable energy, which has been mainly wind. Solar energy remains invisible, even with the greatly stretched vertical scale.

What about the world as a whole? The global story (Fig. 6) is similar to that for the U.S., except there has been growth in large hydro. Hydropower has contributed more to global growth than all other renewable energies together. Meanwhile, fossil fuel use has continued to increase.

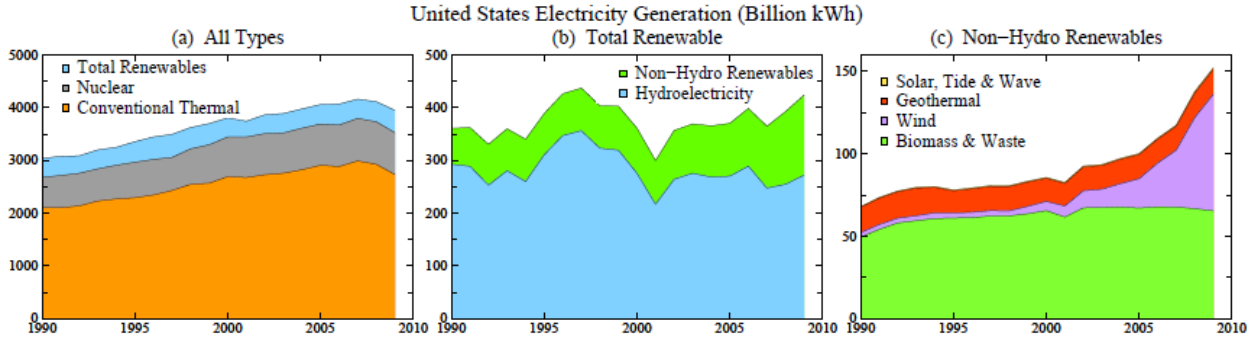

Fig. 5. Energy sources United States electricity generation.[2]

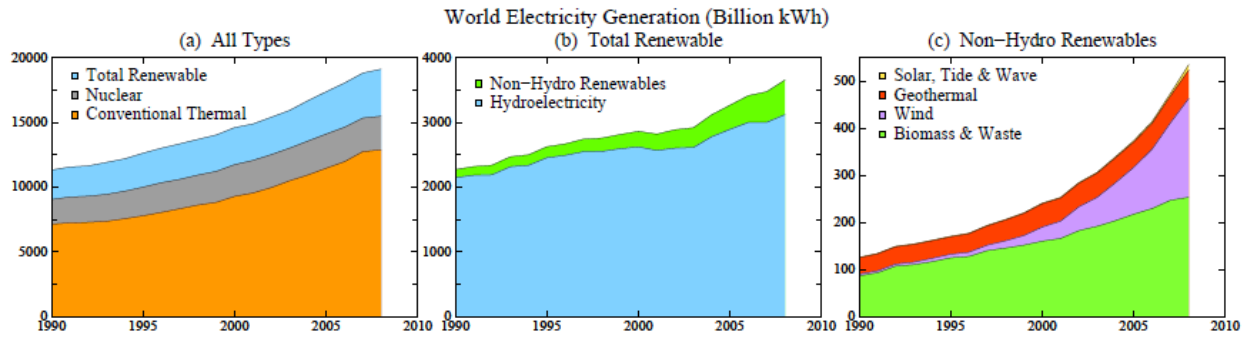

Fig. 6. Energy sources for global electricity generation.[2]

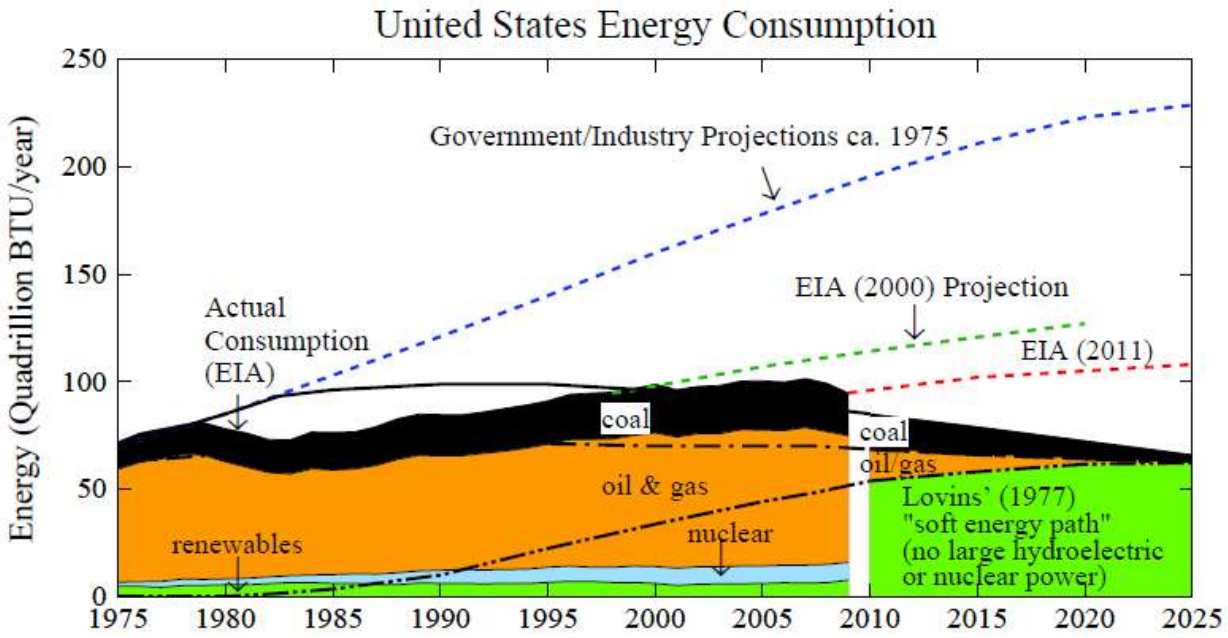

Fig. 7. Update of Fig. 2 in "Storms of My Grandchildren" comparing actual U.S. energy consumption with projections of the U.S. Dept. of Energy (EIA) and Amory Lovins.

The Easter Bunny and Tooth Fairy

The insightful cynic will note: "Now I understand all the fossil fuel ads with windmills and solar panels – fossil fuel moguls know that renewables are no threat to the fossil fuel business." The tragedy is that many environmentalists line up on the side of the fossil fuel industry, advocating renewables as if they, plus energy efficiency, would solve the global climate change matter.

Can renewable energies provide all of society's energy needs in the foreseeable future? It is conceivable in a few places, such as New Zealand and Norway. But suggesting that renewables will let us phase rapidly off fossil fuels in the United States, China, India, or the world as a whole is almost the equivalent of believing in the Easter Bunny and Tooth Fairy.

This Easter Bunny fable is the basis of 'policy' thinking of many liberal politicians. Yet when such people are elected to the executive branch and must make real world decisions, they end up approving expanded off-shore drilling and allowing continued mountaintop removal, long-wall coal mining, hydro-fracking, etc. – maybe even a tar sands pipeline. Why the inconsistency?

Because they realize that renewable energies are grossly inadequate for our energy needs now and in the foreseeable future and they have no real plan. They pay homage to the Easter Bunny fantasy, because it is the easy thing to do in politics. They are reluctant to explain what is actually needed to phase out our need for fossil fuels. Reluctance to be honest might seem strange, given that what is needed to solve the problem actually makes sense and is not harmful to most people. I will offer a possible explanation for their actions below.

But first, let's look at one of the main sources of the Easter Bunny fable. Fig. 7 updates Figure 2 of "Storms of My Grandchildren"(http://www.columbia.edu/~jeh1/). It compares actual U.S.

energy consumption with projections made by the U.S. Energy Information Administration and by Amory Lovins in the 1970s.

Note how EIA keeps adjusting energy projections down as reality disproves their assumptions of rapid growth. Lovins, and many others, are right to assert that energy efficiency is the cheapest and most effective way to satisfy energy requirements. Of course, a principal reason for slow growth of energy use is that much of our manufacturing moved overseas.

Note the failure of U.S. energy to follow the 'soft' energy path of Lovins. Lovins asserts that we could phase out nuclear power, large hydro, coal, oil and gas. But soft renewables are still nearly invisible after 30 years, providing about one third of the thin renewable slice of total energy.

Yet Amory Lovins is the most popular person that I know and has received uncountable awards. He deserves them. But I believe his popularity is in part because he says everything people want to hear. He even says there is no need to have a tax on carbon. Thus even fossil fuel companies love him. Fossil fuel companies are happy to support energy efficiency, which places the onus on the public and guarantees fossil fuel dominance far into the future (see Yankee Ticket Prices).

When I saw Amory most recently and queried him, he affirmed that no tax was needed. He said that hundred dollar bills are being left on the ground by companies that ignore energy efficiency.

Indeed, there is still great potential in energy efficiency. However, the full potential of energy efficiency to help rapidly phase down fossil fuel CO_2 emissions will be achieved only if there is a substantial rising price on carbon emissions. As long as fossil fuel energy is cheap, efficiency encourages more energy use. For example, solid state lighting is much more efficient, but it encourages more extensive lighting. That would be o.k., if the energy source were carbon-free.

The Real World

Many well-meaning people proceed under the illusion that 'soft' renewable energies[3] will replace fossil fuels if the government tries harder and provides more subsidies. Meanwhile, governments speak greenwash while allowing pursuit of fossil fuels with increasingly destructive technologies (hydrofracking, mountaintop removal, longwall mining, drilling in the deepest ocean, the Arctic and other pristine environments) and development of unconventional fossil fuels[4].

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[3] Renewable energy such as windmills and commercial scale solar power are not entirely "soft", in the view of many people, i.e., they have an environmental footprint. Also, because of their intermittency, they require dispatchable back-up power, which is commonly provided by gas, thus degrading the ability to reduce carbon emissions.

[4] Tar sands (renamed oil sands by greenwashing governments) are a current target of the fossil fuel industry and an appropriate place for the public to take a stand. Known tar sands resources contain about 300 GtC, equivalent to about 150 ppm CO_2 at time of injection into the atmosphere. Additional resources are expected to be found, if tar sands are heavily developed as a fuel source. Only a fraction of the resources (15-20% today) are economically recoverable with current technologies, but this fraction will grow if the world's addiction to fossil fuels continues.

The airborne fraction of injected CO_2 will decline by about a factor of five in 1000 years as carbon redistributes itself among surface reservoirs (atmosphere, ocean, soil, biosphere). However, the injected CO_2 is the relevant amount, because future generations (today's young people) will be left with the task of extracting the entire injected amount of unconventional fossil fuels. Fossil fuel injection of CO_2 remains in the surface reservoirs for millennia. An extraction of CO_2 redistributes itself among surface reservoirs in the same way as an injection. Thus, because CO_2 has already reached the dangerous level, unconventional fossil fuel injections must be entirely removed.

It will be a tragedy if environmentalists allow the illusion of 'soft' energies to postpone demand for real solution of the energy, climate and national security problems. Solar power is just a small part of the solution. Subsidies yielding even its present tiny contribution may be unsustainable.

Victor and Yanosek discuss ineffectual U.S. policies to promote green energies and green jobs in the current issue of Foreign Affairs. They conclude that the policies do not promote technologies that can compete with fossil fuels without subsidies. Victor and Yanosek suggest incentives for innovative technologies, including advanced nuclear power. Bill Gates is so distressed by the irrational pusillanimous U.S. energy policy that he is investing a piece of his personal fortune to help develop a specific 4th generation nuclear technology.

I do not want to distract focus from the real solution to the climate/energy problem with a discussion of nuclear power, which is an emotional matter to some people. Pushker Kharecha and I will write a paper with an objective post-Fukushima assessment of the role of nuclear power, but first we must complete papers 2 and 3 (Energy Imbalance and Case for Young People). However, a few comments on safety[5], technology status[6], nuclear waste[7], fuel supply[8],

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Other unconventional fossil fuels include tar shale (estimated resource 400 GtC), heavy oil (150 GtC), the combination of shale gas, tight sands gas and coalbed methane (>200 GtC) and methane hydrates (>1000 GtC). If even 200 GtC (100 ppm CO_2) is injected into the atmosphere, the estimated cost of extraction (at ~$200/tC; see "The Case for Young People and Nature") is ~$40 trillion. This cost would be passed on to our children and grandchildren, along with the human health, environmental, and climate change costs caused by exploitation of unconventional fossil fuels. Clearly, development of these most carbon-intensive fuels makes no sense. The proposed development of tar sands, as the first big push into unconventional fossil fuels, is an appropriate place for young people and their supporters to take a stand.

[5] Safety: The lobbying organization Union of Concerned Scientists on 25 July broadcast a request to all citizens to write their governors and congress-people to demand improved nuclear power safety. Huh? The number of people who have died from nuclear power in the U.S. is zero. How to improve on that? The safety record of the nuclear industry is the best of all major industries in the U.S.

The National Academy of Sciences estimates that the Pennsylvania population exposed to radiation by the Three Mile Island accident may experience one or two resulting cancer deaths; that population will experience about 40,000 cancer deaths due to other causes. However, the estimate of 1-2 deaths is from the "linear no threshold" (LNT) approximation, i.e., an assumption that known radiation effects for large doses continue proportionally for small doses. That assumption is uncertain – there is at least as much anecdotal evidence suggesting that small radiation doses are beneficial to health (some mentioned here: http://www.humanevents.com/article.php?id=42347) as the contrary. However, no adequate scientific study with proper controls has been made.

Curiously, people seem to ignore the far greater dangers of fossil fuels. Mountain-top removal for coal alone (http://www.huffingtonpost.com/jeff-biggers/breaking-new-study-links-_b_910739.html) has been linked to 60,000 cancer cases. The United Nations has estimated global deaths due to fossil fuel air and water pollution to be of the order of one million annually.

[6] Technology: Fukushima nuclear power plants are a 50-year-old technology. They withstood a powerful earthquake, but were washed over by a 10-meter tsunami that wiped out the power sources used to cool the reactors. Modern 3rd generation light-water reactors can use passive cooling systems that require no power source.

No people died at Fukushima because of the nuclear technology. Four people died from other causes (one fell from a crane, one died of a heart attack, and two were drowned by the tsunami). When a plane crashes and kills 100 people do we choose to terminate the airline industry? No, we take steps to make planes safer. Already nuclear power has the best safety record of any energy technology, and the newest nuclear plants have great improvements.

[7] Nuclear "waste": it is not waste, it is fuel for 4th generation reactors! Current ('slow') nuclear reactors are light-water reactors that 'burn' less than 1% of the energy in the original uranium ore, leaving a waste pile that is radioactive for more than 10,000 years. The 4th generation reactors can 'burn' this waste, as well as excess nuclear weapons material, leaving a much smaller waste pile with radioactive half-life measured in decades rather than

and cost[9] are warranted to balance the opportunistic barrage of misinformation from dedicated 'anti-nukes' and an undiscerning sensation-minded media.

The main conclusion is to keep an open mind. China and India will increase nuclear power use; they must if they are to phase out coal over the next few decades. It behooves us to be objective.

Recently I received a mailing on the climate crisis from a large environmental organization. Their request, letters and e-mails to Congress and the President, mentioned only renewable energies (specifically wind and solar power). Such a request offends nobody, and it is worthless.

Indeed, it is much less than worthless. If you drink the kool-aid represented in the right part of Fig. 7, you are a big part of the problem. Sure, I could ignore this and wait for time to make the situation clear to you, but I could say the same thing 10 years ago. Look at part (a) of Figures 5 and 6; do not be fooled by parts (c), which have a vastly different (smaller) scale.

The problem is that, by drinking the kool-aid, you are also pouring it down the throats of my dear grandchildren and yours. The tragedy in doing so is much greater than that of Jim Jones' gullible followers, who forced their children to drink his kool-aid. All life will bear the consequences.

The Real Solution

As long as fossil fuels are cheap, they will be burned. But fossil fuels are cheap only because they do not pay their costs to society. Costs include direct and indirect subsidies, human health costs from air and water pollution, and climate change impacts on current and future generations.

The public can appreciate that a rising price must be placed on fossil fuel emissions, if we are to phase out our addiction to fossil fuels. A carbon fee must be placed across-the-board on all fossil fuels in proportion to carbon emissions. The fee should be collected from fossil fuel companies at the first domestic sale (at domestic mine or port of entry).

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millennia, thus minimizing the nuclear waste problem. The economic value of current nuclear waste, if used as a fuel for 4th generation reactors, is trillions of dollars.

Nuclear reactors deployed in the next 1-2 decades would be primarily improved light-water reactors, with passive cooling capability and other safety improvements, because these are ready for commercial use. However, it is important to also deploy the first 4th generation reactors to demonstrate that the nuclear waste problem can be solved and to optimize the 4th generation technology.

[8] Fuel supply: anti-nuke environmentalists argue that it takes energy to mine and process uranium, and that the uranium supply is limited. In fact, 4th generation nuclear technology, by using more than 99% of the energy in the fuel, expands the fuel supply by a factor of the order of 100.

China has just announced its first 4th generation nuclear reactor (http://www.physorg.com/news/2011-07-china-nuclear-power-breakthrough.html), thus increasing the expected lifespan of their proven uranium reserves from 50 years to more than 3000 years.

The United States was the first country to develop 4th generation nuclear technology. But, when General Electric and Argonne National Laboratory disclosed that they were ready to build a commercial scale reactor in 1994, anti-nuke people persuaded the Clinton administration to terminate the program. The U.S. still has top brainpower in this technology, but, unless there is a change of policy, China will soon leave the United States behind.

[9] Cost: the 'real solution' to the climate/energy problem allows the market to determine winning technologies. Westinghouse AP-1000 advanced 3rd-generation nuclear power plants are being built in China Although anti-nukes may do everything they can to make nuclear power as expensive as possible in the United States, they are not likely to affect nuclear power development in China.

No international exchange of funds is required. The fee would be collected in the nation burning the fuel, and the money would be distributed within the country.

The carbon fee must rise to substantial levels to provide the incentives needed to encourage life style changes, investments in clean energies and energy efficiency, and technology innovations. The public and businesses must realize that the fee will rise over time.

The fee, to be effective, perforce must have a notable effect on the price-at-the-pump, utility bills, and almost all aspects of economic life. The public will not allow the fee to rise to levels that are needed to phase out fossil fuels if the disposition of the money is determined by the government, banks, and economists, the people responsible for the current economic mess.

Disposition of the money collected from fossil fuel companies is thus the most critical matter. You can be certain that politicians and economists will come up with all sorts of suggestions about how they will cleverly use the money (investments in renewable energies, reduction of other taxes, etc.). Do not let them get away with it. The fee will only reach required levels if the money is going to the public. Let the motto be "100 percent or fight!"

The money collected from fossil fuel companies should be distributed electronically each month to bank accounts or debit cards of all legal residents. My suggestion is that each legal adult resident get an equal share, with families getting an added half share per child up to a maximum of two such half shares per family.

For example, the carbon fee proposed by Congressman John Larson ($15/ton of CO_2 the first year, growing $10 each year) would be $115/ton after 10 years. Such a rate would add about $1 per gallon to the price of gasoline. However, it would also yield an annual dividend of $2000-$3000 per legal adult resident, $6000-9000 per family with two or more children. Economic models show that this fee would yield a 30% reduction of carbon emissions at the end of the 10 years, and we would be well on our way to phasing out our fossil fuel addiction by mid-century.

Such a growing fee on carbon emissions is the only way that fossil fuels can be phased out. It can be called a carbon tax, but there is no net tax if the money is distributed to the public. Such distribution is necessary, so that the public has the wherewithal to make changes needed to deal with rising fossil fuel prices. Sixty percent of the public would receive more in their dividend than they pay in increased fuel prices. The public would be encouraged to make changes in their energy choices and energy use, in order to stay on the positive side of the ledger.

Such a simple, honest, transparent system is essential for public acceptance. The public will never accept the gimmicky cap-and-trade system, which inherently brings big banks into the matter and encourages bribes to the fossil fuel industry. Nor can cap-and-trade ever become global – China and India will never accept caps on their economies, but they have many reasons to put a price on carbon emissions to avoid fossil fuel addiction, solve local pollution problems, and to be in a leadership position in a global move toward clean energies.

Fig. 8. Baby Lauren, age 7 months.

Meanwhile, Back on the Farm

We should do what is practical to maximize use of renewable energies and energy efficiency. Wind is not very good on our 7½ acres, but geothermal is a possibility. The idea is to use the nearly constant temperature of the ground at depth to drive a heat pump that provides heating in the winter and cooling in the summer.

The economics, including subsidies, is not as good as for solar power. The only subsidy here for geothermal is the 30% renewable energy federal tax credit. According to some people in this area who installed geothermal, it did not reduce their heating/cooling bills much because they chose to keep more comfortable temperatures than they dared with their prior oil heat system.

The effectiveness of geothermal in reducing costs depends on the required temperature for the fluid in your system. In our family room and kitchen we have a tile floor with below floor heating, which allows geothermal to provide most of the energy free – but in the rest of the house we would need a whole new system. It can be very cost-effective to install geothermal when a house is built, but ours, a small stone farmhouse, was built in 1744.

It is pretty clear that baby Lauren is determined to go to college (Fig. 8). I have a bit over $100K left from awards. Most of it is needed to bring her college fund up to the level of the other three grandchildren, so I likely will choose a very limited geothermal system and/or better insulation.

Finally, Jessica Bilger, daughter of a neighbor, is a bright young enthusiastic recent college graduate (2 years ago) with a BS in Environmental Science & Agronomy from Delaware Valley College of Science and Agriculture. While a student she did internships at Rider University on invasive plants and at USGS (Las Vegas) on impact of relocation of endangered species. She is interested in wetland restoration, water quality, ecological conservation work, especially amphibians, and enjoys field-work, but is open to any work in the environmental field. Lives in Pipersville (eastern PA, about 90 minutes from NYC), but is willing to travel, work elsewhere. If you have relevant information, the contact is Jessica Bilger <jessicaloretta3@yahoo.com>.