A BIG WIND…

TV spots by GE, radio advertisements; all you see and hear is how our future electric power will be provided by wind and solar energy. Never mind the fact that in reality, only 2% of our total electrical energy requirement is currently being provided by all renewable energy sources combined if measured in real time, not capacity. The primary forces behind the advertising are the usual players, large multi-national corporate conglomerates promising green jobs and green energy, with little to show for their past or current efforts. The problem is mainly one of perception. People see the large turbines spinning and assume they are producing lots of electrical power for all. Every time a new development is planned, the catch-phrase is always the number of homes they will power. This wind unit or that wind farm will be able to power 200 or maybe 20,000 homes. The Obama administration seems currently to be behind promoting wind, not as load assistance but as the single power provider for urban and rural areas alike. Then there are the millions of supposed jobs, "green collar" jobs which will "magically" materialize if we expand the role of renewable energy in the energy sector. All of this has real political implications for those who promote and fund these technologies, but what is the reality behind the façade? We have timely evidence how publicity and hype is used against us in the current financial situation, one of many typical cycles of boom and bust, driven mostly by greed. When "experts" like CNN's Jim Cramer and many, many others completely miss the mark, who can really predict anything. Petroleum and Gas associations spend millions on TV ads abut how wonderful "fracking" is while coal concerns are behind promoting "Clean" coal. Everything is based on what someone has to sell, not what will provide the least And during this time, there were only a few naysayers, single voices asking questions, but no one listened, least of all the regulators and a government which is obligated to protect us on some level.

The same is true for the demise of the US auto industry, where either the management or designers or someone should have been observing the fact that oil had become an issue and gas guzzling SUV's would no longer be profitable. What seems to happen in all these cases is a disconnect from reality in favor of promoting someone's economic or societal philosophy in spite of the factual situation. The "American way of life" or the "American Dream" are always popular catch-phrases in this debate. For some, doing anything other than the idealized 1950's version of a consumer driven future where everyone has a flying car, a house, and plenty of electric appliances would be considered "socialist" or "communist". The truth is that the benefits of this economic bubble were limited to the upper economic strata, most people still had to struggle, always had problems with energy costs, health care, food prices and just plain keeping a job. The present trend toward more centralized, computer controlled power systems centered on very large scale wind and solar farms will inevitably lead to higher costs for all and will fail. The reason is **entropy**. Large scale systems, relying too heavily on computerization, fail in a very large way. The T. Boone Pickett version of powering the USA with wind farms (which he owns) and relying on Natural Gas (which he invests in) as the fuel of choice as an alternative to coal will not work. This will only increase production of natural gas and drive up costs which will inevitably put us in the same corner - painted in. Likewise, Al Gore's version of a country completely powered by renewable energy is similarly flawed. The US is geographically segmented and there are no current technologies or materials that will allow billions of kilowatts (if available) to be transferred from Arizona to Washington DC, or Wyoming to New York via any transmission method currently feasible. The problem is very simple. Each wind generator, each solar farm absolutely requires a stable grid to feed into and are not nor can be prime power sources. Meters record the amps passing thru the transformers which connect the wind units to the grid, but very little real power goes very far (see notes on AC power). They are simply dispersed, independent power producers which cannot supply any load without the base loading power of coal or natural gas. In truth, not one ounce of coal, programmed to be burned in a coal fired power system has ever been offset by the introduction of wind or solar power into the grid.

Following are just a few of the many facts regarding large scale wind and solar which point out the fallacies of these proposals.

Wind power is being put forward as a way to partially or completely replace our current coal-fired base-load power plants. One simply has to look at a map of Europe where wind has been marginally successful and compare this to the land area of the United States to see the massive differences. First, all these countries are socialist systems where all the costs are heavily subsidized. Second, the entire country of Spain, where large solar farms and wind systems are already operating is less than 3/4 the land area of Texas alone, so energy transmission, using an updated and decentralized grid, has a very short distance to go from production to point of use. France, having 59 nuclear power plants, uses approximately 400 billion kwh annually-87% from nuclear, while the USA uses over 800 billion kwh annually from nuclear alone, though our nuclear capacity is less than 10% of the overall power generated. The average European electric consumer uses less than ¼ than the average American uses daily. Denmark, for example has massive wind farms, onshore and off, which supply about 19% of the electrical load. The bulk of the electric load is still served by conventional and biomass power plants. Denmark is a country which is slightly less than twice the size of Massachusetts with 5.5 million people who are extremely energy conscious.

Based on these and other factors, it is nearly impossible to conceive of a scenario where wind generation could replace even our nuclear power generation. Other factors are important here, such as the fact that wind and solar are both intermittent power sources. Most high wind areas are far from population centers and very far from the greatest energy needs. All power production facilities are rated as to “Capacity Factor” and the capacity factor for a coal fired power plant is over 90% while large scale wind generators are rated at 30% capacity factor. Therefore, any collection of wind generators can be expected to make only 30% of the full nameplate output at any one time. Put another way, to get the full operational output of a single one-megawatt wind generator, you have to build three. Wind generators are very high maintenance. All of the current systems require maintenance and constant service is imperative to their continued operation. One in 800 has a broken blade every month. The life cycle of a large scale wind unit is about 5-7 years without major overhaul, at a cost of approximately $ 250,000 per incident. All these factors plus many more, point to large scale wind being just outside the range of being capable of providing the bulk of our electrical energy needs at any point in the near future. Wind generators <u>are not</u> prime power producers, and without the grid available, they cannot input the power generated into the grid. (See appendix for facts on large wind generators)

Consider the amount of raw materials going into these machines. Each wind generator, on average, requires 250 tons of steel, thousands of tons of concrete, about 20 miles of copper wire and multiple control systems. While this may seem to back the claim that these systems generate jobs, most of the steel and materials comes from overseas. Steel production requires lots of electricity and produces many of tons of CO2 per ton of steel produced. How will we ever get a handle on CO2 output going this route? And further, when we have finally built out the wind infrastructure, will this not lead to another boom-bust cycle?

How about large scale solar farms? To date, none of these has produced more than a very small amount of power and are fraught with downsides. For one, solar is very intermittent power, even solar thermal plants in Arizona have downtime. They rely on the suns massive thermal output for a fuel source and that fuel source can be gone with the first thunderstorm. Meanwhile, your refrigerator still needs power.

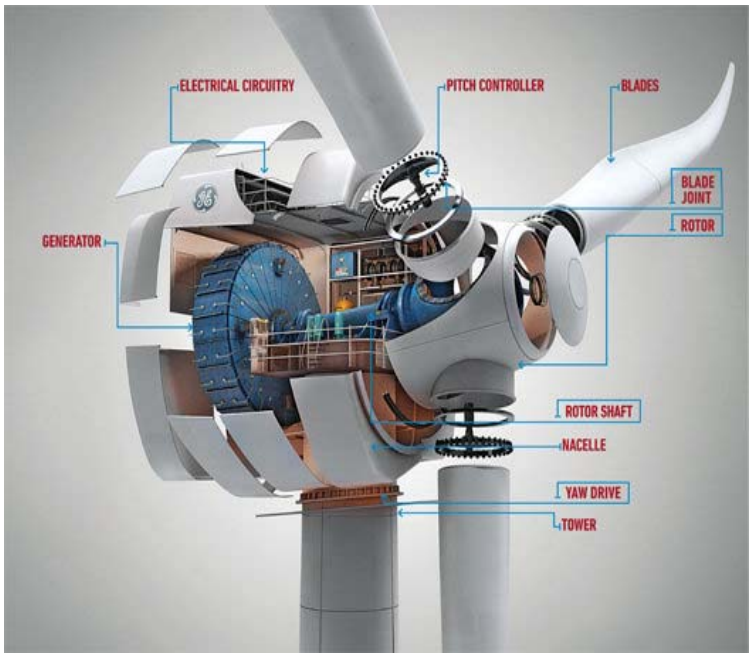
Large scale battery systems of different types are being considered to help offset the intermittence and downsides noted above. However, currently there are no best-case batteries for large scale battery systems without significant downsides either in cost, longevity or in performance. So where is all this leading? .

There are optional ways of utilizing these intermittent power sources, and the best one is hydrogen production. A fully operational wind system can produce the electrical equivalent in H2 every day which can very easily be transported, but more importantly can be used locally, at any time without regard to wind power levels. For this and many other reasons, it is clear to this writer that Hydrogen will eventually win over all electrical transmission options. Hydrogen can be used for any purpose which previously used natural gas or propane and can be distributed for less cost than both. Hydrogen is clean, easy to use, easy to make and has no downside, except one. Anyone can make it. I think it is obvious who would object to having the average American being able to make their own fuel in a safe and cost effective manner. Topping the list of objectors to national fuel efficiency standards were car companies and oil companies. Under the guise of supposed loss of performance, loss of choice, loss of individuality, we have let the oil industry and our car manufacturers limit our ability to reduce our oil consumption for 50 years. We are about to have the new “green sector” do the same thing by maintaining the status quo of grid interconnected cities and towns, just to keep utilities in business. The grid serving our homes and businesses is no longer viable. We replace thousands of power poles (at the expense of trees) and thousands of miles of power lines every year due to weather alone. As the climate worsens, these losses will increase.
In point of fact, with much smaller investments, every home, every business can be independently powered. Not just on paper as currently is done with grid tie systems (see note on grid-tie system operation), but with integrated systems with wind and solar inputs and with advanced and completely recyclable battery technology already available. These systems can and do provide enough energy at the point of use to power nearly any energy efficient load. Why not make power at the point of use? Not with a wimpy little set of solar panels that cannot power your home without the utility present, but with a complete system, with energy storage (just like the utilities intend to do) and which can reduce your loads, 24 hours a day in real time. Then, give these homeowners real capital to invest in these systems, guaranteed loans, and low interest loans. An entire country of independently powered homes and businesses, with each entity able to provide all its own power (with or without the utility) would have many advantages. The services would be impossible to cut off. Each home would need to be energy efficient, but this will become a necessity anyway. The “Smart Grid” is not about not benefiting each person, but giving the utility the ability to cut off your load at the source, so the system can be stabilized with less power input. In a world without large scale power plants, this ability will be necessary. What about the safety and reliability of a computer controlled smart-grid? If a 12 year old in China can hack into a Google system or into the main frame of a major corporation-how safe do you think your grid will be? When we have built the last wind generator or solar farm with either public or private investment and those workers are no longer needed-will this not simply perpetuate the continuous boom-bust cycle that America has been in for 200 years? How many boom-bust cycles can any economy, any civilization survive. You would need to ask the Romans, the Egyptians, the Mayans, the Aztecs and maybe the people that lived on Easter Island about 2 centuries ago. Very soon now, 400 million people in the US and 7 billion people on the planet will be asking for electricity, food, cars and other consumer goods. How many wind generators or solar farms do you think that will take? We need a do-over and we need to stop and rethink the whole system, rather than just letting the folks in charge do what they always have done using the same ideas over and over. Recycling is a good thing except when it involves worn out ideologies and theories. Economy of scale is one of these ideas and needs to be abandoned. Make no mistake about it; we are way past the tipping point in global warming and need to be concerned with surviving the event rather than reversing it. Make your own power, make your own food, take local control of your services and control your destiny. The clock is ticking and you cannot keep putting the same bandage on a wound or you get gangrene…

Appendix:

Facts about large scale wind turbines:

1. Utility scale wind turbines are extremely complicated machines The simplified drawing to the right details just a few of the many engineering features in a utility scale wind unit. They need a motor to start the blades rotating, a motor to move the unit into the wind, a motor to control blade pitch, and much, much more.



1. Each wind unit (800kw to mega-watt size) requires over 250 tons of steel, over 80 yards of concrete, 20 miles of copper wire and yet each installation employs fewer than 20 people.
2. Transporting the wind units alone requires 10 tractor-trailers and over 600 gallons of diesel. They cannot go by rail, so lots of diesel trucks are used.
3. Each wind unit costs about $ 1 per watt or about $ 1 million for a mega-watt machine.
4. Power producers are rated in “capacity factor”; a coal fired power plant has a typical capacity factor of over 90% but wind turbines have a capacity factor of 30%. This means you have to build three units to get one unit full output potential.
5. Wind generators are not stand-alone power producers, nor can they be ganged in multiples to produce thousands of megawatts like a coal fired power plant. They all synchronize to and feed into an existing, stable grid.

AC Power: A technology essentially created by Nicola Tesla, which allows power to be transmitted via waves of power amplitude being sent down wires to power loads rather than actually moving electrons in the transmission medium. This technology requires electromagnetic mass for operation. The amount of mass in the generator magnets, windings and connected transformers is directly proportional to the amount of power which can be transmitted and the losses incurred in the transmission.

Solar Farms: This photo illustrates the nominal condition of many solar farms in the US and overseas, they simply do not maintain them and this is the result. The weeds will reduce the output by about 20% to as much as 40% in some cases and create other problems with “hot spots” in the panel. Many solar farms have even been abandoned or went bankrupt. With subsidies set to expire, many more will follow.

Wind Generators vs Nature:
Large scale wind generators are no more immune to weather events like hurricanes and tornadoes than houses or other man-made items. They will fail and do. In this case, every loss reduces the grid integrity of the group and costs millions of dollars to replace. In 2012 alone, over 100 large wind turbines were damaged by tornadoes. These structures cannot just be patched up and put back to work-they must be completely inspected and usually replaced. As of January of 2013, reports how that over 14,000 wind generators have simply been abandoned when they could not make it without subsidies.

Grid-tie systems: Current technology for grid tie systems without batteries purports to make enough energy during the day to be able to say, on paper, that the home is net-zero energy use. This is an accounting trick worthy of Wall Street because the home is a load to the utility at night and creates the same load it always did requiring massive power plants to run 24 hours a day, irregardless of the input to maintain load and frequency balance on the grid. Not a dime is really saved here.

Why we cannot transmit large mounts of Wind Power:

According to the Power Law: $P = I^2 \times R$, that is power (in this case, power lost) is equal to current **squared** times resistance. To deliver power, it takes amps and volts. If you raise the volts, you can reduce the amps and still get the same power. If you reduce the amps, you lower the losses. Did you notice the squared term in the formula? That means if you reduce the current to one-tenth of the original value, your losses go down to ***one one-hundredth*** of what they were.

This is a *huge* issue for the utilities. Every kW lost is one they cannot collect money for, yet they still have to pay for fuel to generate it, they have to size the generator bigger to supply it, and they have to size the transmission system to carry it. There are other good reasons too (see below), but minimizing line loss is the main one. A few transmission systems have been designed at *1.2 million volts (DC)*. The utilities would have billion-volt systems if they could figure out how to do it. This voltage is not technically feasible.

Use of a higher transmission voltage saves a tremendous amount of money in many ways. For example for the expensive material used for the cables (often a steel multi-strand core wound with an outer skin of copper, aluminum, or similar good conducting wires) and for the weight and costs of construction and erection of the towers that carry the cables across the countryside.

To carry 400 kV (= 400 kilovolts = 400 thousand Volts) the steel towers have to be taller and the porcelain insulators have to be longer than they would have to be for cables carrying lower voltages but the cost of making the towers taller and the insulators longer is far less than the cost of the extra weight of the much thicker cables that would be needed to carry the same power at a lower voltage. A transmission system tower to carry over 1.2 million volts (AC) would have to be over 750' tall.

There are many other costs which have to be reckoned when deciding what voltage to use for long-distance power distribution. For example the high cost of the massive power transformers and big switching stations that have to be included in the power distribution network; the power that is lost from the cables - radiated to the surrounding air as heat - because of the electrical resistance of the materials from which the cables are made.

In short, it is physically impossible to transmit power from wind generators in Wyoming to New York.

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