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Why is coal fuel needed as a major contributor to America's energy supply?

Why is the public against new coal fueled power plants?

What has the industry done wrong to create such a poor perception?

What does "Fuels" and "Heat" have to do with economic prosperity and the high living standard that Americans enjoy?

These are my opinions, based on my experiences and observations of the electric power industry over the last forty years. The four questions in the title are all valid and they have not been addressed as they should. These questions were asked by a friend of mine who is a gifted and successful professional. He was honest and sincere and truly wanted an answer. Perhaps these questions have been answered before, but I thought I would write my take on how we arrived at this poor public perception and understanding of energy. – Dick Storm

The four "E's" Energy, Environmental Protection, Economic Prosperity and Education come to mind. All four of these are important when attempting to understand why we need to stand together to support domestic energy production of more electricity from clean coal. America has more energy in coal reserves within our borders than Saudi Arabia has in equivalent energy in the form of oil within theirs. So, why don't we just make it policy in America to use our vast national treasure? And of course, use it cleanly and wisely as "Good Steward's of God's Creation".

It is in America's best interests to use all of our energy forms from within our borders. All forms, including coal, oil, gas, nuclear and renewable. I will attempt to explain later why renewables cannot replace coal, at least, not until there are major technological breakthroughs.

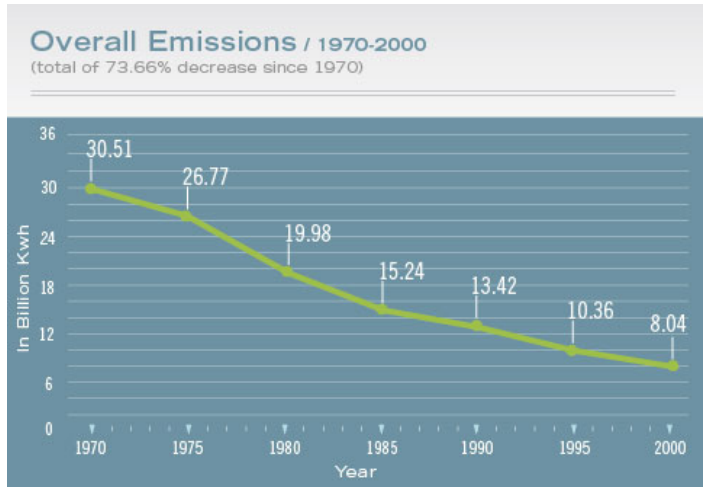
America needs to use our own energy for purposes of national security, and continued economic prosperity.

So, if coal is so good for America, then, why does the public not support coal

fueled power plants? Here is how I remember our public relations going wrong.

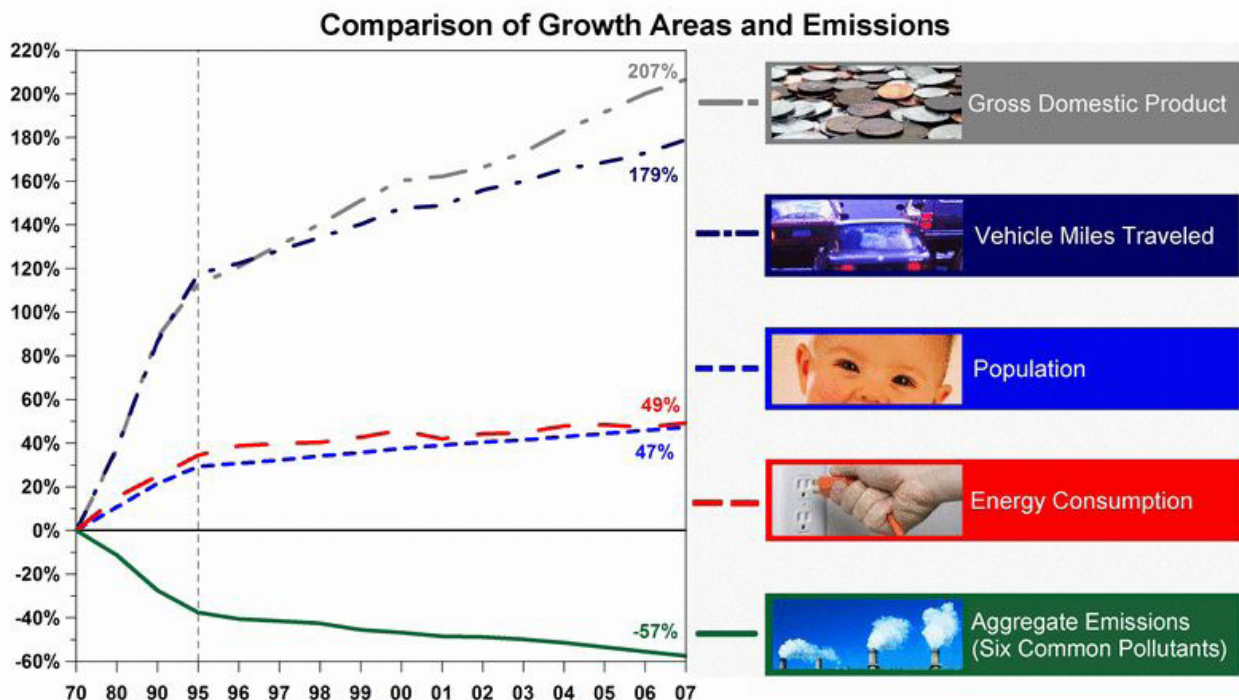
The perception of coal being harmful and the "War on Coal" by the detractors begins, by my recollection, about 1970. It was at this time that the environmental movement began. The EPA was formed in 1970 under President Richard Nixon. Then the EPA along with industry, worked hard to apply increasing requirements for cleaner stacks beginning in the early seventy's. Yes, coal plants back then did need cleaning up. The EPA enforcement was effective and great progress was made. The utility industry was slow to implement corrections at the time, partly due to many factors. Among the reasons for slower progress in the first few years was that because so many large coal boilers were converted to oil in the interest of cleaning up stack pollutants. I was involved in several of these that could use either coal or oil. The fuel conversions from coal to oil slowed down the stack clean ups. This was partially because back in 1972 (at least in North Carolina and Florida where I was working) both coal and oil was about \$0.50/million Btu. Contrast

the costs then to the present, where coal even at \$140.00/ton converts to about \$5.83/million Btu and oil today is the equivalent at \$120.00/barrel of about \$18.75/million Btu. Not close to parity. After the Arab Oil Embargo of 1973-74, coal and stack clean up systems were implemented. Coal fuel then (immediately following the Arab Oil Embargo) was and continues to be the lowest cost fuel for power generation. Later, power generated by nuclear would become less expensive. The gradual implementation of electrostatic precipitators, scrubbers and selective catalytic reactors resulted in a steady decline in pollutants. This is shown on the graphs on this page. These have been copied from EPA reports and data from Americans for Balanced Energy Choices. Note the comparisons of increased expansion of the economy, US population and vehicle miles driven. The aggregate emissions actually declined. The quality of the atmosphere has actually improved. Incidentally, as one who does a lot of flying and has several friends that are private pilots, our consensus is, that the air has become cleaner, and visibility improved. The most visible haze and air pollution problems (non-attainment areas) are where there is more concentrated vehicular traffic. In other words most cities have their pollution as a result of emissions from transportation fuels, not coal power plants.



“Why does the public not support coal fueled power plants?”

During the 70s, most large utilities were very active in education of the public with programs in the schools and through many advertisements in the media. Most people over age fifty remember “Reddy Kilowatt” the stick figure formed from lightening bolts that was on the logo of many utilities. Better things and better living through the use of reasonable cost electricity was taught and explained by many public service announcements and proactive involvement with schools and civic organizations. “Living Better Electrically” was the message for three decades. Electricity costs had a downward trend for a decade or more as new coal plants became larger and more efficient. The

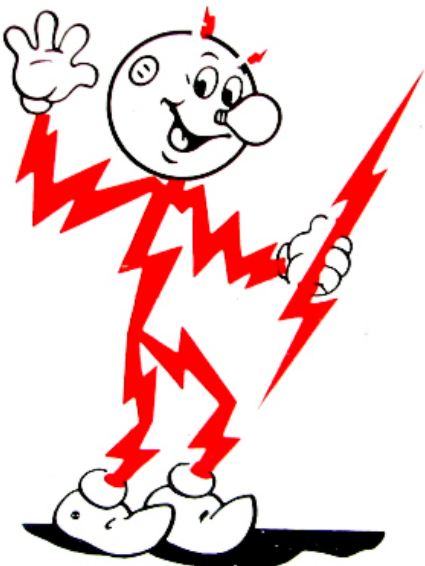


most efficient plant, ever designed and built in America was the Philadelphia Electric Eddystone station, Unit #1. This unit started up about 1957 and is still in operation. It is now an ASME historical landmark.

The Duke Power Marshall Steam Plant started up about 1964 and remains one of the most efficient coal power plants in the world. Not bad for a 44 year old plant?

The Arab Oil Embargo of 1973-74 was a time that all utilities were under great pressure to reduce the cost of production. I worked for Carolina Power and Light at that time, and I remember clearly what was done to reduce costs: The first three budget items to be reduced to nearly zero were: 1. Public Relations; 2. Tree trimming; and 3. Painting; and any maintenance that could be put off until later.

It took a while for the impact of reduced public education to take effect. To be exact, it took an entire generation. Now, after 30 years there has been very few people or organizations who attempt to explain the benefits of coal and nuclear (which together produce about 70% of our electricity generation capacity). As a result of this lack of "energy education" we are paying or about to pay a high price as an entire nation. The energy crisis is now here, and it plays a large part in harming the American economy.



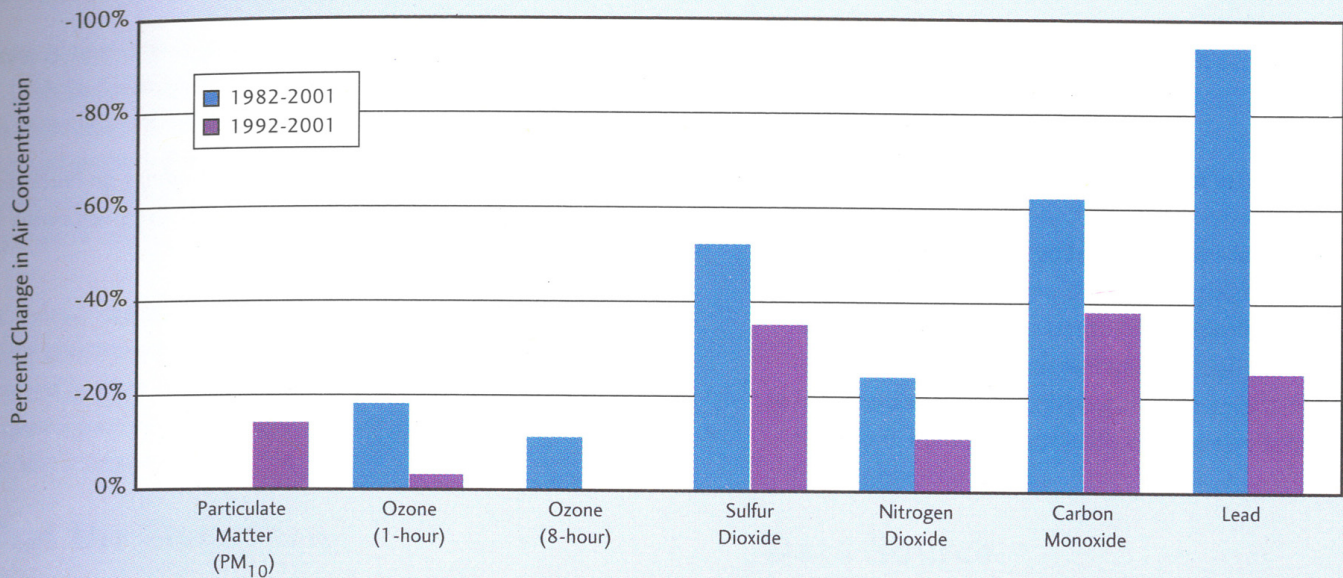
"Reddy Kilowatt" the symbol of living better electrically for many decades, 50s – 70s.

The public education programs along with "Reddy Kilowatt" and the theme of "Living Better Electrically" pretty much went silent after the Arab Oil Embargo and the costs began rising for electricity with the increased cost of mining coal, transportation and environmental retrofits of electrostatic precipitators, sulfur scrubbers, selective catalytic reactors, low NO_x burners and other air correction devices. The key point is, all the time while the industry was implementing pollution control devices and doing the right corrective actions, the industry did little or nothing to educate the public on these good works and how important electricity was for our quality of life, economic prosperity and industrial competitiveness.

Now, contrast the scenario of the electric utilities cutting back on the public educational programs of "Living Better Electrically" with the rise of "Environmental Extremism". Well intentioned organizations such as the Sierra Club, Environmental Defense, Natural Resources Defense Fund, "Green Peace" and others have become stronger and stronger and clearly aligned with one Political party, the Democratic Party. Later, Al Gore was well publicized for his book, "Earth in Balance" and of course the well hyped and exaggerated movie "An Inconvenient Truth". The liberal news media has piled on and been very effective in spewing biased reporting on "manmade global warming" and other environmental issues. The junk science of manmade global warming, the biased media and public opinion became so entrenched in worldwide conventional wisdom that Al Gore was awarded a Nobel Prize and the US Supreme Court became sympathetic to the movement. The green movement has been described by the Czech President, Vaclav Klaus as being the new totalitarianism. Klaus has proclaimed that the global warming issue is being used as a means to erode our freedoms.

So, we have the confluence of two movements. The electric utilities did almost nothing to tell their side of the story of what they were/are continuing to do now. And that is; to make coal as clean as possible. The environmental extremists (while we were not telling our side) have been doing a very effective job of exaggerating the harm that coal plants do to the environment. As an example,

Exhibit I-6: Percent reduction in concentration of six criteria air pollutants regulated under the Clean Air Act, 1982-2001



Note: Trend data for PM_{2.5} are not available. Trend data for PM₁₀ are only available for 1992-2001. Between 1992-2001, ozone (8-hour) concentrations remained level.

Source: EPA, Office of Air Quality Planning and Standards. *Latest Findings on National Air Quality: 2001 Status and Trends*. September 2002.

let me show the major pollutants on a graph on page 2 and the one pictured above. It is from EPA data.

Pollutants have been reduced on a very definite downward trend. The air is getting cleaner, even with increased electricity production from coal.

The worst thing done in the “War on Coal” has been the classification of carbon dioxide as a pollutant. There are many scientists that disagree with the now common conventional wisdom that man is causing “Global Warming”. The climate may be changing and warming, but there are many true scientists (over 31,000 have signed a petition that states, “There is no convincing scientific evidence that human release of carbon dioxide methane or other greenhouse gases is causing or in the foreseeable future, cause catastrophic heating of the Earth’s atmosphere and disruption of the Earth’s climate”) that disagree that carbon dioxide at 380ppm (or 0.038%) is the cause. Clouds and natural emissions of methane are much larger contributors of greenhouse gases. Solar activity, changing ocean currents and the tilt of the earth are other large natural factors that cause climate change. These can be covered as a separate subject.

My point is the public has been severely misguided on the facts and consequences of using coal fuel to generate electricity cleanly and at a reasonable cost. The economic damages of not building more coal plants have already been felt by the US economy. The damage to economic prosperity is significant and is likely to worsen. It is my belief that much of our economic downturn (this is being written in August 2008, when the consensus of economists has been that unemployment is rising and the economy is slowing) would have been reduced in intensity had we been working to build more domestic energy production capability over the last ten years in all forms. About 93% of our energy comes in four forms; oil, coal, natural gas and nuclear. America needs more domestic production of all four of these. I’ll show why later.

Now to summarize “Why does the public not support building new coal fueled power plants in America?”

1. The electric utilities stopped their very effective education of the 50s – 70s, so the public has not heard the benefits of using coal for production of electricity to live better electrically for

over 30 years. Electric reliability has become an Achilles Heel in that electricity is taken as a God given benefit of living in America. Yet, the average American today does not even know where his/her electricity comes from.

2. The environmental extremists have filled the void left by the exit of utilities on public education. As Vaclav Klaus referred to them, the new totalitarianism movement has replaced educational programs to tell the true story of where energy comes from and why we need more domestic supplies. The environmental extremist organizations are well connected politically and to the major news media – both print, electronic and entertainment. It has become politically correct to save the plant by installing compact fluorescent bulbs, driving a small hybrid automobile and bashing the American way of life.

So, these two reasons are why I think the American public has been skeptical of the power companies building new coal generating plants.

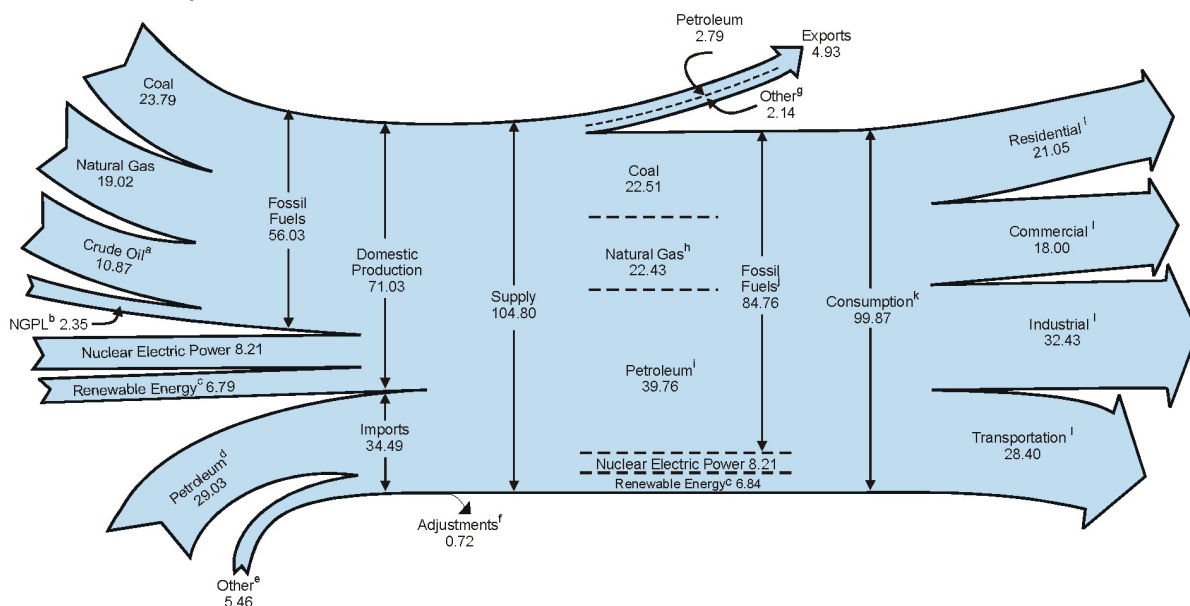
Why is coal fuel needed to power America?

America presently uses between 105 and 120 quadrillion Btu's of energy. Figure 3 below shows 104.8, this is from 2006 data. You will notice that the coal portion of the total "Energy" used in America is 23.79 quadrillion Btu's – almost a

This is very important to understand. America uses a lot of energy to power our lifestyles and our economy. Most of us enjoy our standard of living and our freedom.

Speaking of freedom, one of our very enjoyable freedoms is the freedom to drive our cars to wherever we want to; at any time we want to do it. There are those that say we should use public transportation, walk or ride our bicycle. Well, where possible we should. We can have both with PHEV's. That is Plug-in Electric Hybrid Vehicles such as the General Motor's "Volt". When these are proven, they can be plugged in at night and driven round trip for approximately 40-50 miles using no gasoline. Battery storage technology is progressing and with the latest lithium ion batteries, basically cleanly generated electricity from coal, nuclear, wind, solar, hydro and other renewable will be used to replace the energy of gasoline. Of course the detractors will say this will require more power plants. To this I answer yes it will and we should be very pleased to use domestic energy to supplement at least some of our 70% imported oil with American power.

From the prospective of using more American power to enhance and improve our freedom of travel while at the same time building our economic prosperity – coal looks even better!



quarter of all energy we use – and it does in fact provide about 50% of our electricity generation.

Figure 3
Energy Flow, 2006 (Quadrillion Btu)

Now, here is what happens when American coal powered generation is not expanded to provide for population growth and other increases in electricity consumption. The default fuel of choice is natural gas. In other words, when a utility attempts to build a coal plant, and is restricted from doing so because of public opposition or regulations, then the 1-2% per year growth must be generated by some form of generation. Natural gas like coal, oil or nuclear is a form of energy that can power a turbine to drive a generator that produces power, even in the dark and when the wind is not blowing. The second fuel of choice if not coal is natural gas. Now again referring to Figure 3 of the energy flows, note that the energy must come from one of five forms:

- Oil
- Coal
- Natural Gas
- Nuclear
- Renewables

Although the politically correct approach is renewables, the dependable fuel source that can be permitted for a new plant is just one. Natural Gas. The increased use of natural gas for power generation then competes with the supply of natural gas available for home heating in the winter. Therefore, by not building and using more coal plants for power generation, the cost of natural gas for home heating will escalate. Even worse yet, natural gas is touted as a low carbon fuel. Well, it does emit less CO₂ than an equivalent amount of energy from coal but it is not carbon free! Depending on the efficiency of the end use, natural gas may result in a carbon footprint that is 70% or more of an equivalent amount of energy from coal. Please note Figure 4 below.

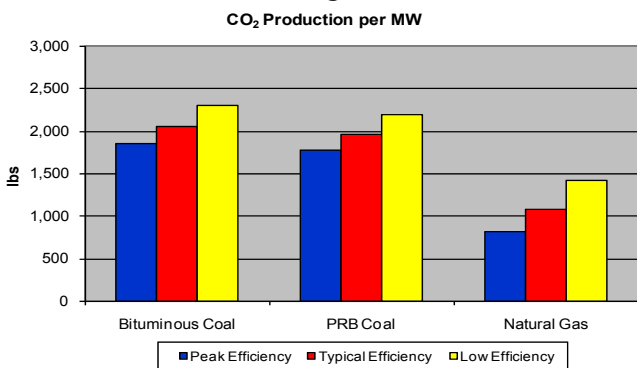


Figure 4

The same supply limitations affect home heating fuel and jet fuel prices as the law of supply and demand is applied to all forms of energy. The purpose of Figure 3 is to illustrate that some fuels can be substituted to provide the required energy needed. That is, if coal prices were very high, then natural gas fuel (if it were lower priced) or oil could be used to fuel a steam boiler to provide steam to a steam turbine to drive an electric generator. Windmills and solar power, if available, can provide some electric power to reduce the amount of fuel used by steam boilers for electricity production. That is providing the windmills are installed and the wind blows at a sufficient velocity to produce the power the windmill is capable. Similar for solar power, a great concept on sunny days. In NC it can be estimated that there are about 3.5 hours of peak sunshine per day.

Now, how do we obtain enough energy to power our way of life? Here is a pie chart, Figure 5, showing where we obtain our energy now.

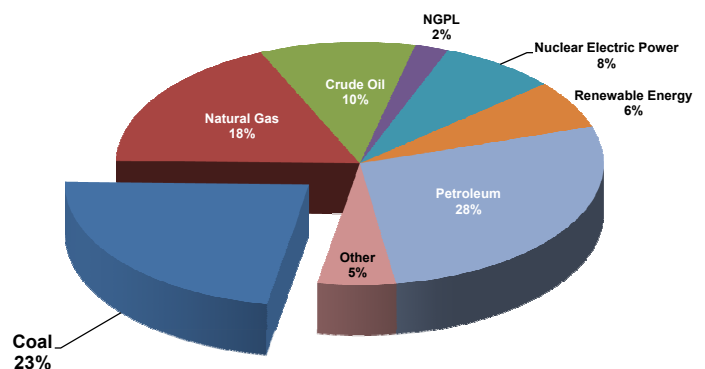


Figure 5

Let us put into perspective how difficult it will be to generate power from renewables by comparing the real estate that is required for 100 megawatts of generation. One hundred megawatts is about enough power to energize two cities the size of Albemarle, NC. In our town we have about 20,000 people and we use up to 50 MW (50,000 kilowatts). This includes commercial, residential and some light industrial electrical load.

- 100,000 kilowatts by solar will require about 1,000 acres of prime land (desert would be better if out west).

- 100,000 kilowatts by windmills. The average wind turbine is about 2 MW each and it would require about 1 acre/turbine, but space is required between the windmills. In open land it is said by the "American Wind Energy Association," that about 60 acres are needed per megawatt. 50-100 MW could require up to 6,000 acres. A wind plant on a ridgeline or hilly terrain will require much less space, as little as two acres per megawatt. As far as Dick Storm is concerned, I support building windmills wherever it is practical to do so. The myth on windmills is that they can replace our imported oil consumption in a large way, all across America. The truth is combined with lithium ion batteries and PHEV technology; yes they can, in some areas of Texas, the windy west and off shore where strong winds blow. But they are not practical in my county.

- 100,000 kilowatts by two poultry waste thermal plants. A company is considering building a poultry waste to energy plant in our county. One plant is equal to about 55MW of generation capacity and it will consume most of the chicken and turkey litter for about a 30 mile radius. A good idea, and environmentally sound, but it will take two of their plants to provide the 100,000 kilowatts of power as an example. I support the poultry waste plants, it is a good concept. However, the true construction and electricity production costs are higher than coal. As I understand NC's Green Power Law, all the power generated from any approved renewable generator will/must be purchased from the utility serving that area for 12.4 cents/KWh. This is about 50% more than the production cost of power from a well run coal plant.

- How much coal would a 100,000 kilowatts modern coal power plant consume? About 70,000 pounds per hour. One coal car is about 100 tons or 200,000 pounds. So, one coal car would fuel a 100,000 kilowatt plant, operating at full load for about 3 hours. Rain, shine, windy day, clear day or day of still air.

America needs to use all of the domestic forms of energy that we have within our borders. Coal, in my opinion, must remain a major component of our national energy policy. Feel free to send me your comments.

Yours very truly,



Richard F. Storm, PE



Factoids

- Coal provides America's railroads with more traffic and revenue than any other commodity.
- A typical train car holds between 115 and 117 tons of coal.
- Wyoming is the largest coal-producing state.
- Coal accounts for half of the electricity use in the U.S.
- Coal costs less than any other major fossil fuel source.
- The world's largest producers and consumers of coal are China, Poland, Russia, India and the United States.
- Total world consumption of marketed energy is projected to increase by 57 percent from 2004 to 2030.
- Coal's share of total world energy use climbed from 25 percent in 2003 to 26 percent in 2004 and is expected to increase to 28 percent by 2030.
- America has more than 250 billion tons of recoverable coal reserves, the equivalent of 800 billion barrels of oil, more than three times Saudi Arabia's proven oil reserves.
- Texas is the largest coal-consuming state in the U.S. and is the largest consumer of electricity.
- According to an electric power industry journal, 23 of the 25 power plants in the U.S. that have the lowest operating costs (and therefore provide power to their consumers at the lowest prices) are powered by coal.
- Today, America's coal-based generating fleet is 70% cleaner (based upon regulated emissions per unit of energy produced) thanks, in part, to \$50 billion invested in new technologies.
- Since 1970, the use of coal to generate electricity in the U.S. has nearly tripled in response to growing electricity demand.
- U.S. electricity demand continues to increase even as energy efficiency gains are made. Despite the fact that we are continuing to become more energy efficient, the U.S. Energy Information Administration projects that electricity demand will grow by 41% by 2030.
- Using coal to generate electricity is less than a 1/3 of the cost of other fuels.
- Intermittent energy resources like wind and solar are used for meeting peak energy demand because they are not always available. That is different from coal, which is used to provide "baseload" power — the constant, steady supply of electricity we depend upon throughout the day.
- America has more than 200 years of available coal reserves.

Source: www.americaspower.org