FILE

August 14, 2011

Ohio Power Siting Board
180 E. Broad St.
Columbus, OH 43215

Re: Case # 10-2865-EL-BGN
Re: Black Fork Wind Energy requesting denial dated Aug 12, 2011
Re: My request for intervention status dated July 28, 2011

To board members,

My husband and I live in Plymouth Township, Richland County, Ohio, which places us in the boundaries of the proposed project. The purpose of this letter is in response to Black Fork Wind Energy's request to deny intervener status to Alt, Biglin, Heffner, & Davis in general and Davis in particular.

I feel it is the right of any tax paying citizen to request intervener status. Likewise, any Ohio electric rate payer has the right to intervene in these projects, because the mandate to use their product is an unjust one and will make our cost go up. Black Fork Wind Energy, LLC is here for the subsidies and mandates, period! One of their people freely admitted that at public meeting #1. The fact that the Ohio Power Siting Board's mission statement "**is to support sound energy policies that provide for the installation of energy capacity and transmission infrastructure for the benefit of the Ohio citizens, promoting the state's economic interests, and protecting the environment and land use**", these issues are the tip of the spear. There are many other issues involved for us also...all the so called NIMBY issues that the company continues to ignore and swears don't exist, but historical evidence world wide indicates otherwise. I chose the issue of the OPSB mission statement because I find it to be in direct conflict with its actions and because everything else stems from that very issue.

If the boards purpose is to simply check off the various studies required by rules, then their mission statement should reflect that instead of the more broad reaching and grand purpose of "sound energy policies....for the benefit of Ohio citizens". As a taxpayer, continuing to fund these projects with my taxes and borrowing from foreign governments or future generations is a crime. Purposefully driving up our electric rates by demanding that we use the unreliable and costly product put out by this and other such projects is wrong. Therefore, as to whether I have good cause:

Re: 4906.08 (A)(3) & 4906-7-04(B)

a.) Nature and extent of my interest - who better than a person who's 40 year old home has been dropped in the middle of this proposed industrial wind project?

b.) The extent I am represented by existing parties - there is NO representation of non-participant homeowners anywhere on this board or other existing parties. so we have to represent ourselves - that goes for everyone requesting intervener status.

c.) My contribution to a just and expeditious resolution - "just" is in the eyes of the beholder - "expeditious" means to ram it thru so BFWE can get their $$ before it runs out - (Hello - it has already run out, so it will be borrowed). We don't seem to think anything thru anymore.

d.) Will my intervention unduly delay or prejudice an existing party - anything short of rubber stamping this project is considered undue delay to BFWE. "Unjust prejudice"- BFWE seems to have that covered where OPSB is concerned. There should be some balance to address concerns of the 400 plus

residences who do not hold contracts. Therefore, I again request that the board allow intervener status for any and all hearings on this case, to Karel Davis, as well as any other person who has requested the ability to stand before the board and present the other side of this issue.

I have enclosed a set of articles, written by an energy expert. When human logic demands that our direction is wrong, and experts in the industry cannot support wind as sound energy at this time, the Ohio Power Siting Board needs to reflect on its own mission statement as reason to fully scrutinize these projects. Please include these attachments in docketing my letter.

Respectfully,

Karel Davis

Karel A. Davis
6675 Champion Rd.
Shelby, OH 44875

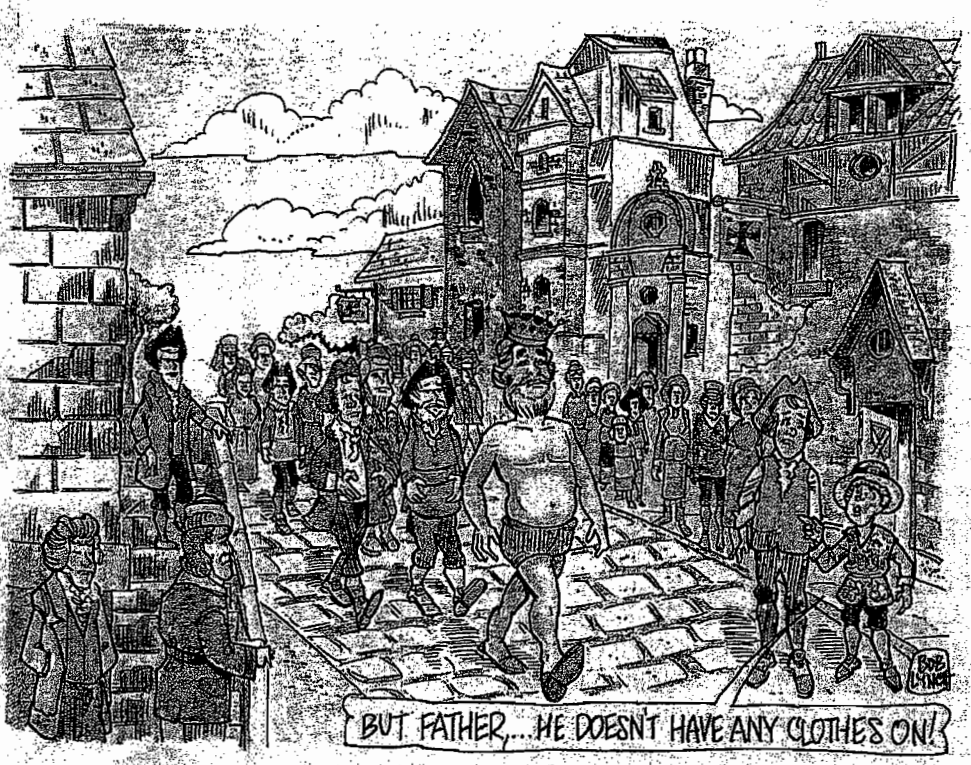
The Emperor's New Clothes

Part 1 — Evaluating Energy Policy Choices

by MARKUS I. BRYANT
General Manager

There is a charming fairytale by Hans Christian Anderson called *The Emperor's New Clothes.* This story illustrates several principles about the political process that I have learned over the years while lobbying various energy policy issues on behalf of electric cooperatives.

According to the story... many years ago there was an Emperor who was so excessively fond of new clothes, that he spent all his money on them. He cared nothing about his country or his people, except to show off his new clothes.



One day two swindlers came to the castle and told the Emperor they could weave the most beautiful materials imaginable. Not only were the material's colors and patterns unusually fine, but the clothes made from it had the peculiar quality of becoming invisible to every person who was either not fit for the government position they held, or was incredibly stupid.

The Emperor placed an order for a suit made from this wonderful cloth and in the bargain believed he would find out who were unfit for their positions in his kingdom. The two swindlers asked the Emperor for an advance in gold coins along with pure gold thread, and other fine silk and cotton threads. They set up shop with two looms and pretended to work night and day at them.

Being a bit nervous about whether even he would be able to see the cloth, the Emperor sent two of his trusted ministers each at separate times to see the cloth. Of course, neither would admit that they could not see the cloth, but praised it anyway. They carefully memorized the details about the cloth described by the swindlers, so they could repeat the information "correctly" back to the Emperor.

Finally, the great day arrived for the Emperor, who got dressed in the clothes he couldn't see, to lead a procession through the middle of town. Of course, all of the townspeople who had heard about the quality of the cloth, were wildly praising the Emperor's new clothes, afraid to admit they couldn't see them either.

"He doesn't have any clothes..."

Finally, a small child said: "But father, he doesn't have any clothes on!" This was whispered from person to person in the crowd until everyone was shouting the Emperor was wearing nothing. The Emperor heard the crowd, believed they were right, but held his head high and finished the procession.

The Emperor represents a government that is focused on the fashion or issue of the day as opposed to focusing on the long-term, real needs of the country and its people. Because of the competitive nature of the political process it is difficult for government to prioritize multiple issues and to act on more than one or two issues at a time. Often you will find politicians more worried about their appearance (polls) than results.

The two swindlers represent those organized to lobby the government. In real life, the vast majority of people involved in the political process are decent, honest people. The very few who are not, eventually get caught. However, it is critical to understand every

person involved in the political process comes with two pieces of baggage: 1) a set of beliefs (political, religious, environmental, etc.), and 2) a set of economic interests.

These beliefs and economic interests always affect how people present (spin) their message to their elected representatives. The entire political process can be seen as an effort to accommodate the beliefs and interests of various members of our society, which are often in serious conflict with each other.

The government ministers are well intentioned and want to be effective. However, they have a self interest (keeping their jobs) and also are vulnerable to being swept along by the issue of the day. This can render them ineffective in their jobs when they ignore the real facts in front of them, rather than risk sounding "politically incorrect."

The people also can be swept up by the issue of the day and may even buy into the "politically correct" view for a time. Ultimately, the people get it right! Usually, it starts out with a few (the small child) seeing the facts as they are. Then the process of networking begins and everyone (or at least the majority) sees the truth as it is, not as someone wishes them to see it. That is why it is critical for the majority of voters to inform themselves about issues that affect them and then participate in the political process.

In the future

In future articles/editorials I plan to discuss various aspects of today's energy policy debate such as climate change legislation, the economics of solar and wind generation versus coal, gas and nuclear generation, the drive to modernize the transmission grid, etc. My goal will be to try to look at and analyze the issues with an objective view like the child in the story. Hopefully, we will have some fun while informing you about energy issues affecting your cooperative and ultimately the electric rates you pay by putting some real "clothes" on these issues.

I freely admit to also having a set of beliefs and economic interests while addressing these issues, especially those affecting the cooperative. However, I also will employ a four-part yardstick in my analysis: is it Affordable, Reliable, Fair and Achievable?

Importance of Reliable Electricity

Figure A

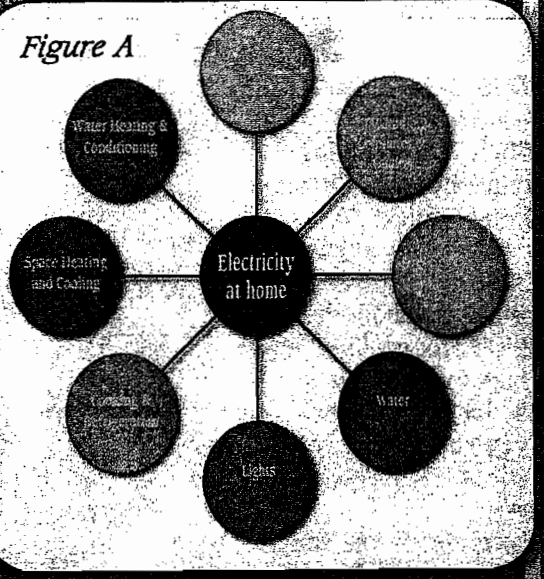
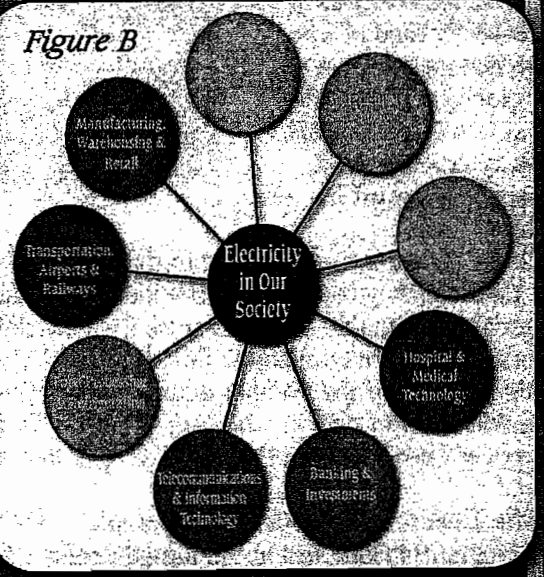


Figure B



Affordable – Is the proposal affordable? Not every proposed idea is affordable or even worth the investment. The issue of affordability is one your cooperative takes very seriously.

Reliable – Will the proposal result in maintaining or improving the reliability of the electric system? Figures A and B illustrate the critical importance of electricity to running our homes and powering our society. The electric grid is said to be the largest and most sophisticated machine ever built by man over the last two centuries. It needs to be maintained and updated to safeguard the reliable distribution of electricity. Is it too much to ask the people who built and maintain the grid for advice on what is achievable, affordable, and won't erode reliability before the government forces changes that could disrupt it?

Fair – Is the legislative proposal "fair" to all parties, especially electric cooperative members? Please note that fairness is often determined in the eye of the beholder.

Achievable – Can the proposal even be implemented in the proposed time frame? Electric utilities are often tasked with various mandates. Nevertheless, the electric industry is based on well established science, despite the wishful thinking of how others believe the electric industry ought to operate.

The EMPEROR'S NEW CLOTHES

by Markus I. Bryant
General Manager

Part 2 — The "uncertainties" of science

Borrowing a title from from author Hans Christian Anderson, General Manager Markus Bryant is writing a series of columns called "The Emperor's New Clothes" because not everything in the world of electricity is as it is portrayed in the media and in Washington. This is the second part of the series.

Have you noticed the Statue of Liberty is destroyed in almost every disaster movie involving New York City? In the 1970s I remember seeing Lady Liberty facing a bulldozing glacier due to the "Coming Ice Age." Today's threat to Lady Liberty is drowning from rising sea levels caused by global "warming" melting the ice caps.

Time magazine had a global "cooling" article in 1974, *Newsweek* magazine in 1975 and *National Geographic* in 1976. Some of the global "warming" alarmists today were "cooling" alarmists in the 1970s. I find it amazing that some of those who attack global "warming" skeptics as "deniers" have websites denying that global "cooling" was ever a serious theory proposed by scientists. The magazines got their global "cooling" stories from scientists in the 1970s, just like their global "warming" stories in the 1990s.

Since I've acquired a few grey hairs, I appreciate a quote from the German poet and scientist Johann Goethe (1749-1832), who said, "He who cannot draw on 3,000 years is living from hand to mouth." In other words, if you don't have the perspective of the acquired wisdom of at least the last 3,000 years, then you are living an impoverished life. Without that perspective you will be dependent on whatever someone else tells you to believe.

When discussing the "uncertainties" of science, I must state the obvious. I am not a climate scientist. However, I have had a love for science since my youth. I have taken courses in earth science, biology, chemistry and physics and have tried to keep up-to-date by reading books and articles. More importantly, I was trained by my father and by education to read, study and think for myself.

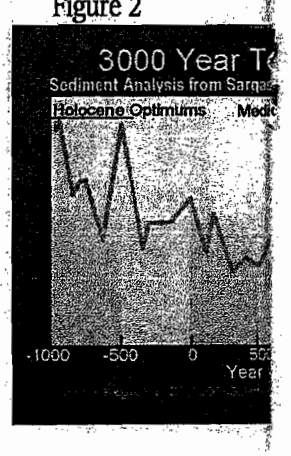
Where's the proof?

Figure 1

Using the premise of these "Emperor' New Clothes" columns, I've concluded the global warming theory doesn't have enough "clothes" to justify a "planetary emergency" requiring drastic slashing of carbon emissions as proposed by former Vice President Al Gore. We have real problems to solve such as providing abundant and affordable power, increasing the capacity and reliability of the transmission grid, and developing affordable alternative energy sources while maintaining a clean environment. We also may need to adjust as the natural climate change cycles occur, just as human beings always have done.

We need to take the necessary time to carefully think through and debate our energy policy choices.

Figure 2



What have we learned from history?

Climate change is a normal earth process. It occurs naturally — both warming and cooling — and the many changes since the last ice age occurred before humans began burning fossil fuels in the Industrial Revolution.

Figure 1 shows the glacial deposits

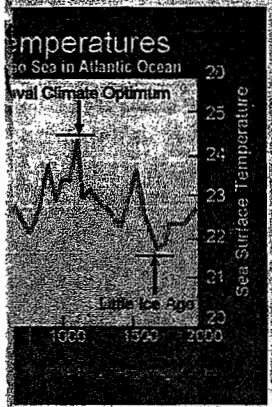
in Ohio. The green areas are sediments deposited directly by the glacier. About 18,000 years ago the North American ice sheet reached its maximum extent in southwest Ohio and had a depth of 8,000 to 10,000 feet. So your cooperative's entire service area was under 1 to 2 miles of ice until the climate warmed enough to start melting the ice 10- to 11,000 years ago. This ice melting led to rising sea levels around the world. Archeology shows some coastal settlements were submerged and people relocated. This warming set the stage for the advancement of human civilization.

Hundreds of studies using ice cores, pollen sedimentation, tree rings, etc. from all over the earth have shown there was a major cooling of the earth in the 1700s and 1800s when it was well over 1 degree Centigrade cooler than it is today. The theory is so well established it is called the Little Ice Age (Figure 2). It was accompanied by very cold winters (the Thames River in London and the canals of Holland froze over every year), famine and outbreaks of plagues. Scientists discovered that during that period of time the sun was very inactive, which seems to be the real driving force for climate change on the earth. The warming seen today may be nothing more than the recovery from this Little Ice Age.

Before the Little Ice Age, research has shown in the last 3,000 years there were two major warming periods: the Medieval Climate Optimum and the Holocene Optimum, when it was 1.5-3 degrees Centigrade warmer than it is today. This was followed by an extended cold period known by historians as the Greek Dark Ages (1100 to 750 B.C.). The Classical Greek civilization rose along with the rising temperatures of the second Holocene Optimum.


Ohio Geological Survey

The growth and prosperity of the Roman Empire coincided with a much warmer climate known as the Roman Warming, when it was so much warmer than today that wine grapes and citrus trees grew in England as far north as Hadrian's Wall. Temperatures during the heyday of the Roman Empire were warmer than today's allegedly "unprecedented" global warming. The collapse of the Roman Empire also coincided with a sharp drop in global temperatures that led to a long, bitter cold spell known as the Dark Ages. It was so cold in the Dark Ages that food production plunged along with temperatures. Plagues and pandemics plus malnutrition sharply reduced human population.



The Vikings colonized Greenland during the Medieval Climate Optimum when they could actually grow crops on Greenland. By the 1400s, Greenland had become so cold these colonies had to be abandoned.

Why isn't there consensus?

Nobody disputes climate change; history proves it occurs. What is not "settled," despite political and media propaganda to the contrary, is the theory all of the warming since the Industrial Revolution began (or the Little Ice Age ended) is caused by the burning of fossil fuels releasing greenhouse gases like carbon dioxide or CO_2.

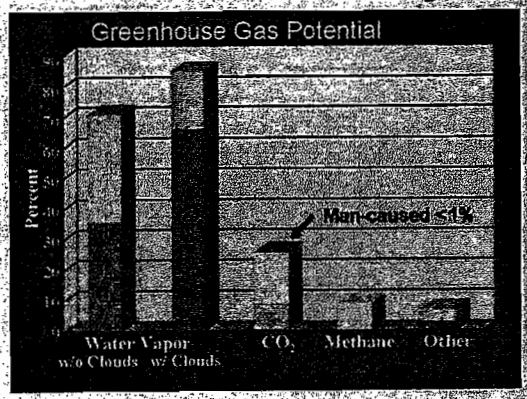
There is a 255-page report on the U.S. Senate Environment and Public Works Committee Minority website with over 700 international scientists who dissent from the "consensus" of man-made global warming. Their detractors have labeled them as "deniers." Remember, some of the greatest minds in science such as Copernicus, Galileo, Newton, Tesla and Einstein were all opposed for daring to go against the scientific and/or sometimes political "consensus" of their day.

CO_2 as a greenhouse gas

Annual carbon emissions from burning fossil fuels accounts for about 3 percent, or 7 billion metric tons, of a total 210 billion metric tons CO_2 emissions worldwide. Let's also put CO_2 in perspective with other greenhouse gases (Figure 3). People are not often told that the most powerful greenhouse gas is water vapor, especially in the form of clouds. Less than 1 percent of the greenhouse gas potential comes from human activity. Yet all the global warming is supposed to be attributed to it. Water vapor plays a huge role in keeping the earth warm; it is 70 times more powerful than the CO_2 emitted by human activity. When clouds are added, CO_2 becomes even less important. However, clouds not only trap heat, but at low elevation clouds also reflect much of the incoming solar radiation, so the sun's heat never reaches the earth's surface, which cools the earth. A growing number of scientists believe this is one of the primary mechanisms warming and cooling the earth.

As atmospheric CO_2 concentrations rise, it becomes increasingly difficult for additional CO_2 molecules to further increase the greenhouse effect, because the relationship is not linear. By the time atmospheric CO_2 reaches modern-day levels of 380 ppm, additional CO_2 has an extremely small effect. Therefore, the CO_2 global warming theory is not based on a direct cause-and-effect relationship. Instead, the theory assumes an indirect relationship based on the belief that additional CO_2 causes a positive "feedback" effect involving cloud formation. Actual measurements are showing this warming is not occurring as predicted by the global warming model's assumptions, which then casts serious doubts on the theory.

Figure 3



Source figures 2 & 3: http://www.globalwarmingclassroom.info/index.htm

The EMPEROR'S NEW CLOTHES

by: Markus I. Bryant
General Manager

Part 3 — Power shortage on the horizon

ELECTRICITY IS THE BACKBONE OF the American energy system, providing 3.87 trillion kilowatt-hours (kWh) of power to U.S. homes, businesses and industries in 2008. That's a staggering number. As the economy grows and the U.S. population increases, the U.S. Department of Energy (DOE) forecasts we will reach 5 trillion kWhs by 2035. That's nearly 30 percent growth.

Looking at the other side of the coin — generating capacity — you'll see why Uncle Sam is being asked, "Where's the Juice?" According to the DOE, the U.S. had 979.5 gigawatts (GW = 1 billion watts) of electric generating capacity in 2008. Roughly one-third of our generating capacity is coal-based and produces about one-half of our nation's electricity. About 11 percent of our generating capacity comes from nuclear power.

The DOE is forecasting the total generating capacity will increase 16 percent by 2035. The question is will that be enough to satisfy the projected 30 percent increase in overall electric use?

If you are wondering whether you should be concerned about the mismatch in growth rates — you should be!

In the electric industry, the number one rule for maintaining service reliability is to make sure adequate generation is available when called upon by the customers.

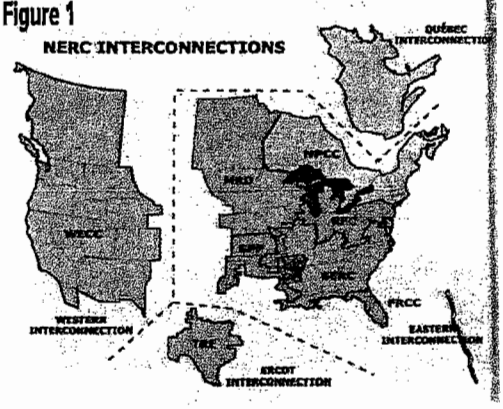
However, industry underinvestment in new generation combined with government policies is causing a power shortage to loom on the horizon. To avoid this shortage, we must first recognize the danger and then take steps to avoid it.

Industry warning lights are flashing

The North American Electric Reliability Corporation (NERC) is an international regulatory body authorized by the U.S. and Canadian governments to evaluate the generation reliability of the North American power systems and is empowered to enforce reliability standards. NERC is divided into eight regional areas as shown in Figure 1. Ohio is in the area labeled RFC, or the Reliability First Corporation.

When assessing generation reliability, it is necessary to maintain an adequate Reserve Margin of generation sources that can be called upon in emergencies, such as when a power plant fails and goes off-line, or a tornado or ice storm takes out a transmission line, which prevents a generator from putting power on the grid. Based upon many years of experience, the NERC has adopted a 15 percent Reserve Margin Standard, which means that generating resources available should exceed the highest projected peak consumer demand by 15 per-

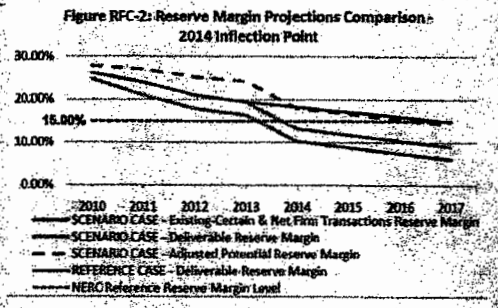
Figure 1
NERC INTERCONNECTIONS



cent. So, the best-case planning scenario is that 15 percent of the RFC region's generators could go off-line and the grid still maintain stable power delivery.

Figure 2 summarizes the 2009 forecast for the RFC region's reserve margin under several assumptions. Note that all the lines show for 2010 a mid-20 percent Reserve Margin, which is 4 percent higher than the 2008 forecast. This 4 percent represents the drop in power demand due to the recent recession. The three scenarios assume the region's economy fully recovers and starts growing rapidly by 2014. The green existing resources line drops below the 15 percent Reserve Margin by 2013-14. The red dashed line represents adjustments for all known additional generation that might be available, but still goes below the 15 percent Reserve Margin by 2017. Six years is like "tomorrow" in the electric industry when it takes 5 to 15 years to secure permits and build a power plant.

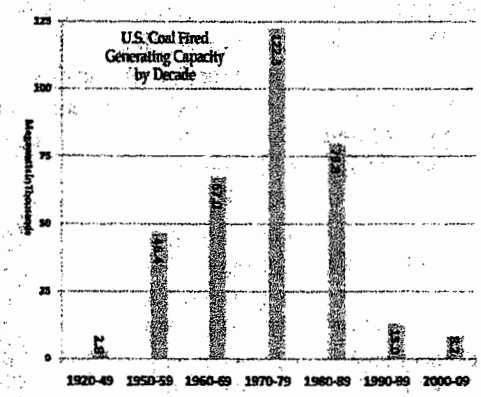
Figure 2



Government is accelerating time line

The age distribution of the U.S. coal generation fleet is illustrated in Figure 3. Some of these plants are approaching the end of their useful lives. Replacement generation must be built in addition to building the new electric generation needed for the growing U.S. electricity demand. The Ohio cooperatives' coal-fired plants were built in 1955, 1967 and 1978. These plants have been well maintained to avoid the reduced operating performance that often accompanies a power plant as it ages. In fact, the cooperatives have spent well over $1.5 billion since 2000 adding additional generating capacity and retrofitting our coal plants with the best available technology to meet federal standards for sulfur dioxide, nitrous oxide and mercury emission controls. The cooperatives will complete these projects by 2013-14, while much of the electric industry has not really started making these improvements. These improvements will add at least 30 to 40 years to the useful life of the Ohio cooperatives' plants.

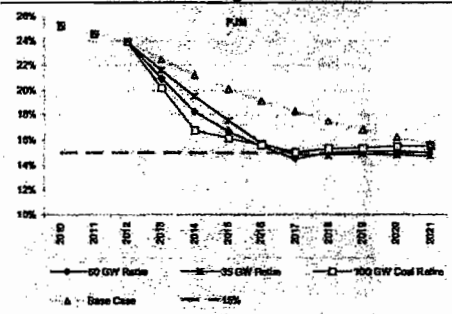
Figure 3



Recent proposed changes in EPA regulations are causing many utilities to consider shutting down older, less efficient plants rather than make significant upgrades to meet the new EPA regulations. Over the past decade, less than 30 gigawatts of power plants have been retired in North America. Some analysts believe retirements could double over the next 10 years, mainly from coal plants. How would this affect grid reliability?

The research department of a large international bank, CREDIT SUISSE, issued a September 2010 report "Impact of EPA Rules on Power Markets." Figure 4 shows its analysis of the Reserve Margins in the NERC RFC region if 35, 60 or 100 GW of coal generation is retired. Note that all three scenarios cause the RFC Reserve Margins to fall below 15 percent by 2017. Note also that the economic growth scenario of lower Reserve Margins impact discussed earlier would be in addition to the lower Reserve Margins, caused by coal plant retirements, possibly pushing it below 10 percent! CREDIT SUISSE reports this is good news for investors, since tight power supplies means higher prices and higher profits for investors in private power companies. The good news is the Ohio cooperatives own their power plants, which means our members are shielded from the price volatility of the electricity market. We also do not need any additional generating resources before 2025, which means we can keep our rates lower by selling excess power into a "tighter" market.

Figure 4



What should we do?

Clearly, the electric industry must build new electric power generation. Unfortunately, our country is at a political impasse as to what kind to build. Meanwhile, generation reliability Reserve Margins are falling as U.S. electric demand continues to grow, older plants are retired and not enough new plants are being built. Even though the Ohio cooperatives have done a good job meeting our members' future power needs, we are not islands. If the RFC grid has problems, then we can be adversely affected.

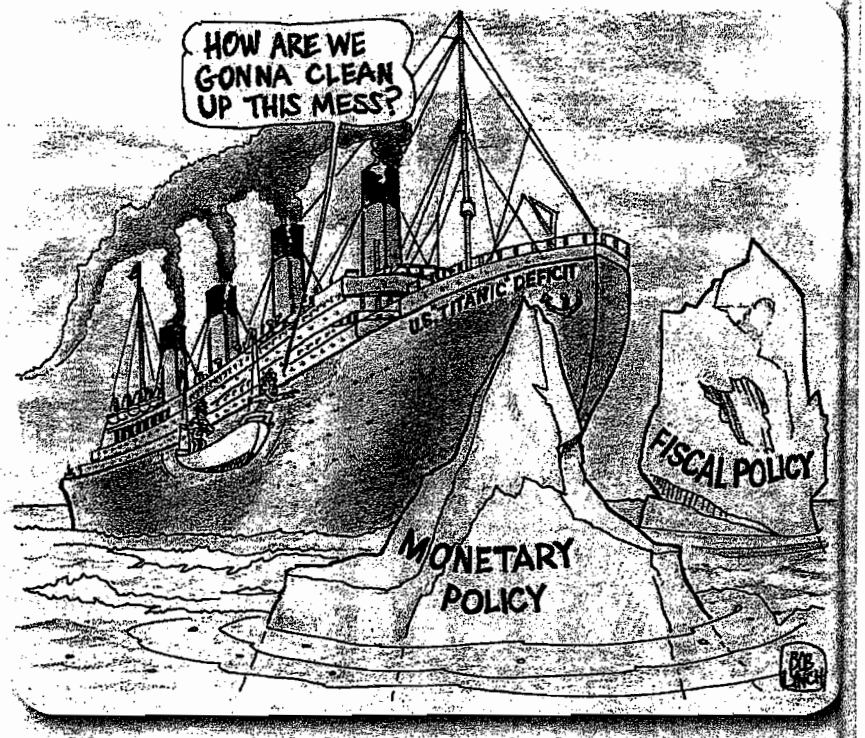
Before the next large black-out occurs, perhaps we should urge Congress to ask the electric utility industry engineers for realistic, affordable solutions to keep the lights on. Future editorials will begin discussing the pros and cons of some of the solutions available.

Sources:
[illegible] 2010 Special Reliability Scenario Assessment, Aug. 2010, p. 14
[illegible] 2010 Special Reliability Scenario Assessment, Aug. 2010, p. 36
[illegible] U.S. Coal Plants, Data: http://www.sourcewatch.org
[illegible] CREDIT SUISSE Growth from Substitution, 23, Sept. 2010, p. 13

The EMPEROR'S NEW CLOTHES

by: Markus I. Bryant
General Manager

BORROWING A TITLE FROM AUTHOR HANS CHRISTIAN ANDERSON, GENERAL MANAGER MARKUS BRYANT IS WRITING A SERIES OF COLUMNS CALLED "THE EMPEROR'S NEW CLOTHES" BECAUSE NOT EVERYTHING IN THE WORLD OF ELECTRICITY IS AS IT IS PORTRAYED IN THE MEDIA AND IN WASHINGTON.



Part 4 – S.O.S. to new Congress "We're all on the same ship"

By the time you read this, the new Congress will soon be sworn in on Jan. 3, 2011. It is my hope they work together to grow the economy with a wise fiscal policy of government expenditures and revenue collection (taxes).

Under the U.S. Constitution, Congress is also responsible for monetary policy to control the supply of money. However, Congress delegated this responsibility to a privately owned central banking system under the 1913 Federal Reserve Act. Today, the Federal Reserve system regulates the supply of money and targets interest rates to control inflation and to encourage employment. The decisions made by Congress and the Federal Reserve ultimately impact your cooperative's budgets.

Forecasting the 2011 budget

As I write this in mid-November, we are preparing the 2011 budget. Our annual operating budget is fairly straight forward to prepare since it deals with routine administrative, billing, collections, customer service and system maintenance functions. We have achieved significant economies of scale through our shared management and services federation with our partner Lorain-Medina Rural Electric Cooperative of Wellington. Twenty employees are shared by the two cooperatives.

The real challenge to forecast is our capital expenditure budget for new services, line upgrades and line replacements. The recession has led to a sharp drop in the number of new services as shown in the table to the left.

New Services

Year	Total
2005	103
2006	118
2007	81
2008	73
2009	47
2010 (Oct.)	35

We will optimistically budget for 50 new services in 2011. This drop in new services is a two-edged sword. Although we save $2,500–$4,000 per new service installation cost, we lose the additional 1,240 kilowatt-hours per month new revenue per service in our operating budget. The continuing drop in new services also means we will have limited need for line upgrades, unless a large consumer comes on line. Therefore, we anticipate mostly line replacement for 2011 and 2012. This work will be done with our own line crews. While completing work done with the large FEMA grant from the 2005 ice storm, we had two, six-man contract crews helping with line replacement in 2009.

As of the end of September 2010, North Central's utility plant was valued at $53 million, which is depreciated at a rate of 3 percent per year. That means we will need to budget at least $1.59 million in depreciation expense for 2011. In a perfect world of no inflation, the line replacement budget would equal our depreciation expense. However, as the following two figures shown at our recent district meetings illustrate, there is a built-in inflation factor in our annual capital budgets.

Figure 1 shows the miles of main feeder line installed per decade on our system. This 2010 system aging study will be used to develop a long-term system replacement plan to establish our capital budgets in future years. As you can see, approximately 240 of new or replacement line was added in the 1970s, 1980s and 1990s. The 2005 ice storm pushed the 2000-09 total well above average. A FEMA grant helped finance 75 percent of the replacement cost for 234 miles of damaged line.

Figure 1

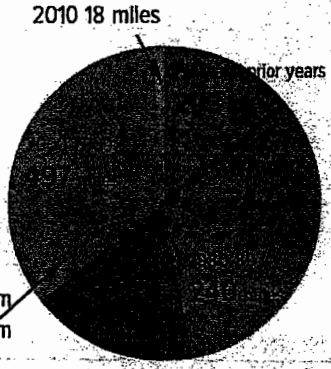
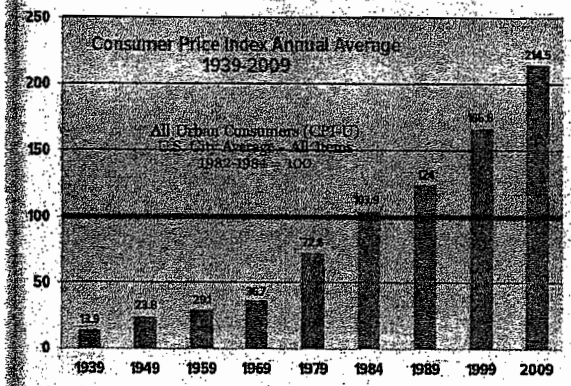


Figure 2 shows the consumer price index for the last year of each decade since your cooperative was formed. Note the graph is scaled to the years 1982-1984 = 100, which means what would have cost $100 in those years could be purchased for $29.10 in 1959 and for $214.50 in 2009. To understand the built-in inflation effect, simply note that line built in 1959 would cost 7.37 times more to replace in 2009 (i.e. 214.5 ÷ 29.1). Because of this inflation effect, we budget $2 to $3.5 million per year for line replacement instead of the lower annual depreciation amount.

Figure 2



Warning: Icebergs ahead

In addition to our annual capital budget, we prepare a 10-year financial forecast annually for board review. The last 10 years we have been pretty accurate assuming an inflation rate of 3 percent and long-term mortgage interest rates of 5 percent. Long-term interest rates and the inflation rate are heavily affected by fiscal policy and monetary policy at the federal level. However, they create the business environment in which we operate. My hope is we have good people in charge, especially at the Federal Reserve, but the indicators don't look good. There is great potential for higher interest rates reminiscent of the early 1980s.

Figure 3 shows the annual federal budget surplus or deficit since 1895. It is fair to say the budget hasn't just been driven into a ditch, it's fallen off a cliff. Congress needs to take this issue seriously, since it is not sustainable. The President's bi-partisan debt commission has issued its report. It's time to have a serious adult national discussion to turn this situation around. As it stands, not only our children, but our grandchildren will be stuck paying off this debt.

Figure 3

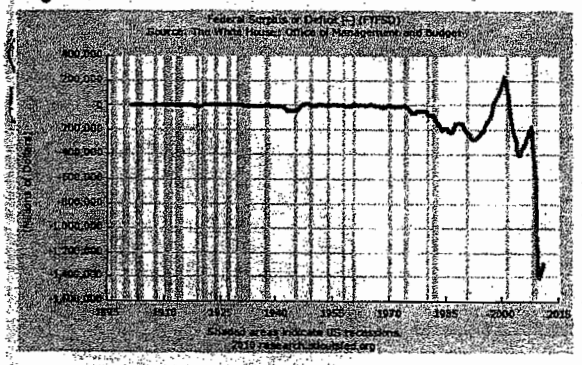
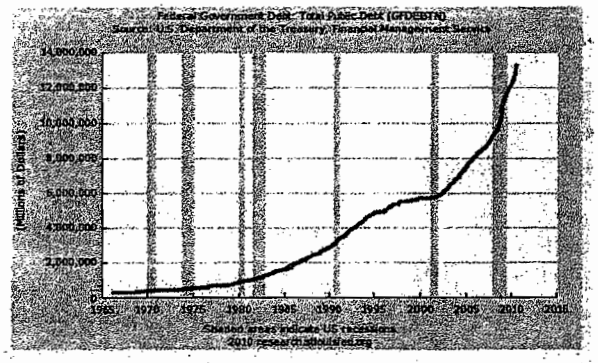


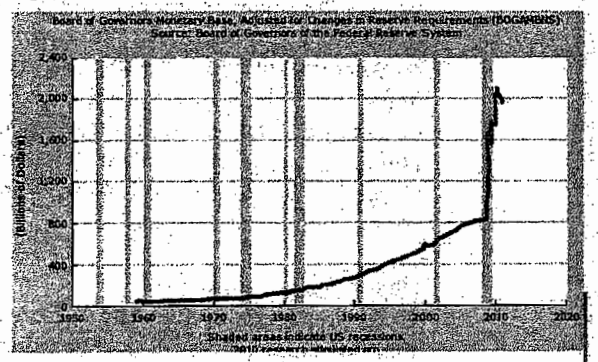
Figure 4 shows how the budget deficit is being financed with debt. Ultimately, government borrowing will compete for capital businesses need to invest to create new jobs, which will lead to higher interest rates even as the economy begins to climb out of this recession. Higher interest rates would have a dramatic impact on our operating budget.

Figure 4



Finally, and most ominously for me is Figure 5, which shows the Federal Reserve "created" $1 trillion dollars out of nothing to support the government's bailout and stimulus efforts. This is called "Quantitative Easing." Federal Reserve Chairman Ben Bernanke decided in early November to add another $600 billion to this chart. Folks, they don't need to print the money anymore, they just make an electronic checkbook entry! This is a serious "roll of the dice" by the Federal Reserve to spur economic growth. If it doesn't work, we will be seeing serious inflation and rising interest rates, which would result in higher electric rates.

Figure 5



This "money printing" looks bad to me because my mother's parents were shopkeepers in Germany during the 1920-1923 period of runaway German inflation. Their business almost failed. Their life savings were reduced to pennies of its previous value. They told us stories of how people on fixed incomes suffered real hunger, as food prices rose uncontrollably as much as five fold per week in the last half of 1923. My grandmother impressed upon me a saying, "The man who doesn't honor the penny is not worth the dollar." On the other hand, how do you value a dollar if after inflation it is not even worth a penny?

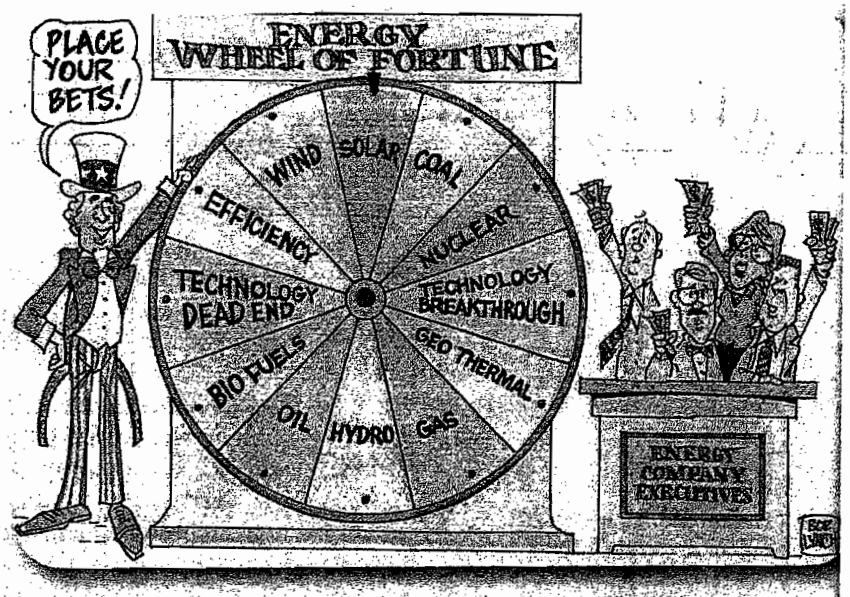
Unlike the Titanic, we can clearly see the 'icebergs' ahead. Let's hope Congress and the Federal Reserve steer us safely past. After all, we're all on the same ship.

Source:
Figure 2, 4 & 5 – Economic Research – Federal Reserve Bank of St. Louis, http://research.stlouisfed.org

The Emperor's New Clothes

by: Markus I. Bryant
General Manager

Part 5 — "Betting" on Energy Technology



Energy company executives tend to be conservative and see themselves as "investing" their company's money in energy projects rather than "gambling." Yet, investing and gambling do share two basic qualities: 1) an expected "payoff" or return on money and 2) the management of risk.

The management of utility investment risk today is preoccupied with the impact of government regulation. In the cartoon, Uncle Sam has his hand on the wheel. The government can pick winners or losers by "punishing" companies for investing in politically incorrect fuels such as coal and "rewarding" companies for investing in politically correct fuels such as wind or solar.

Presidential candidate Barack Obama was quoted in a Jan. 17, 2008, *San Francisco Chronicle* interview: "Under my plan of cap-and-trade, electricity rates would skyrocket." What was not reported from the same inteview is the following: "So if somebody wants to build a coal-powered plant, they can; it's just that it will bankrupt them because they're going to charge a huge sum for all that greenhouse gas that's being emitted. That will also generate billions of dollars that we can invest in solar, wind, biodiesel and other alternative energy approaches."

This quote should help our members understand why they, their board of trustees and the cooperative's management cannot afford to be neutral on energy policy. We don't need to be partisan, but we do need to let our elected officials know our position.

When evaluating the choice of fuel to meet our electricity needs, let's first look at U.S. fuel use history in Figure 1. Several observations can be made about this chart.

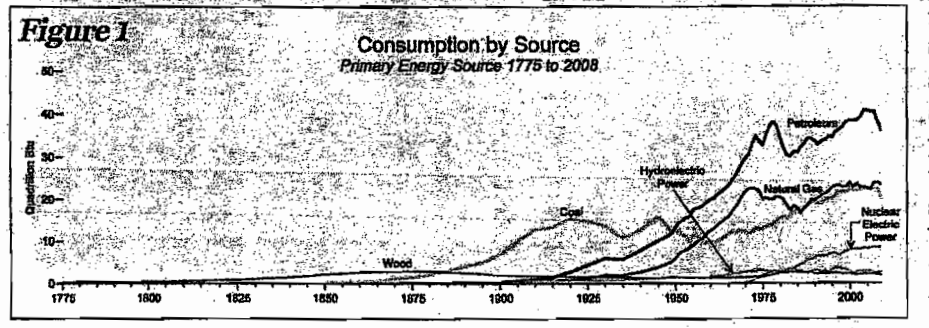
The first point is as a new fuel source is introduced, it never completely replaces the previous fuel. For example, we still use as much wood today for heating as in the early years of our country.

The second point is that although wood, coal, oil and natural gas have been used for heating buildings, their use has specialized around several technology applications. For example, wood is still used for space heating, especially in forested parts of the country. Coal is used as a boiler fuel by industry to create heat and electricity. Oil (and its derivatives) is used heavily by the transportation industry (ships, rail, trucks, airplanes and automobiles) because it is easily carried by the vehicle that uses oil for fuel. Natural gas is used for heating buildings, industrial process heating and electrical generation.

The third point is that basic energy technology innovation is a historically slow and intermittent process. Most of our power production technology was developed to power the industrial revolution. Alternative energy such as wind, solar and biofuels has been around in primitive forms for thousands of years. Nuclear power is the most recent commercial fuel technology advancement starting in the 1950s. Once a fuel technology arrives, the underlying technology does not change, rather it is refined and made more efficient as more commercial applications are found for it. That is why I believe any politician who claims an entire alternative energy industry can be built in five to 10 years (with or without government subsidies) is dreaming. The reality is more like 25 to 50 years, based on Figure 1.

The fourth point is energy technology represents a huge intergenerational infrastructure investment. One generation makes the investment to develop a technology, the next scales it up for mass use and the next fine-tunes the technology. Let's look at the Ohio cooperatives' investment in coal and gas plants. Even if we decided to shut them down in favor of another fuel, such as nuclear, it would take at least 10 to 15 years to build the new plant, and meanwhile the capital cost of 2 to 3 cents per kWh on the old plants would still need to be paid for the next 30 years. Yet there are many environmentalists who insist we do this, and instead of nuclear go with wind or solar technology. Utility exec-

Figure 1



utives are acutely aware that consumers only have so much money to spend, which is why utilities invest to generate the greatest return on capital and at the lowest cost of electricity.

When utility executives evaluate electric generation investments, they first consult with their engineers, who work with the established laws of physics, chemistry and engineering.

Figure 3 - Construction Costs

	Nuclear	New Coal	Combined Cycle Natural Gas	Peaking Natural Gas
Construction Cost ($/KW)	$6,000	$3,600	$1,800	$800
Fixed Charge Rate	15%	15%	15%	15%
Capacity Factor	85%	85%	60%	5%
Capital Cost ($/kWh)	$0.121	$0.073	$0.051	$0.274
Fuel Price ($/MMBTU)	$0.50	$2.30	$5.00	$5.00
Fuel Cost ($/kWh)	$0.005	$0.022	$0.038	$0.053
O & M Costs ($/kWh)	$0.030	$0.008	$0.006	$0.005
Total Cost of Electricity	$0.156	$0.102	$0.095	$0.331

Figure 2 is a table expressing the energy density of some materials in terms of megajoules of energy per kilogram. A megajoule (MJ) is 1 million joules, or about the kinetic energy of a 1-ton vehicle moving at 100 MPH. The point is if something has a high energy density, then less physical material will release the same amount of energy. Notice that uranium fission technology has different energy outputs based on how advanced the reactor technology is. There is always a trade-off among plant design investment costs, fuel density and delivered fuel price when designing a power plant. Fusion is the hoped for breakthrough technology due to its incredible energy density. After more than 50 years and billions in research money, fusion technology is still elusive.

So based on energy density, fuel availability and price, the electric industry has favored investment in nuclear, coal or natural gas generation. Figure 3 is a table showing a "very rough" cost estimate of building a new nuclear, coal or gas power plant, which illustrates additional issues to be considered. Obviously, construction cost per KW (or 1,000 watts) is a major issue, since for all choices the fixed charge is 15 percent, which represents depreciation, interest, taxes and insurance.

The capacity factor represents how much of the time the plant is expected to be operating. Coal and nuclear plants are designed to be "base load" or operated continuously. Peaking natural gas is operated during seasonal peak hours. Nuclear has the lowest fuel cost but the highest construction cost, while natural gas has the highest fuel cost but the lowest construction costs. Evaluating natural gas generation is quite sensitive to natural gas prices. About 30 percent of U.S. natural gas production is burned to produce 20 percent of U.S. electricity. A substantial increase in natural gas generation would have a major impact on the price per kWh, which is why coal is usually considered the more stable price option.

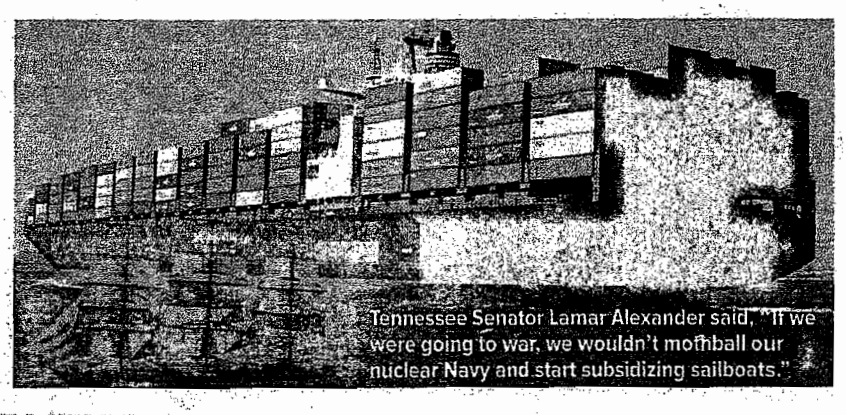
Finally, the utility needs to consider possible legislation and/or regulation. For example, if carbon capture and sequestration is legislated for new coal plants, then you need to add another 5 cents per kWh. In this case, investing in a new coal plant would have the same "payoff" as a new nuclear plant.

Next month, I will begin analyzing the wind power electricity generation option. Meanwhile, I will leave you with the adjacent picture and a quote from a U.S. senator during an energy policy debate.

Figure 2 - Energy Densities Table

Fuel/Technology	Specific energy (MJ/kg)
Deuterium-tritium fusion	576,000,000
Natural uranium in fast breeder reactor	86,000,000
Reactor-grade uranium	3,456,000
Natural uranium	443,000
Hydrogen gas	143
Natural gas	53.6
Diesel fuel	46.2
Biodiesel oil (vegetable oil)	42.20
Ethanol	30
Coal, bituminous	24
Methanol	19.7
Wood	18.0
Solar*	0.36 - 1.8

** I had to fudge a bit with the solar measurement. Solar energy is usually measured in MJ per square meter. It's hard to state solar energy in terms of mass (kg) when the density of solar energy is usually measured per square meter. I figured that solar energy expressed in mass is 2-10 percent of what you get from burning wood.*



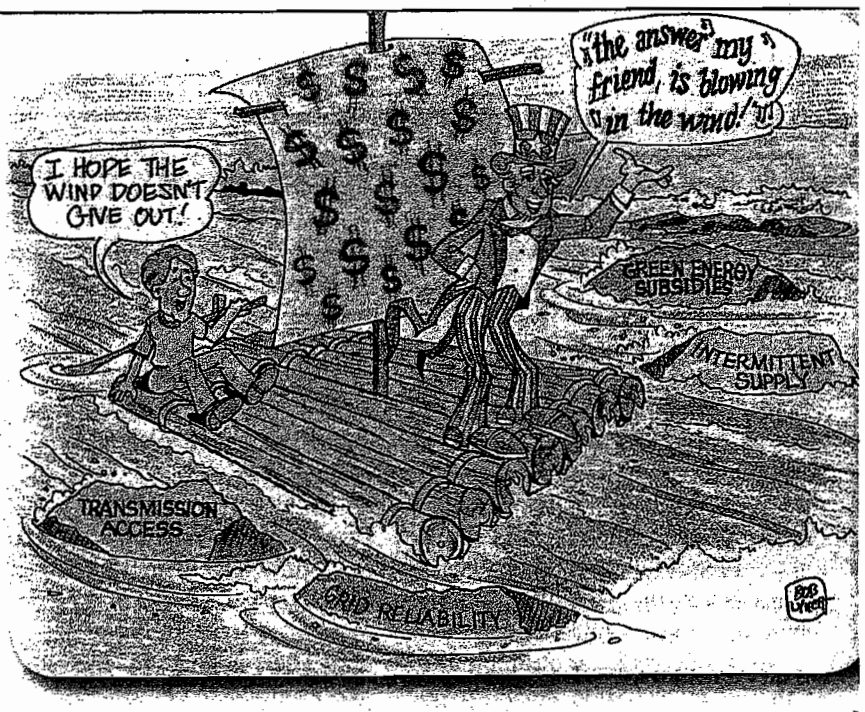
Tennessee Senator Lamar Alexander said, "If we were going to war, we wouldn't mothball our nuclear Navy and start subsidizing sailboats."

Sources: Figure 1 — "Energy Perspective," U.S. Energy Information Administration, Department of Energy; Annual Energy Review 2009; Figure 2 — "Energy Density" from Wikipedia; Fogure 3 — Buckeye Power, Dec. 21, 2010, "Rough Estimate"

The Emperor's New Clothes

by: Markus I. Bryant
General Manager

Part 6 — The Allure of Wind Power



Wind power has intersected my life three times. First, as a story from my childhood, secondly when I started my career in 1979 at an electric cooperative in Minnesota and today. In this and several future columns I will share my personal experiences, some basic information about the science and economics of wind power, and some opinions on the realistic role for wind power. Although wind power will be a part of the nation's energy mix, it is not the panacea for our energy needs claimed by some environmentalists and politicians and touted by some in the media. I believe wind power along with all other energy policies must be measured by the yardstick I discussed in my first column — see the *Country Living* section at www.ncelec.org: Is it Affordable, Reliable, Fair and Achievable?

Electricity's impact

Ever since my childhood, I have marveled at the role of electricity in our lives. When my family homesteaded in Alaska in the late 1950s and early 1960s, we lived without electricity for about two years. The appliances, TV and stereo were stored behind a curtain hung in one corner of what we affectionately called the "shack," which my mom and dad built by themselves. We used a wood cooking range for cooking, for heating water for laundry and baths, for heating the irons for ironing, and for heating in the winter time. The extent of our indoor plumbing (until we had electricity to operate a pump) was the hand pump over the sink. (My dad, pushing 50, drove the well point and well pipe with a sledge hammer into the water table about 20 feet below.) We weren't Amish! My dad, born in 1910, was simply applying what he learned growing up in rural Nebraska to parents who also had been homesteaders.

Wind power versus central station electricity

What does this have to do with wind power? My dad told us stories about the wind generators some of the more "well-to-do" installed on their farms. The most well known was the Jacobs machine, which came "complete" with a battery storage back-up power system. It was the first wind generator to be designed with three airfoil shaped blades, which is still the most common design today. Dad stressed that although they were better than having no electricity, they were expensive and required a lot of maintenance of the wind machine, tower and battery system. In addition, the amount of electricity you could use was limited by the size of your wind generator.

Development of wind power came to a standstill in the 1930s with the spread of the rural electrification program. Dad always revered the great Nebraska Senator George William Norris, who sponsored the 1936 Rural Electrification Act in the U.S. Senate and is also considered the father of the Tennessee Valley Authority, or TVA. Local electric cooperatives such as North Central extended electric lines financed by the REA, or the Rural Electrification Administration. Those who had wind generators took them down in favor of the more convenient, abundant and cheaper central station electricity supplied by the cooperatives. This created a revolution in energy use throughout rural America.

I vividly remember our homestead life improving after the Matanuska Electric Association in Wasilla, Alaska, extended power to our home. We could once again use our appliances, have running water and read by electric light instead of the Coleman kerosene lantern. I was especially thankful as a kid for running water. It led to the installation of a septic system and a flush toilet. Previously, the choice at night and especially in winter, was the outhouse (tricky with a flashlight or lantern) or the chamber pot. Guess whose chore it was to empty that one? Eventually, my parents built a small country store. Now that he had electricity, dad built a walk-in cooler to go along with his meat-cutting equipment. Electricity provided economic opportunity for my parents in Alaska, just like it did in rural Ohio with the REA cooperatives.

Now, as I'm accumulating a "few" gray hairs, I'm probably one of the few electric cooperative managers still working in the industry who have actually lived

without electricity and personally witnessed its transformational power. Consequently, if I seem a bit skeptical at times, then I ask your forgiveness for being cautious about embracing alternatives to an electric system that has worked so well.

Wind blowing again

I started working in the electric industry in February 1979 at Todd-Wadena Electric Cooperative in Minnesota. This coincided with the Iranian Revolution. The Shah of Iran left in January 1979 along with most of the foreign skilled oil field workers. Iranian oil production collapsed, which led to the second Mideast oil shortage crisis. In the summer of 1979 President Carter outlined in a July 15th speech (also my birthday) plans to reduce oil imports by promoting energy efficiency, solar power, wind power and alternative fuels. Sound familiar? We did have a few members install wind generators, but after a time they faded away due to cost and maintenance issues. In some parts of the country, large utility-scale wind farms were built. These fared better due to better economics based on "economy of scale."

Thirdly, wind power has been resurrected again the past two decades for three main reasons: 1) the goal of "energy independence," 2) fears about fossil fuel CO_2 emissions driving "global warming" (discussed in my second column — see the *Country Living* section at www.ncelec.org) and 3) heavy government subsidies. At least this time around, the wind generator materials and control technology are superior to the last two waves of wind power.

Invest where the wind blows

Wind power is not free, just like coal, oil, gas and nuclear fission. All of these energy sources start out "free" in the air or buried in the ground. What costs money is the labor, equipment and financial resources needed to extract useful energy from them. So wind is not free, no more than any other source of energy.

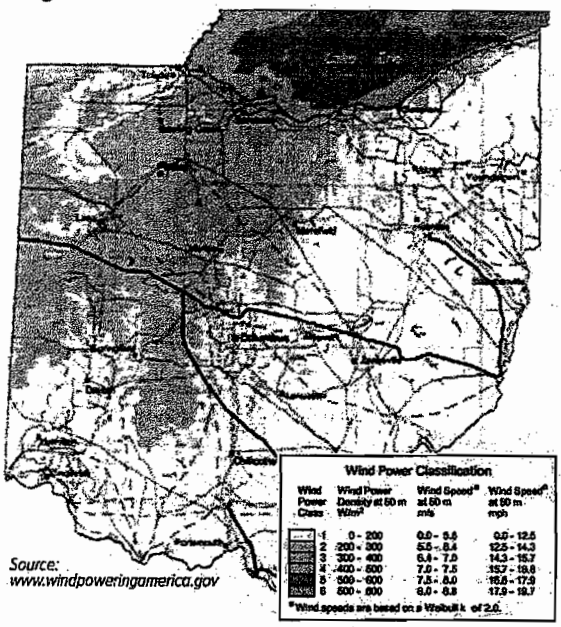
The most important consideration for locating a wind generator is, "Does the wind blow hard and consistently enough at a proposed site to economically justify making the investment?" The Electric Power Research Institute, or EPRI, is the research arm of the electric industry. At an August 2010 meeting, the role that wind power could play in the U.S. energy mix was discussed. After all, if the electric industry is mandated to develop wind power, as it is in some states, then we have to find a way to make it work as affordably and reliability as possible. EPRI presented the map in Figure 1, which showed wind had "huge near-term potential, but uneven regional distribution." Future columns will explain why this is really a qualified and cautious assessment.

The map was based on actual hourly meteorological data from 1977 to 2008. A study simulated output for a typical commercial wind turbine (80 meters in height, and 1.5 MW maximum output). The study identified 5,300-plus "utility-scale" sites with a 100 MW site minimum and a "reasonable" distance to the transmission grid. Note that most of the best sites are west of Ohio, with the exception of Lake Erie as shown in Figure 2. I think you can see why Buckeye Power participated in the 30-megawatt Story County Wind Project in central Iowa rather than a project in Ohio.

To be continued ...

Figure 1 — United States - Wind Power

Figure 2 — Ohio - 50m Wind Power



Source: www.windpoweringamerica.gov

by: Markus I. Bryant
General Manager

PART 7 – WIND POWER ECONOMICS & OPERATION

In last month's column, I introduced a wind generation study by the Electric Power Research Institute, or EPRI. The study simulated output for a typical commercial wind turbine — 80 meters in height and 1.5 MW (1 MW = 1 million watts) maximum output.

Figure 1 is taken from a General Electric (GE) Company online brochure for a 1.5 MW turbine. The chart shows why it is critical to locate wind generators where the wind consistently blows the strongest, which we noted last month is in the central region of the USA and west of Ohio with the exception of Lake Erie.

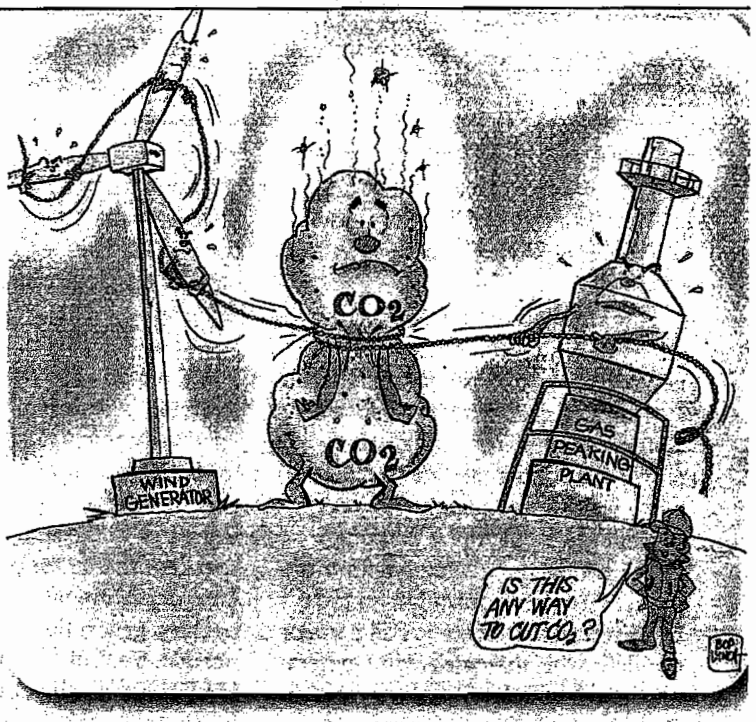
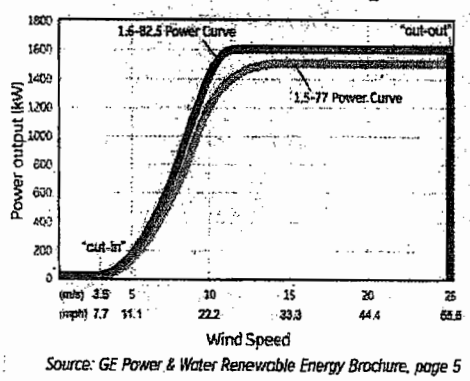


Figure 1 shows the power output curve for GE turbines at various wind speeds, which the brochure listed in meters/second(m/s) and which I converted to miles per hour (mph). Note there are two curves on the graph — one for a 1.5 MW generator with a 77-meter rotor diameter and one for a 1.6 MW generator with an 82.5-meter rotor diameter. The brochure states the 1.5 MW model can be mounted at a rotor hub height of 65 to 80 meters and the 1.6 MW model can be mounted at 80 to 100 meters. (Note: 1 meter converts to 3.281 feet.)

The reason for different hub-mounting heights is average air speed increases with height and may vary with local terrain influences on wind flow. One size tower will not fit every field situation. Note also the 5.5-meter increase in the rotor diameter needed to generate an additional .1 MW of power. In other words a 7.1 percent increase in rotor diameter gives you a 6.7 percent increase in power output.

This is the reason why I support utility-scale wind generators over "home size" systems. The low energy density of wind requires that a wind generator be built with a large enough rotor diameter and a tall enough tower and sufficient wind for a wind project to be physically and economically viable.

Figure 1 — Turbine Power Output



Source: GE Power & Water Renewable Energy Brochure, page 5

Figure 1 shows that power output varies with wind speed. Note these GE machines, even if the rotor blades are turning, don't generate any power until the wind speed exceeds 7 mph. This is the point where the generator "cuts in" to produce power. The wind generator reaches 50 percent of its output when wind speed is between 17 and 18 mph. Maximum power output occurs when wind speed exceeds 24 mph. When wind speed exceeds 55 mph, the wind generator "cuts out" and quits producing power. This is a safety feature to protect the wind generator from being destroyed by excessive wind.

Reliability of wind?

The key issue is this model of generator only generates 100 percent of its nameplate power output at sustained winds between 24 and 55 mph. This is typical of all commercial wind generators and is why average wind speed is so critical to the economics of wind power. The red, purple and blue areas of last month's wind power map show there is sufficient average wind speed 40 to 60 percent of the time over Lake Erie compared to 20 to 25 percent in the very best non-Lake Erie wind areas of Ohio. This also means an Ohio wind project will produce power at a significantly higher cost than one in a better average wind speed state. For example, our power supplier, Buckeye Power, is paying about 8 cents per kWh for the Story County, Iowa, wind project versus 12-plus cents per kWh estimated from an Ohio project.

This leads to another interesting political issue. Ohio investor-owned utilities have wholesale power costs in the 6 to 8 cents/kWh range. Buckeye Power has a 6.2 cents per kWh power cost, projected to rise to about 7.2 cents per kWh when the last coal plant scrubbers are installed in 2013. The IOUs are installing scrubbers on their coal plants or shutting them down. The IOUs are also mandated by Ohio law to generate some of their power from renewables like wind power. Eight-cent wind power from Iowa might not have a big impact on electric rates, but 12-plus cents per kWh for Ohio wind power will have an

over

impact. One might argue that 12 cents per kWh wind power looks good compared to the 9.5 cents per kWh combined cycle natural gas, 10.2 cents coal and 15.6 cents nuclear power costs estimated from newly constructed power plants in Part 5 of this series.

A major operating issue is the variability of wind power output. Wind power is intermittent, not firm power such as gas, coal or nuclear power. Note again in Figure 1 that wind power output doubled (.8 to 1.6 MW) when wind speed increased by 33 percent (18 to 24 mph). Although better and faster voltage synchronization equipment is installed on today's wind generators, there is still a major problem with matching wind generator output with load on the grid due to wild swings in wind speed and thus power output.

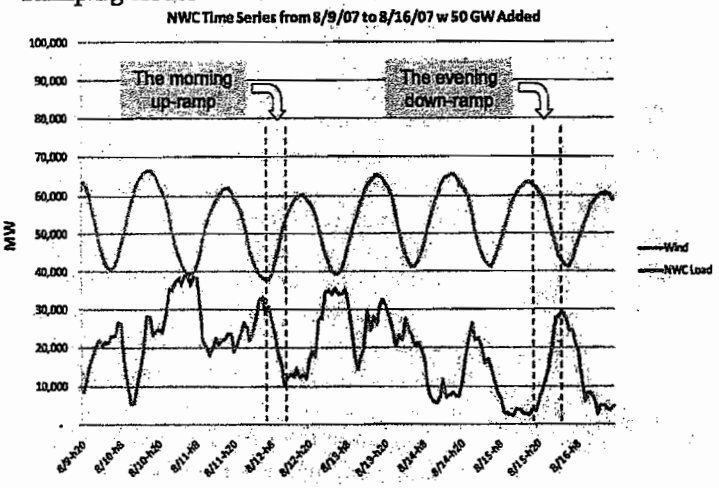
The EPRI study looked at the wind data for the best wind states of North and South Dakota, Minnesota, Nebraska, Iowa, Kansas and Missouri. They referred to these states as the NW-Central Region, or NWC. The study looked at building 50 GW (1 GW = 1 billion watts) of wind generation to supply the region's power needs.

Figure 2 looks at how this 50 GW of wind generation would synchronize with the NWC region's load during the winter days of Feb. 28, 2007, to March 7, 2007. Roughly one-third of the time the wind generation output, or blue line, exceeded what the grid needed to meet load represented by the red line. The rest of the time wind provides less than the region's power needs and sometimes as little as 10 percent of the 50 GW nameplate wind generation capacity.

Figure 3 looks at NWC region load versus wind generation for the summer months. First, note that the region's load is greater in the summer months, so some kind of additional peaking generation is needed. Second, we have the same kind of wind power output variability issues as we saw in Figure 2. Thirdly, we see another problem called "ramping." Note that as the morning electric load (red line) increases, the wind power output (blue line) decreases. Then in the evening as load decreases, wind power output increases. Therefore, wind generation output tends to be opposite to the region's electric load. The same issues for the NWC region would apply to Ohio.

This leads to the major operating and economic issue about wind power. Although the existing power grid can live with a 15 percent reserve margin (see Part 3 of this series), wind power must be backed up by almost 100 percent of other generation when the wind fails. In most cases this is gas peaking generation and in some cases coal. This means the true cost of relying on wind generation must also include the cost of a parallel back-up generation system to maintain a continuous supply of electricity to meet the load when the wind fails. The practical effect of this is wind can only supplement, not replace our current generating system.

Figure 3 — Anti-correlation of Wind with Load Creates Ramping Issues



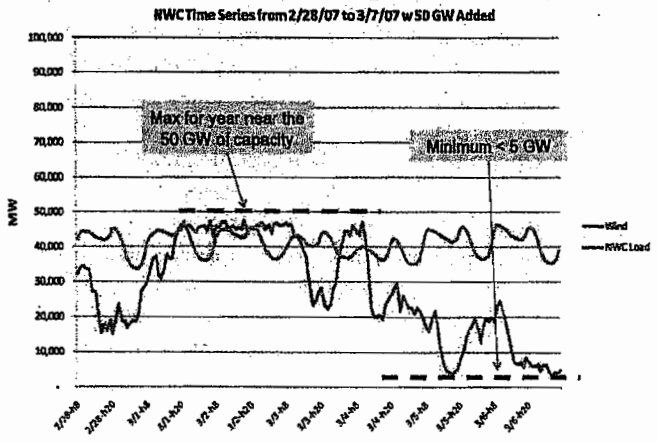
Source: Electric Power Research Institute
Preliminary Insites from EPRI's Regional Model, slide 11

CO_2 Tug of War

This operational "Tug of War" between wind and fossil fuel generators to match electric load leads to one final irony. Wind power doesn't produce the reduction in greenhouse gases (CO_2) that promoters claim. Since coal and gas plants must continually ramp up and down as wind power output varies, their fuel consumption and emissions generally increase because they operate most efficiently when running continuously. A car will run more efficiently and emit less pollution at a constant speed than when stuck in stop-and-go traffic. An April 2010 study of wind cycling and power plant cycling in Texas resulted in a slight savings of CO_2 (600 tons) in 2008 and a slight increase (1,000 tons) in 2009.*

Ask yourself, is this how you would invest your money if you owned a utility? Remember, as a cooperative member you are a part owner of an electric utility. Perhaps our federal and state legislators should discuss with utilities the real economics and operations of wind power before mandating more wind power than can be justified.

Figure 2 — New Wind Data Captures Variability



Source: Electric Power Research Institute
Preliminary Insites from EPRI's Regional Model, slide 10

* *Source:* The Wall Street Journal, *August 24, 2010, "Wind Power Won't Cool Down the Planet" by Robert Bryce.*

PART 8 – WIND POWER - "DECIDING WHAT IS FEASIBLE"

If you have been following my columns, you might be tempted to think that I'm anti-wind power. I assure you that I'm not! However, your board has entrusted me with your cooperative's mission, which is to supply you with highly reliable electric service at an affordable cost. I also serve as a trustee on the board of Buckeye Power, whose mission is to supply your cooperative with stably and competitively priced, economical and highly reliable wholesale power.

In these two roles, I am responsible for making recommendations to your board and for approving recommendations made to the Buckeye Power board by its management. In both cases, I must consider the four tests laid out in my first column: Is it affordable, reliable, fair and achievable? Wind power, like any other source of generation, has real operational and economic issues which must be evaluated. I have tried to share some of these issues with you. It is my job to look beyond wishful thinking which is often disguised as "public policy."

I am very positive about the capabilities of the American people. After all, we sent men to the moon, and invented much of the world's modern technology. We can accomplish anything, IF, 1) we can agree on the goal and 2) are willing to spend the money (It seems we can print that too). For electric industry decision makers, it really boils down to two questions: 1) What can be done? and, 2) How much will it cost? This month's column tries to address these two questions.

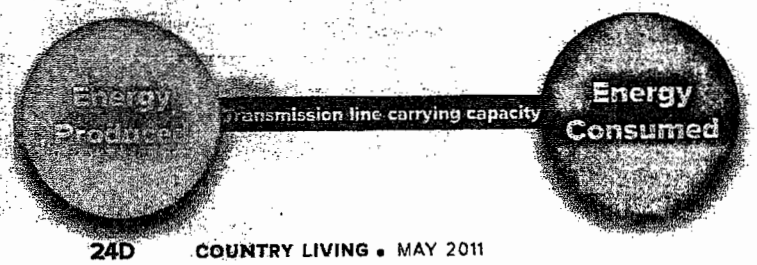
All power sources need grid access

I voted enthusiastically for Buckeye's 30 MW participation in the Story County, Iowa, wind farm project. This project looked feasible because central Iowa is in a "red" area for wind intensity (see Part 6 – Figure 1). The projected cost after the federal wind tax credit was 5 cents per kWh for energy and .6 cents per kWh for transmission service. The 5.6 cents per kWh compares favorably with Buckeye's current 6.2 cents cost, projected to rise to about 7.2 cents when the last coal plant scrubbers are completed in 2013. I believe (still do) this project was important because the cost was reasonable and the Ohio cooperatives needed experience with wind energy. What we learned is we have to pay an additional 3 cents per kWh for transmission "congestion" charges. The real cost per kWh for this wind project turned out to be 8.6 cents per kWh.

Figure 1 is a simple illustration of transmission grid operation. The amount of energy demanded must be matched by the amount of energy produced, provided the transmission line between them is adequately sized. Transmission "congestion" occurs whenever there is a mismatch between power production and demand and/or an inadequately sized transmission line. For example, assume the power generated is equal to the power demanded, but the transmission line capacity is too small. The transmission grid assesses a "congestion" charge. Another example is there is plenty of power generated (such as wind power at night), but there is not enough power demand to use all of the energy. In this case the transmission grid must choose between paying another generator (usually gas or coal fired) to reduce their amount generated or tell the wind generators to go off-line. Either decision results in higher transmission "congestion" costs. This "congestion" issue is what occurs at the Story County wind project.

The better solution to transmission "congestion" is to build more transmission lines, either where line capacity is limited, or where lines are needed to move the power further distances to where there is more energy demand. Remember, the EPRI study looked at "utility-scale" sites within a reasonable distance from transmission lines. This is because for every area considered for wind generation, there is a physical limit to the amount of wind generation (or any other kind of generation) that can be added before the transmission "congestion" problem develops. This is a hard business reality in the electric industry regardless of

Figure 1 — Balancing the Transmission Grid



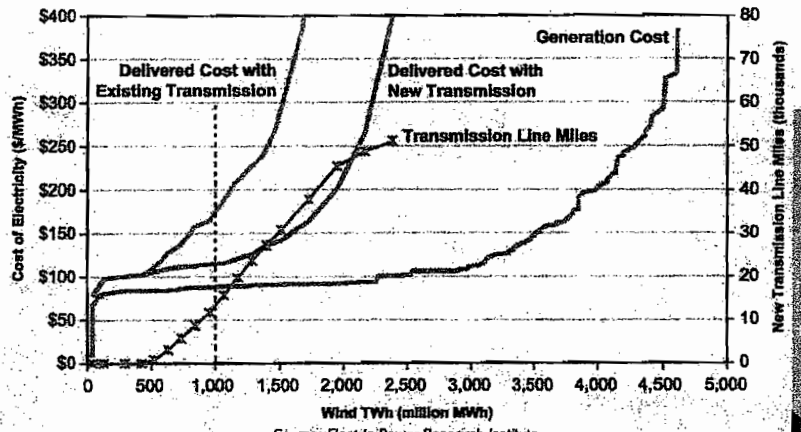
any "public policy" goal of 20 to 30 percent plus renewables by any chosen target date.

Figure 2 illustrates the biggest challenge to integrating renewables into the nation's electric grid. Note that wind resources are concentrated in the Northwest Central region of the country which the EPRI study clearly identified as the best areas for wind development. Figure 2 identifies the desert Southwestern U.S. as the best area for solar energy development and the Western states as the best area for geothermal power production. The inescapable fact is all three best areas of the country for renewable energy development are in the least populated areas (and outside of Ohio except for Lake Erie) AND there is both insufficient power demand in those areas to use all the renewable energy that could be developed AND insufficient transmission line capacity available to move the excess power to where it could be used, primarily the industrial heartland states and coastal cities. This lack of transmission capacity is in addition to the back-up generation issues covered in last month's column. Therefore, evaluating wind power feasibility also necessitates evaluating the availability and cost of transmission capacity.

What will it cost?

Figure 3 is taken from the EPRI study analyzing the wind energy potential supply curve for the whole U.S. Please note that 50 percent of this total U.S. potential wind energy is in the NW central states discussed in last month's column. Potential wind energy is measured in tWh (terawatt hours). 2008 U.S. energy production was 3.97 trillion kWh or 3,870 tWh. Therefore, 20 percent of U.S. energy production is roughly 1,000 tWh represented by the vertical black dashed line. Twenty-five percent was chosen since it is a goal often used for a future percentage of renewable energy to total electricity supply. Notice the blue line for only wind generation costs stays fairly steady at 8-9 cents per kWh up to 1,000 tWh, rises to 10 cents per kWh at 2,500 tWh, and then rises dramatically. This is because the better and more economical wind resources are used first.

Figure 3 — National Wind Energy Potential Supply Curve (Including transmission costs)



Source: Electric Power Research Institute
Preliminary Insites from EPRI's Regional Model, Bryan Hannegan, Ph.D.

Therefore, we could develop 12.5 percent, or 500 tWh, of our country's electricity supply with wind without a major investment in new transmission. This might be a realistic goal, IF we also take the steps to manage the intermittent supply impact on the grid discussed in last month's column. One estimate of back up generation cost to stabilize the grid to manage wind power is an additional 2-3 cents per kWh to the costs shown in the EPRI study.

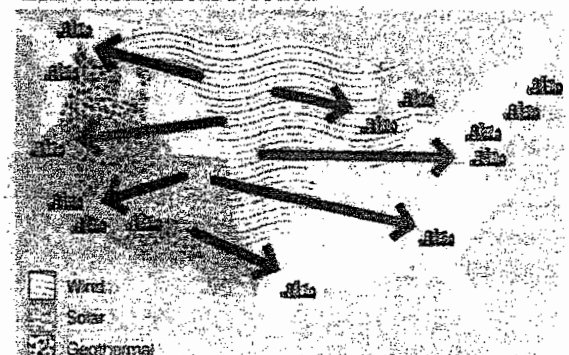
The green line represents the cost of wind generation plus transmission costs for the existing grid system. Note that total cost stays stable at 10 cents per kWh until 500 tWh or about 12.5 percent of U.S. electricity production. After 500 tWh, the green line rises dramatically due to "congestion" issues discussed previously. The only way to reduce these costs is to build additional transmission line capacity. The miles of transmission line needed is shown by the red "asterisked" line, while the total wind generation cost with new transmission line investment is shown by the red line. In this scenario, costs are relatively stable at about 11-12 cents per kWh until you reach 1,000 tWh. Thereafter, costs begin to escalate dramatically because increasing transmission investment is required.

Will it happen?

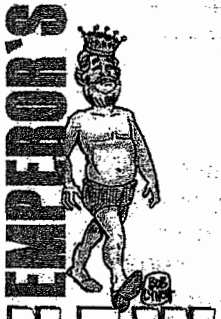
If our wind power goal is 25 percent, or 1,000 tWh, of our country's electricity supply, then per the EPRI study, we will need to commit to the following: 1) construction of 175,000 1.5 MW wind turbines costing $650 billion, AND 2) construction of 19 new extra high voltage transmission lines, 13,000 miles in length, costing $50 billion.

Wind power development of this magnitude simply will not happen without a concerted national effort coupled with changes in transmission siting authority and eminent domain laws at the federal level. Today, most transmission siting occurs at the state or local level. If you think getting regulatory approval for a new power plant is difficult, (wind farms included), just trying building a major transmission line across one or more state lines. Do you really think this will happen just to develop intermittent wind power at 10-13 cents per kWh versus 9.5 cents from a new combined cycle natural gas-fired plant or 10.2 cents from a new coal-fired plant? Probably not. However there are additional reasons for a national effort to upgrade and expand the

Figure 2 — Renewable Energy Location Versus Areas Needed



Source: Green Superhighway: Overhauling the Grid to Accommodate Renewables
http://www.renewableenergyworld.com/



by: Markus I. Bryant
General Manager

PART 9 — SUBSIDIES — WHO PAYS THE BILL?

IN THE LAST SEVERAL COLUMNS I DISCUSSED UTILITY SCALE WIND PROJECTS MEASURED AGAINST OUR FOUR-PART YARD STICK. IS IT AFFORDABLE, RELIABLE, FAIR AND ACHIEVABLE? I COULD HAVE PRESENTED A SIMILAR ANALYSIS OF SOLAR ENERGY PROJECTS AND WE WOULD FIND OUT THE POWER GENERATED COSTS MUCH MORE, BUT FROM A "GRID" PERSPECTIVE IS MORE RELIABLE, SINCE SUNSHINE IS MORE CONSISTENT THAN WIND. BUT NO MATTER WHAT KIND OF ELECTRICITY GENERATION IS ANALYZED, USING THE FOUR-PART YARDSTICK IS ESSENTIAL TO ENSURE THE ELECTRIC CONSUMER IS TREATED FAIRLY AND IS RECEIVING AFFORDABLE AND RELIABLE ELECTRIC SERVICE.

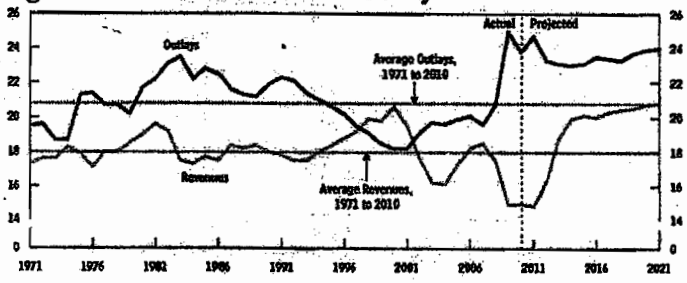
What many in government and business forget, it is the consumer who pays the bills and taxes who is central to the economy, "green" or otherwise. That is why the electric consumer is central to this month's editorial cartoon. What I have observed over the years is the economy tends to crash when the consumer runs out of cash.

What we have really discussed so far is the consumer's "right" hand transaction for electric service. This month we begin to show the consumer's "left" hand transactions and how the federal and state governments use the consumer's taxes and/or impose regulations to provide subsidies to various business and individuals.

I approach this subject with some trepidation. First, the issue of subsidies is a huge topic. Therefore, in this introduction I have narrowed it to subsidies to the energy industry. In subsequent editorials I will focus on subsidies to the wind energy business.

Secondly, the judgment as to whether or not a subsidy is a "boondoggle" or "essential" to the economy often depends on whose wallet is affected. It is a sure bet the whole issue of subsidies in general will become part of the national discussion.

Figure 1 — Total Revenues and Outlays



Source: Congressional Budget Office, http://www.cbo.gov/

Why is it a sure bet? Take a look at Figure 1, which shows as a percentage of U.S. gross domestic product total federal government revenues and outlays from 1971 and 2010, and projections for 2011 to 2021. It's no secret that the federal budget needs to be balanced. The 2011 federal budget shows revenues at $2.15 trillion and spending at $3.77 trillion resulting in a $1.62 trillion deficit. This means for every $1 in spending, the government collects 57 cents and borrows 43 cents. That is why Uncle Sam is shown in the cartoon collecting $1 in taxes for every $2 in subsidies. One debate in Congress is that by reducing subsidies you can reduce federal outlays and reduce the deficit, or alternately, overall tax rates could be reduced by cutting back on the number of tax credits.

What are subsidies?

A subsidy is financial assistance paid to a business either in money or through a regulation, such as a monopoly license, or product purchase mandates. Some subsidies are used to prevent the decline of an unprofitable, but considered needed business operating at a loss (such as AMTRAK), to promote the growth of an industry (such as wind and ethanol), to prevent the increase and/or decrease in product prices (agricultural price supports), encourage more hiring (new job tax credits), or as a form of protectionism to keep domestic products competitive against imports. Nonbusiness subsidies to individuals are called welfare payments, or entitlements if made by the government and charity if made by other organizations or individuals.

It seems once subsidies are introduced, human beings are incredibly creative in applying the concept to a whole range of issues. As a result, almost every business and individual in the U.S. receives one or more subsidies. The continued growth in the number and cost of subsi-

dies of all kinds is one of the reasons the federal budget is out of balance. The reasons subsidies multiply and are difficult for Congress to cutback is because they have "special interest" groups supporting them who make campaign contributions and hire lobbyists to plead their case. If you have doubts, look up "Business Tax Credits" at IRS.gov. You will find a list of 28 different forms for claiming various tax credits.

Energy subsidies

Still not convinced? Just for the energy industry, I found a 274-page report prepared in April 2008 by the Energy Information Administration — U.S. Department of Energy called "Federal Financial Interventions and Subsidies in Energy Markets 2007."

According to the Executive Summary pages xi and xii of this report, total federal energy subsidies were $16.581 billion in fiscal year 2007. This is up from $8.194 billion in fiscal year 1999. The 2007 subsidy breakdown is shown in Figure 2. Further breaking down the 2007 total, we find Direct Budget Expenditures were $2.55 billion, Research and Development was $2.819 billion, Federal Electricity Support was $.767 billion and 2007 Tax Expenditures were $10.444 billion compared with $3.199 billion in 1999.

Since the early part of the last century, federal tax law broadly defines energy tax expenditures as the provision of beneficial tax treatment to taxpayers who produce, consume or economize on energy in ways judged to be in the public interest. The tax revenue foregone due to tax expenditures are thought of as equivalent to a direct expenditure in the budget to achieve the same result (see page 11 of 2007 report). That is government-speak for "There's no free lunch!"

I don't want to suggest all subsidies are necessarily bad. However, it is important to realize how prevalent and large they have become. A broad based subsidy may have merit. For example, an investment tax credit and accelerated depreciation on equipment placed into service by any business may be desirable to encourage economic growth. If such a policy is applied evenly to all industries, then the marketplace won't be distorted by the government trying to direct business investment.

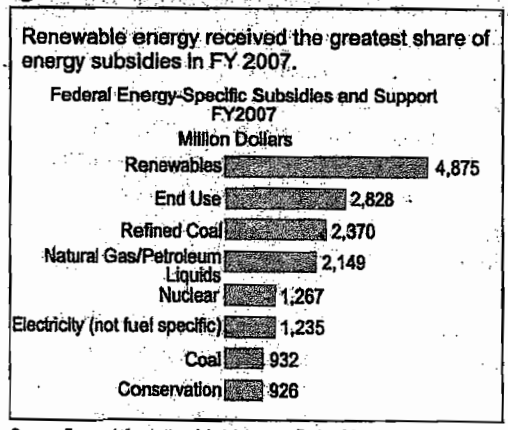
It is important to recognize that non-taxable organizations such as cooperatives and municipal electric systems also participate in the economy. While investment-related tax provisions assist investor-owned electric utilities such as Ohio Edison or American Electric Power, it has been traditionally argued on the basis of consumer fairness that a comparable benefit should be provided to municipal electric systems by allowing them to issue tax free bonds, and for electric cooperatives through loans at the government's cost of borrowing.

Playing favorites

What gets the "special interests" really riled up is when the federal government tries to use targeted subsidies to promote one industry over another, or in some cases to "punish" a so-called "undesirable" industry such as coal. This playing favorites can clearly be seen in Figure 3, where wind and solar subsidies per unit of production are more than 20 times greater than subsidies to other parts of the energy industry. This is just at the federal level!

Next month we'll begin exploring subsidies to the wind power industry. What we will find is there really is no "free lunch" when dollars are handed out from the consumer's left hand financed by taxes and debt to subsidize the rates paid by the consumer's right hand. Since in the long run the consumer always pays, wouldn't it be fairer to let the consumer really understand what energy costs are, so he can decide intelligently for himself what he really wants to pay for?

Figure 2



Source: Energy Information Administration, Federal Financial Interventions and Subsidies in Energy Markets 2007 (April 2008) Executive Summary page xii

Figure 3

Subsidies and Support to Electric Production by Selected Primary Energy Sources

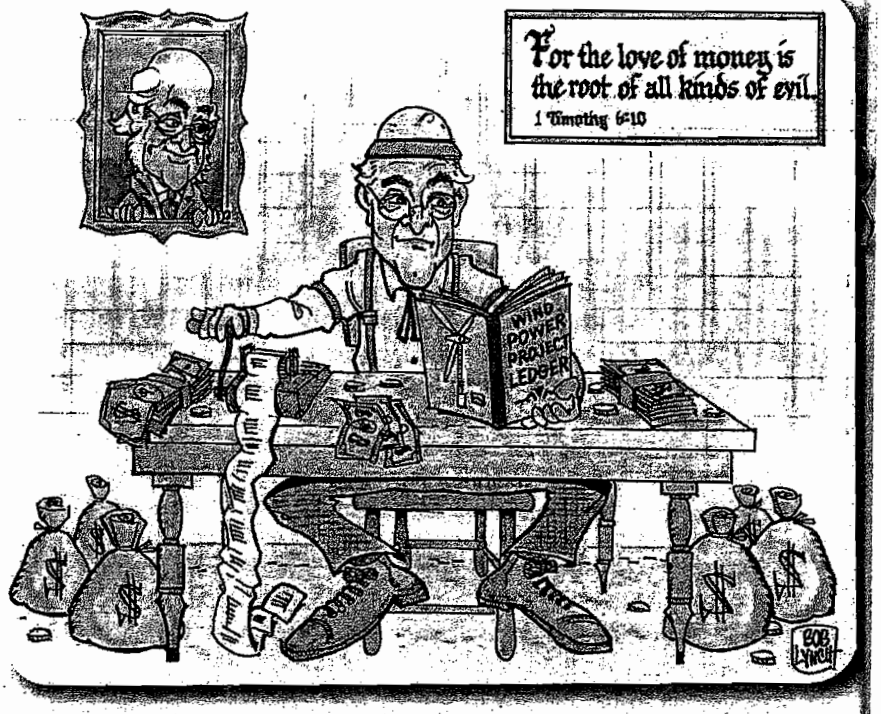
Primary Energy Source	FY 2007 Net Generation (billion kilowatt hours)	Subsidies and Support Allocated to Electric Generation (million FY 2007 dollars)	Subsidies and Support per Unit of Production (dollars/megawatthour)
Natural Gas and Petroleum Liquids	919	227	0.25
Coal	1,946	854	0.44
Hydroelectric	258	174	0.67
Biomass	40	36	0.89
Geothermal	15	14	0.92
Nuclear	794	1,267	1.59
Wind	31	724	23.37
Solar	1	174	24.34
Refined Coal	72	2,156	29.81

Energy Information Administration, *Federal Financial Interventions and Subsidies in Energy Markets 2007*, SR/CNEAF/200-1 (Washington, DC, 2008). Executive Summary page xvi

The EMPEROR'S NEW CLOTHES

by: Markus L. Bryant
General Manager

PART 10 — RUNNING THE NUMBERS



ONE OF THE BASIC RULES OF BUSINESS (AND GOVERNMENT IS ALSO A BUSINESS) IS TO "FOLLOW THE MONEY." THIS IS DIFFICULT WHEN ANALYZING THE COST OF "GREEN" ENERGY SUCH AS WIND POWER. THE TRUE FINANCIAL COST OF WIND ENERGY IS UNDERSTATED COMPARED TO THE COST OF ELECTRICITY FOR TRADITIONAL SERVICES BECAUSE THE COST OF TAX BREAKS AND SUBSIDIES ARE IGNORED. THESE ALTERNATIVE ENERGY SUBSIDIES ORIGINALLY WERE JUSTIFIED AS NEEDED TO HELP NEW ALTERNATIVE ENERGY TECHNOLOGIES UNTIL THEY BECAME COMMERCIALLY VIABLE. THESE SUBSIDIES AT THE FEDERAL, STATE AND LOCAL GOVERNMENT LEVELS ARE SO WIDESPREAD THAT VERY FEW PEOPLE REALLY SEE THE WHOLE COST PICTURE. I SINCERELY DOUBT THAT MOST OF OUR LEGISLATORS SEE THE WHOLE COST PICTURE EITHER.

This editorial is my attempt to share what I've learned after considerable research. Thank goodness for accountants in our society. They can be counted on to keep track of the money. The hard part is finding and interpreting their reports. One thing you can count on, just like your cooperative knows its business numbers; the alternative energy producers know theirs. And all players in ANY business know their numbers when they lobby their federal, state and local governments.

The Rate Payer's View

For example, I looked up an application to the Ohio PUCO for a proposed 300,000 kW wind-power electric generation facility in Hardin County. This project will have 200 wind turbines each with a 1,500 kW name plate capacity. Using information from this PUCO application, Figure 1 was prepared to calculate the cost of electricity from a rate payer's viewpoint assuming your cooperative built the project. Therefore, the cost estimate does not include any "profit," which we assume the Hardin County wind farm developer plans to earn.

I tried to structure the analysis in Figure 1 so you can follow the calculations. Two critical assumptions to this analysis are the interest rate of 7 percent and the 28 percent annual capacity factor. The 7 percent interest may be a little high today for mortgages, but "in the ball park" for business loans. The 28 percent annual capacity factor also may be a little high for Ohio (See Part 7 – Wind Power Economics & Operation – Reliability of Wind?). The Hardin County developer claims a 26 to 30 percent annual capacity factor and wind turbine blade manufacturers claim they are getting better results. Despite my skepticism, the analysis assumes 28 percent, or the average claimed by the developer.

Assuming my assumptions are correct, then the projected end result for a $600 million investment is the project should generate 735.84 million kWh at an average cost of 9.744 cents per kWh. This is higher than the 7.2 cents Buckeye Power projects when the last coal plant scrubber is completed in 2013. However, this comparison assumes wind power and coal power are equal in value,

Merchant Wind Project Economics Rate Payer's View		Figure 1
Number of Turbines in Wind Farm		200
X Turbine Nameplate Capacity in kW		1,500
Size of Wind Farm in kW		300,000
Annual Capacity Factor		28%
x 100% Capacity = 365 Day x 24 Hours		8,760
x Wind Farm Size = Annual Energy kWh / yr		735,840,000
x Turbine Cost per kW	$	2,000
Total Cost of Wind Farm	$	600,000,000
Wind Farm Cost x 30% Equity	$	180,000,000
Wind Farm Cost x 70% Debt	$	420,000,000
Interest Rate		7%
Project Cost Analysis		
Depreciation = Total Cost / 20 years	$	30,000,000
Interest = Debt @ 7%		29,400,000
Operation & Management		8,500,000
Land Lease = 200 Turbines x $10,000 / yr		2,000,000
Property Taxes = $6 per kW Nameplate		1,800,000
Total Annual Cost	$	71,700,000
Cost per kWh Produced	$	0.09744

Note: This analysis uses information supplied in the Hardin County, Ohio Wind Farm PUCO Case: 09-0479-EL-BGN Re: Application for Certificate of Environmental Compatability and Public need.

when they are clearly not due to radically different operating characteristics (See Part 7 regarding wind power operation issues).

The Investor's View

Having spent my career in the not-for-profit electric cooperative industry, my eyes were opened when I analyzed the Hardin County wind project from an investor's point of view. We have the expense side of the project in Figure 1, but what we don't know is the revenue side needed to calculate the expected profit. There has to be one, otherwise why invest in the project? Let's explore the tax subsidy side of the project.

Nearly all of the investment in a commercial wind project can be recovered from taxable income through five-year double declining balance depreciation using "Modified Accelerated Cost Recovery Systems" (MACRS) per IRS publication 946. Figure 1 depreciated the project over its 20-year useful life. MACRS allows depreciation over six years as shown in Figure 2. MACRS provides the investor with three benefits:

1) A further reduction in federal income tax liability as shown in Figure 2 assuming a 35 percent marginal tax rate,

2) Prompt recovery of the equity investment. If we assume a 30 percent equity for the $600 million project, then the investor's $180 million is fully recovered in two years (Note also the full project cost is recovered in six years), and

"These higher costs forced on electric companies will be passed on to electric rate payers in their monthly bills — with the blessings of our federal and state legislators. Folks, I think we now can see where the financial 'green' in green power comes from."

3) An interest-free loan courtesy of the U.S. taxpayers, since the depreciation deduction will continue four more years after the equity is recovered.

In addition, the wind farm owner can receive a wind production tax credit of 2.22 cents per kWh for electricity generated in the first 10 years. This works out to nearly $161.9 million. (735,840,000 kWh per year x 2.22 cents per kWh x 10 years = $161,884,800).

This credit is available for projects put into service by Dec. 31, 2012. That cutoff date is one reason why I'm certain tax subsidies are going to be part of the 2011 and 2012 federal budget debates.

On the other hand, as part of the "stimulus" package, a wind farm started in 2010 and operating before the end of 2012 could opt for a 30 percent investment tax credit instead of the production tax credit. This works out to 30 percent of $600 million, or $180 million. If I were building a project in Ohio, I would take the investment tax credit, since the annual wind capacity factory would have to exceed 31 percent to make the production tax credit a "better deal." And lest we let a tax subsidy go to waste, if a wind project developer can't use all of these tax credits, then the developer can take on "partners" with large tax liabilities and "share" them as part of a tax shelter deal.

In addition, the Hardin County property tax would have been $41 per kW name plate rating. Instead, per Ohio's Renewable and Advanced Energy Project Property Tax Exemption enacted with Ohio Senate Bill 232 in the summer of 2010, qualified energy projects in Ohio are exempted from public utility tangible personal property taxes and real property taxes. In lieu of these taxes, a qualified facility employing at least 75 percent Ohio-based employees during construction would pay $6 per kW. However, the project must be in service by Jan. 1, 2013. This property tax reduction amounts to ($41 - $6 = $35) x 300,000 kW nameplate or $10.5 million per year.

In addition, the Alternative Energy Portfolio Standard enacted with Ohio SB 221 in 2008 assures profits for wind project owners by requiring an increasing percentage of the electricity sold in Ohio must come from "alternative energy sources."

I can't calculate the profit, but there certainly will be one. This means the price for power generated will exceed the 9.744 cents per kWh calculated in Figure 1. That's higher than Buckeye's 2013 projected 7.2 cents, which is projected to be lower than the generation cost of other Ohio utilities.

These higher costs forced on electric companies will be passed on to electric rate payers in their monthly bills — with the blessings of our federal and state legislators. Folks, I think we now can see where the financial "green" in green power comes from. Like the Emperor in the story (see Part 1), the answer is staring back in the mirror — if we only will acknowledge what we see.

Merchant Wind Project Economics Investor's View — Figure 2

	Deduction From Taxable Income		
Tax Year	% of Total Project Cost	Amount	Further Reduction in Federal Income Tax Liability @ 35%
1st	20.00%	$ 120,000,000	$ 42,000,000
2nd	32.00%	192,000,000	67,200,000
3rd	19.20%	115,200,000	40,320,000
4th	11.52%	69,120,000	24,192,000
5th	11.52%	69,120,000	24,192,000
6th	5.76%	34,560,000	12,096,000
Totals	100.00%	$ 600,000,000	$ 210,000,000

Note: The format for the 'Investor View' analysis table and the associated analysis of federal tax breaks and subsidies in this editorial follows closely the analysis prepared by Glenn R. Schoede in his paper "High Cost & Low Value of Electricity from Wind" Feb. 4, 2010.