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IF WISHES WERE FISHES

AN EXAMINATION OF THE COMMON ASSUMPTIONS ABOUT ELECTRICITY GENERATION FROM WIND

ACKNOWLEDGEMENTS

This paper is a collective effort on the part of the board of AHA:

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We consider this effort to be a living document and the reader is invited to offer suggestions and criticism. All comments will be reviewed by the board and, assuming appropriate documentation is also provided, the board will consider incorporating such information in the paper.

Email comments to wspiggle@mac.com or to www.alleghenyhighlandsalliance.org

EXECUTIVE SUMMARY

What is U.S. electricity generation by energy source?

In 2014, the United States generated about 4,093 billion kilowatthours of electricity.[1] About 67% of the electricity generated was from fossil fuels (coal, natural gas, and petroleum).

Major energy sources and percent share of total U.S. electricity generation in 2014:

- Coal = 39%
- Natural gas = 27%
- Nuclear = 19%
- Hydropower = 6%
- Other renewables = 7%
    - Biomass = 1.7%
    - Geothermal = 0.4%
    - Solar = 0.4%
    - Wind = 4.4%
- Petroleum = 1%
- Other gases < 1%

[1] Preliminary data.

Last updated: March 31, 2015

Source of Information

All of the Above

"All of the above" has become a mantra describing the approach to energy management in the United States. This paper focuses on industrial wind because the federal government favors and heavily subsidizes this industry. The Bush administration promoted the concept that the U.S. should have 20 percent of its electricity coming from wind by 2030.

In April, 2015, with only 4.4 percent of the nation's electricity coming from wind, the Obama administration published a concept paper called, "Wind Vision: A New Era for Wind Power in the United States". This report is the wind lobby's dream and in large part is written by them. It would make tax breaks and direct subsidies to private wind companies permanent, build more transmission lines from wind facilities to the grid and multiply the number of turbines many times over. It

expects to increase electricity from wind from 4.4 % now to 10% by 2020, 20% by 2030, and 35% by 2050.

This dramatic move towards grid scale wind development deserves critical analysis. This paper provides information to encourage that process.

Clean and Green – Really?

Despite the hype about being "clean and green" industrial wind is a flawed source for electricity generation. While it is true that industrial wind turbines do not emit particulate matter or carbon dioxide, a large and counterproductive carbon footprint is associated with manufacturing and operating industrial wind facilities.

The Energy Collective, a publication that promotes clean energy, published a September 2011 article that reviews several studies on CO2 emissions and industrial wind. The title reveals their conclusion: **Wind Energy does little to Reduce CO2 Emissions**. This paper refers to several scenarios when grid scale wind actually increases atmospheric CO2.

Two studies, one by the Argonne National Laboratory and the other by the Bentek Corporation, came to the same conclusion: When coal plants are used as wind energy balancing plants, as is the case with Colorado, Texas and Appalachia the rapid up and down ramping at part-load causes coal combustion systems to burn inefficiently releasing more CO2 than they would if they were running at full capacity. A similar phenomenon occurs when gas turbines are used to back up industrial wind.

The Irish have a compounded problem. The vast peat moss fields there function as a carbon sink. When wind turbine roads and machinery invade those fields, CO2 is released. This phenomenon is considered to be significant and is under study.

Raw materials used in turbine manufacture have their own carbon print.
The U.S. Department of Interior USGS predicts that if the U.S. is to produce 20 percent of its electricity via wind by 2030 (It is currently 4.4%.) the U.S. alone will consume annually:

- 6.8 Mt of concrete
- 1.5 Mt of steel
- 310,000 t of cast iron
- 40,000 t of copper

- 380 t of the rare earth element neodymium.

If the administration increases the ante, these figures will increase as will CO2 emissions associated with them.

Strip mining for Neodymium

Mining and smelting neodymium ore for use in permanent magnets involves an extraordinary amount of environmental pollution including CO2 release. A large turbine using permanent magnets needs 700 pounds or more of neodymium.

Ocean Transport of Turbine Components

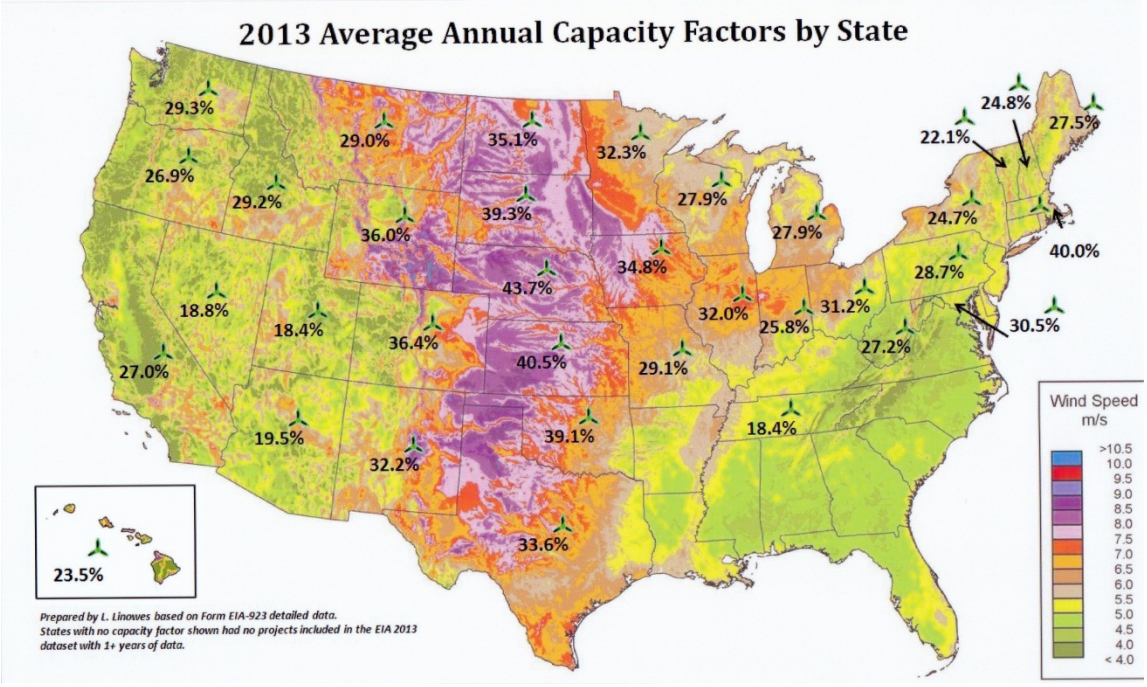
Transport of turbine components is often intercontinental, emitting CO2 in the process.

Wind Related Deforestation and Roads

Building wide roads to turbine sites involves CO2 release and deforesting ridge tops loses a significant resource to mitigate green house gas release.

Installed Capacity vs. Actual Generation

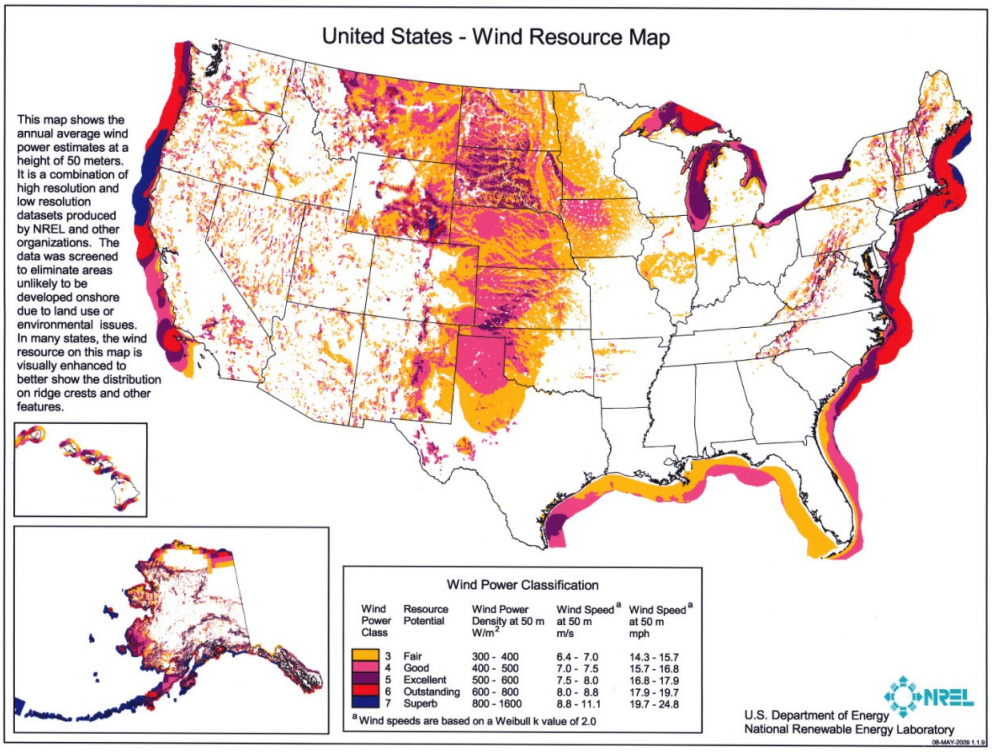
Industrial wind turbines generate a small fraction of their installed capacity. Despite that, wind promoters describe the wind contribution in terms of installed capacity. This is not accurate. The truth is that the variable and intermittent nature of wind makes it impossible for turbines to operate at their rated capacity. They average only 20% to 30% of rated capacity in the east and no more than 40% of rated capacity in the areas of the country with the strongest wind.



EIA Wind Production Numbers
(Courtesy- L. Linowes)

What this means is that while it is possible to increase the efficiency of the turbines by making them taller and larger, and by using permanent magnets rather than electromagnetic coils to drive the shaft, it is not possible to change the way the wind blows. For an industrial wind facility to achieve its rated capacity requires full time wind speeds of 36 plus miles per hour. Because that does not happen, industrial wind requires back up from other energy sources.

Where the Wind Blows in the United States
(*Source – NREL, US Department of Energy*)



The wind resource in Appalachia is weak compared to the country's mid-section. Despite that, the Allegheny Front is becoming a hot spot for industrial wind turbines. Critics of industrial wind power point out that the economics of the industry is dependent on public subsidies, not the quality of the wind.

The Role of Public Subsidies

The Government Accounting Office (GAO) has found that there are 82 wind-related federal subsidies and in a 2013 report to Congress they concluded that taxpayer funds are being wasted.

The two most expensive subsidies are the Production Tax Credit (PTC) and Section 1603 grants which have expired. Taxpayer money has been pouring into these programs for years. A last minute renewal of the PTC for 2014 is projected to cost taxpayers more than $12 billion dollars over the next 10 years.

Over the past 35 years, wind energy – which supplied just 4.4% of US electricity in 2014 – has received US$30 billion in federal subsidies and grants.

Cash Subsidies (Section 1603 Grants) Paid to Regional Wind Companies

MD:			
	Criterion	$39,147,263 (7/22/2011)	28 turbines
	Roth Rock	$31,766,924 (9/8/2011)	20 turbines
WV:			
	Laurel Mountain	$81,965,141 (2/3/12)	61 turbines
	Beech Ridge	$68,609,459 (9/22/10)	67 turbines
	Pinnacle	$44,184,807 (8/23/12)	23 turbines
PA:			
	Big Savage	$65,460,892 (1/24/13)	68 turbines
	South Chestnut	$28,873,226 (5/8/12)	24 turbines

The public cost for 291 regional turbines was just over $360million, approximately $1.5million per turbine.

The European Experience

In contrast to the apparent direction the current administration in the U. S. wants to take us, many countries in Europe have found that underwriting the wind industry is hurting their treasury and increasing electricity costs for their people. Two examples are Germany and Spain.

Germany and Spain were once thought to be the world leaders in developing wind energy. Not anymore. Early in 2014, Germany's Expert Commission on Research and Innovation recommended eliminating wind subsidies because there is no evidence that industrial wind reduces atmospheric CO2 and the cost of the subsidies is expensive enough to raise citizen and business electricity bills. The Merkel government accepted that report and is taking steps to follow its recommendations.

Spain has gone further to stop its support of wind electricity by retroactively ending subsidies to wind facilities constructed before the end of 2004. In 2005, Spanish utilities began refusing new wind power connections. According to Bloomburg News, on June 6, 2014 Spain approved a clean energy bill that introduces an entirely new subsidy system that will cap the earnings of all existing renewable power plants. Spain has already paid about $76.5 billion Euros to clean

energy generators since 1998 and will pay another 142 billion Euros over their lifetimes.

Both countries will have difficulty reducing their public cost of the wind industry because in Germany contracts extend 20 years and in Spain, the turbine numbers are very large.

The recent energy proposals by President Obama are evidence that the European experience is disregarded.

U.S. Wind is beginning to Destabilize Energy Delivery

Texas has more grid scale wind energy development than any other state. In September 2014 the chief financial officer of Texas, Susan Combs, issued a report that called for an end to public subsidies for the wind industry. "Instead of generating jobs and providing a reliable and consistent energy source, wind projects just generate higher costs.", she said.

In Forbes Magazine dated October 23, 2014, three CEO's of energy companies appealed for the end of the PTC. They documented that because of the PTC industrial wind producers are getting paid, on average, over double the price that other generators receive in the wholesale market. The effects of these market distortions are far from academic, they say. Their message is that driving down the wholesale price of electricity discourages the development of base load plants and that will eventually raise the cost of electricity.

Cumulative Consequences
People, Nature and Heritage Values

In Appalachia, zoning and effective long term planning is virtually non-existent, making the rural areas vulnerable to industrial wind promoters. Contracts with willing landowners are said to include a non-complaint clause. Neighbors who do not have contracts with the promoter tend to be passive about the matter, until the turbines start running. Many times those neighbors, even some who live as far as a mile from the turbines find themselves preoccupied and sleepless due to turbine noise and flicker. The pattern is for those neighbors to complain and eventually gain cash settlements along with a gag order. After that the issue tends to fade from the public eye. But the health impacts continue and there is increasing public health evidence that public health is adversely affected. If the number of turbine installations multiply so will the numbers of impacted people increase.


IF THIS IS
GOD'S COUNTRY
So much for Sounding like a Refrigerator!
The more Wind the more Noise!
Why Are We Living in the Dark Deep Depths of HELL
"Losing" the COMFORT of our home due to noise & Shadow flicker inside of our home.
Don't allow yourself to become a "victim" of the Devastating effects!

Constructing a turbine facility on a former wooded mountain ridge brings with it forest fragmentation, headwater disruption, more rapid storm water runoff, bird and bat mortality and invasion of unwanted species. The U.S. Fish and Wildlife Service says, ""As more industrial wind facilities are built and turbine size increases, the cumulative effects of this rapidly growing industry may initiate or contribute to the decline of some wildlife populations and loss of their habitats. The potential harm to these populations from this potential additional source of mortality and habitat loss makes careful evaluation of proposed facilities essential."

Example of Impacts to headwaters during construction

On Shaffer Mountain (PA-designated Exceptional Value Stream)

People take great pride in the mountain vistas where they were been born or have been drawn to. Industrial wind facilities unquestionably dominate the visual experience when placed on mountain ridges. It is probable that sometime in the not too distant future the public will react negatively to the cumulative impact of the industrial wind industry.

PURPOSE

This paper is presented as an educational tool by the Allegheny Highlands Alliance, an alliance of organizations and individuals committed to protecting the mountain resources of the Allegheny Highlands. It is our mission to:

- Advance public knowledge of the cultural and biological diversity, uniqueness, and ecological sensitivity of our mountains.
- Preserve and protect areas of particular scenic, geologic, biologic, historic, wilderness, and recreational importance.
- Aid in the creation and implementation of sustainable local, state and federal governmental policies for the conservation and wise management of energy, water, wildlife, and other natural resources.
- Conduct research and distribute information regarding the costs and benefits of renewable energy development on forested mountain ridges.

In fulfilling our mission, we seek to:

- Encourage scientifically based energy solutions that preserve and protect mountain resources.
- Promote communication and cooperation among members.
- Engage the public through dynamic educational programs.
- Collaborate with elected and appointed officials in policy development.
- Serve as an information clearinghouse.

This paper reviews but a small sample of the available literature to document that the grid scale wind industry stands alone as being dependent on public subsidies that have become unaffordable in Europe and Australia. We contend that is also the situation in the U.S. and an appeal is made that lessons learned in Europe should be translated into this country's public policy.

A brief review contradicts the common assumption that industrial wind generated electricity is environmentally sound and free from untoward consequences on human health.

As the goal of the Allegheny Highlands Alliance is to keep the public informed, we will update this document as appropriate. Please visit our web page:

http://www.alleghenyhighlandsalliance.org

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1 - INTRODUCTION

"If wishes were fishes, the sea would be full." This common saying originates from and is preceded by another 17th century proverb, "If wishes were horses, beggars would ride."

Both sayings make the point that wishes often do not equate with reality. Wishes do not make fishes.

Many people assume that wind and other "renewables" are a viable strategy to modify climate change. After some five years of researching this issue and developing information for the public on grid scale wind, the Allegheny Highlands Alliance (AHA) believes that an informed public is unlikely to believe the suggestion that wind can work in this way.

Wind promoters have been very successful in persuading the general public that they have the answer. Even well intentioned organizations have, in our opinion, been misled. One such organization has stated "Wind and solar farms – these are not only clean, affordable, domestic, and effectively infinite; they produce no emissions and result in cleaner air and water for all." (1)

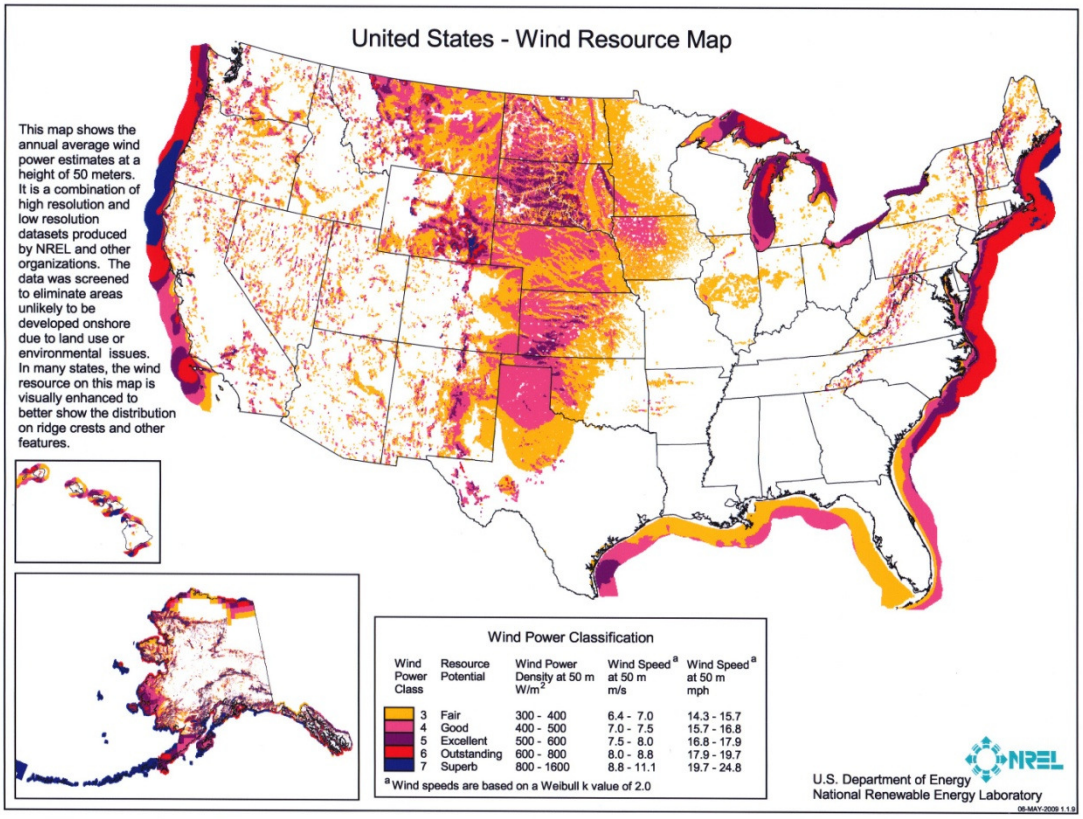
This statement reflects the common assumptions of the general public. There is no documented evidence to support these claims, but we want to believe it and so we do. The purpose of this report is to examine this statement and others like it to see what the supporting evidence is to affirm or to deny these conclusions. Are they wishes or realities?

It is not our purpose to criticize organizations that sincerely believe the viewpoint in this web statement. Some environmental organizations embrace these assumptions as a matter of policy. But that does not make them true.

Our purpose is to summarize relevant information and to let the reader decide. The focus of this report is on grid scale wind. For the most part, we will refrain from blogger's opinions**,** but at times we do refer to an expert opinion within a blog.

2 - WHERE DOES THE WIND BLOW?

Often, the turbines on an industrial wind installation do not turn. That is because, for the purpose of driving wind turbines, most of the wind resource in Appalachia is at best, borderline. Most of the viable wind resource is located in the Midwest and in certain off shore locations. Wind maps created by the National Renewable Energy Laboratory (2) show this to be true.



(*Source – NREL, US Department of Energy*)

2-A - Nameplate Capacity v Electricity Generation

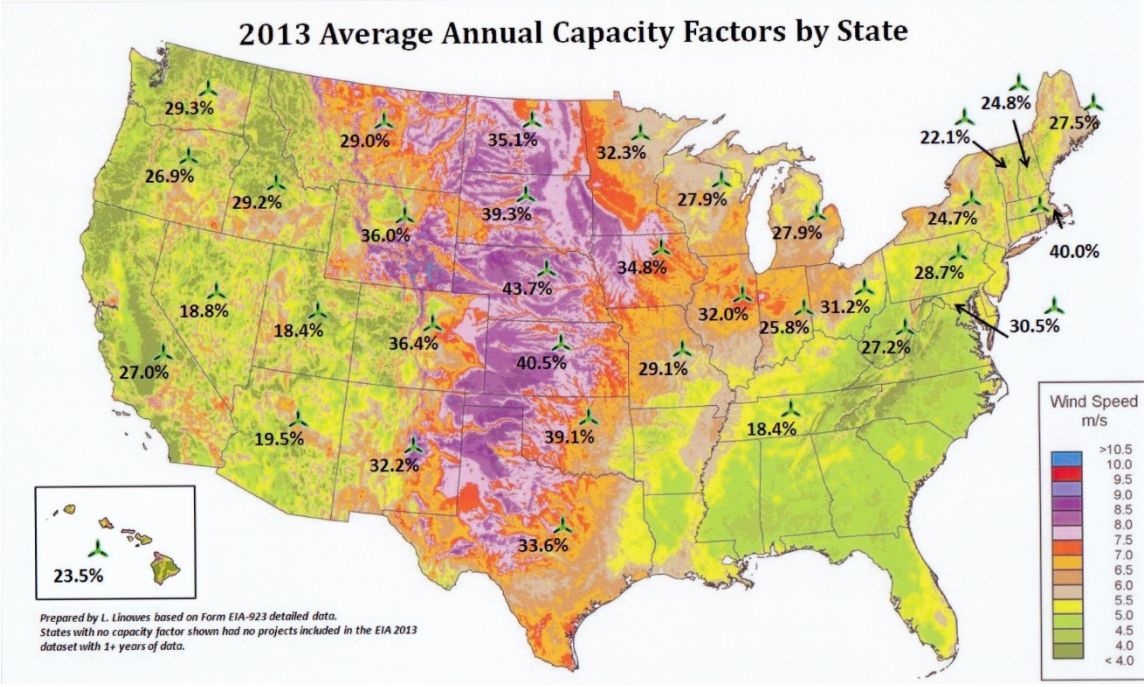
Wind is intermittent so industrial wind turbines generate electricity only at a percentage of their rated capacity factor.

Think of an industrial wind turbine's Nameplate Capacity as equivalent to a car speedometer. If conditions are perfect, a 1.5 MW turbine can produce 1.5

megawatts of electricity just as a well-tuned Corvette might peg the speedometer at 200 miles per hour.

In reality however, there's an important distinction. While the Corvette's performance is voluntarily limited by safety factors, common sense and your local police department, the industrial wind turbines output is at the mercy of the ever whimsical Mother Nature. Turbines must have reliable wind in adequate speed levels in order to meet the immediate demand of homes, businesses and hospitals. The car's speed is controlled by the driver's wish for speed while Mother Nature has her foot on wind's pedal and, when it comes to producing electricity, speed matters. The graphic below demonstrates the loss of electricity generation relative to wind speed:

(*Courtesy of D. Umling*)
This graphic demonstrates wind "potential" and turbine output in terms of capacity factor.



US Energy Information Administration Wind Production Numbers
(Courtesy- L. Linowes)

The graphic above documents that eastern US industrial wind turbines are producing lower than 30% of rated capacity while in the mid-west that figure averages only 40%.

The US Energy Information Administration is an independent government agency that collects, analyzes, and disseminates independent and impartial energy information to promote sound policy making.

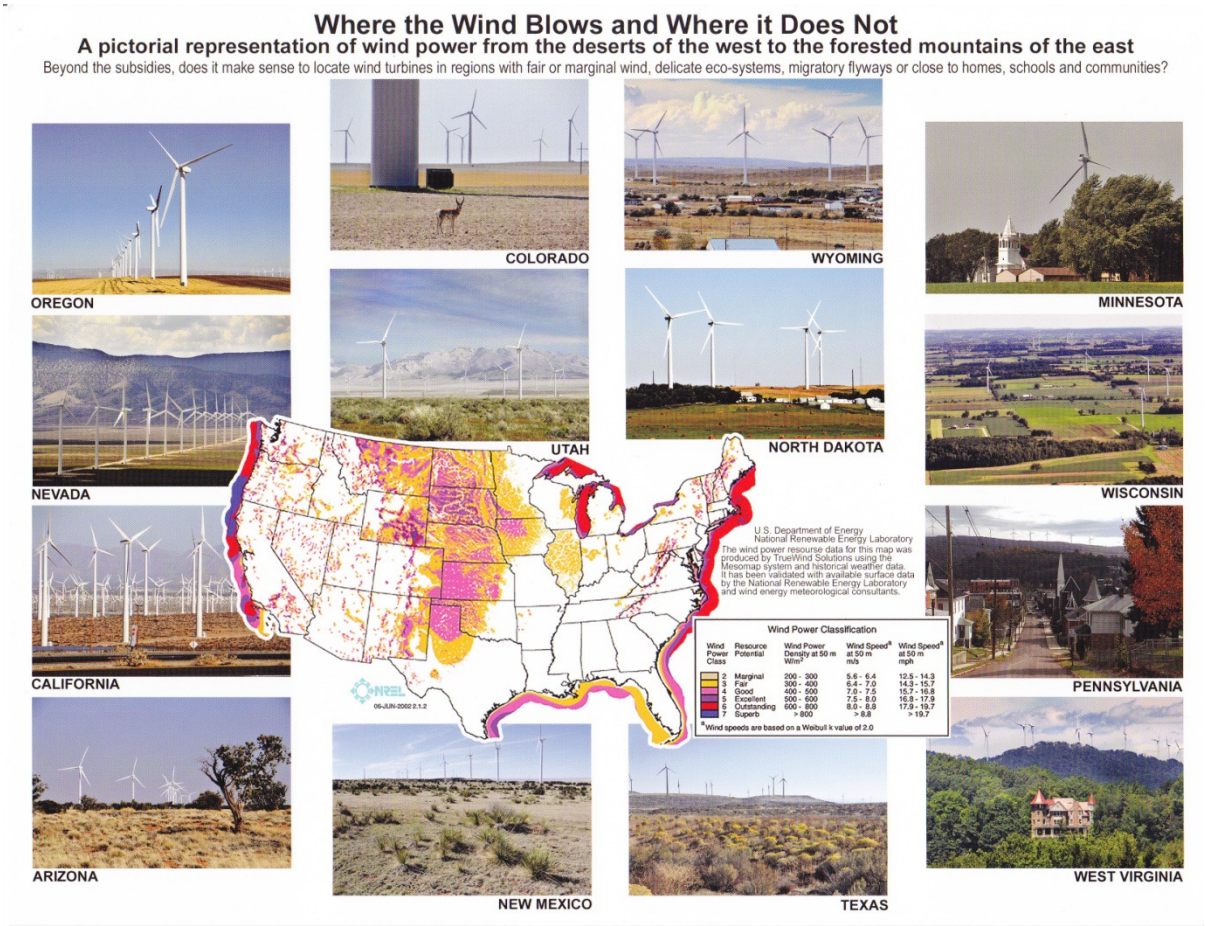
CUMULATIVE IMPACT

"The United States Fish &Wildlife Service has warned that as industrial wind turbine facilities multiply on the Allegheny Front, the international migratory pathway for avian travel will be significantly compromised. The Service writes, "Furthermore, we are concerned about the cumulative impact of wind power projects in the Allegheny Front. There are two projects currently in operation (Mountaineer and NedPower Mount storm), located within 35 miles of the proposed Pinnacle project. These projects have documented mortality of birds and bats. In addition, we are aware of a number of other proposed projects in the Allegheny Front, including the New Creek Mountain and Dan's Mountain industrial wind power projects." "the cumulative impact of these wind power facilities, when added to other bird mortality factors (collisions with buildings,

moving vehicles, and power lines; or bird kills associated with contaminant exposure and other human-caused factors) may result in bird population declines." (WV PSC Case 309-0360-E-CS)

To meet current government mandates for renewables, the Appalachian mountain ridges are targeted for thousands of industrial wind turbines. The Appalachians, the international migration highway for so many species and the home and habitat for protected and critical species which reside in these mountains will likely be destroyed in order to accommodate these energy impostors.

As questioned in the following graphic, the poor performance resulting from a lack of sustained and acceptable levels of wind in many areas of the country leads us to ask, "Does it make sense to locate industrial wind turbines in regions with marginal wind, delicate eco-systems, and migratory flyways or close to homes, schools and communities?"



(Courtesy – J. Terry)

One can see that an underperforming technology which relies on a volatile and unreliable fuel, arriving most often when not needed, which cannot be dispatched to match the customer's demand, is not the energy of the future.

2-B - Consumption v Generation

When one considers that industrial wind electricity generation is supply driven (when the wind blows) as opposed to demand driven (customer flips a switch and the light comes on), it is worth noting that consumption of renewables does not correlate well to its generation. Perhaps this explains why, in spite of the remarkable increase of renewable installed capacity and the forced generosity of taxpayers, consumption of these renewable products has remained flat since the early nineties. (3)

3 - WHAT THE EUROPEAN EXPERIENCE CAN TEACH THE UNITED STATES

In his annual speech on the State of the Nation speech in 2013, President Obama, insisted that this country should look to Spain's example on how to embrace industrial wind generated electricity. Today, Spain, along with the rest of Europe and Australia is turning away from wind (and solar) because it is too expensive and does not work to the benefit of the country. (4)

3-A - GERMANY

Germany is the most recent example. Through its "Renewable Energy Sources Act (EEG), Germany has led the world in policies encouraging wind energy and it has proven to be a disaster for them.

Der Spiegel, one of the most respected news outlets in Germany puts it this way:
"Overall, Germany's energy revolution has made the country's energy unaffordable, unreliable and has ruined its own idyllic landscape, and ravaged rainforests abroad as well. *"Rising energy costs are becoming a problem for more and more citizens in Germany. Just from 2008 to 2011 the share of energy-poor households in the Federal Republic jumped from 13.8 to 17 percent.* Much of the rapid increase in energy prices is owing to Germany's growth in expensive wind and solar energy. Ironically, despite more than 20% of Germany's energy now being supplied by renewables, CO2 emissions have been rising just the same. (Emphasis added)

Germany's expert *Commission on Research and Innovation* concluded that "the **Green Energy Law is neither a cost-effective tool for climate protection nor does it have any measurable impact on innovation.** (Emphasis added) "For both reasons, therefore, there is no justification for the continuation of the EEG ," concludes the "report". (5)

The Commission emphasized that the promotion of renewable energy does not contribute to climate protection. The EEG-triggered expansion of renewable energy for electricity supply in Europe would not avoid any additional CO2 emissions, but only shift them." "The Renewables Energy Sources Act does not produce any additional climate protection but it makes it much more expensive. The Merkel government has accepted the report and has begun the process of markedly reducing or even ending industrial wind subsidies. (6)

3-B - SPAIN

Spain used more wind-based electricity in 2013, just over 20%, than any other single source. That may sound like a success but Spain has also found it necessary to retroactively end subsidies to wind facilities constructed before the end of 2004, which amounts to nearly 40% of its wind energy. (7)

Beginning in 2005, Spanish utilities began refusing new wind power connections. (8) The ability of unreliable and intermittent energy sources to destabilize the grid is now well recognized. (9)

For more information on the European experience with renewable mandates and subsidies please visit the Armstrong Center for Energy and Environment Policy Perspective article "Learning from Others' Mistakes", February 2012.

3-C – Dutch Investments

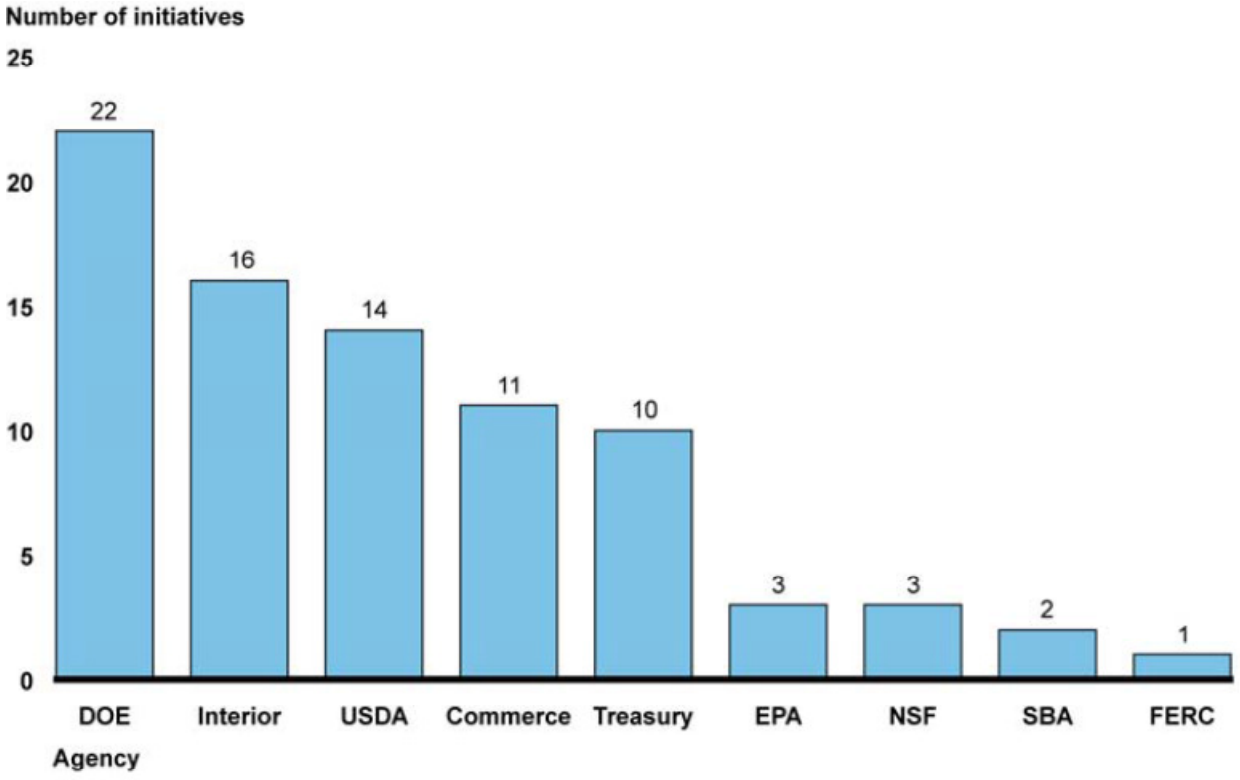
The massive Dutch investment firm APG decided to invest in fossil generation rather than industrial wind projects noting that "investing into alternative energy sources such as wind and solar power "are largely dependent on subsidies and tax advantages", the APG says. The main reason the APG is not willing to invest money into this, then, is that it is "not a solid basis for long-term investments." (10)

4 – U.S.TAX PAYER SUPPORT - MULTIPLE WIND SUBSIDIES

A March 2013 report to congress by the Government Accounting Office (GAO), using 2011 as the benchmark, found that tax payer funds are being wasted on the industrial wind industry. They identified 82 wind-related subsidies fragmented across nine agencies, many with duplicative intent.

The GAO observed that the U.S. Treasury does not have discretion to allocate support to projects based on need-only eligibility.

They recommended that subsidies be based on need; the various agencies agreed with the report but congress has not taken action on this matter. (11)



Source: GAO analysis of agency-provided data.

According to a 2008 Energy Information Agency (EIA) report (12), the average 2007 subsidy per megawatt hour for wind and solar was about $24, compared with an average $1.65 for all others. This fact speaks to the strength and effectiveness of the industrial wind lobby in Washington.

With the non-renewal of the wind Production Tax Credit (PTC) on December 31, 2013, the most expensive of these taxpayer subsidies expired but PTC credits will continue for ten years for any industrial wind project in the application process by that date. A last minute renewal of the PTC for 2014 is projected to cost taxpayers an additional $12 billion dollars over the next 10 years.

It is difficult to comprehend the expense of this tax credit were it not for a stimulus bill provision called Provision 1603 that allowed the industrial wind generation company to be paid in cash in lieu of the credit. While this provision has now expired, payments will continue through 2016. (13)

4-A - 1603 PAYMENTS TO REGIONAL WIND TURBINE INSTALLATIONS

MD:			
	Criterion	$39,147,263 (7/22/2011)	28 turbines
	Roth Rock	$31,766,924 (9/8/2011)	20 turbines
WV:			
	Laurel Mountain	$81,965,141 (2/3/12)	61 turbines
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PA:			
	Big Savage	$65,460,892 (1/24/13)	68 turbines
	South Chestnut	$28,873,226 (5/8/12)	24 turbines

The public cost for 291 regional industrial wind turbines was just over $360 million, approximately $1.5 million per turbine. This subsidy, by law, is to cover only 30% of the installation cost! Can it really be that the average cost to establish an industrial wind facility on an Appalachian ridge top is more than $3 million each? We can find no evidence that the government has audited any of these grants.

The Pinnacle Project received $1.9 million per turbine while the South Chestnut Project claimed $1.3 million, $600 thousand less per turbine. AHA wonders why. Shouldn't these claims be audited?

4-B - PTC: THE FATE OF THE PRODUCTION TAX CREDIT IN CONGRESS

The Production Tax Credit was constructed by Congress in 1992 in order to support the fledgling industrial wind business. The intent was to give this infant for-profit industry a jump start. Here we are some 22 years later and the "oldest living infant" is still relying on subsidies for its existence. Even investment guru Warren Buffett has said that the only reason he invests in the industrial wind business is because of government support: "**I will do anything that is basically covered by the law to reduce Berkshire's tax rate. For example, on wind energy, we get a tax credit if we build a lot of industrial wind facilities. That's the only reason to build them. They don't make sense without the tax credit.**" (14)

The PTC died on December 31, 2014. But it has been dead before and the powerful wind lobby in Washington is hard at work, confident that they will revive it once more.

Senator Lamar Alexander (R-Tenn.) has been a determined spokesman to bring some balance to the nation's energy mix. He puts it this way: "In 2013, when Congress extended this subsidy for one year, it was estimated to cost taxpayers $12 billion over 10 years. The wind subsidy is a colossal, unjustified waste of taxpayer dollars at a time when the nation has an unsustainable debt. The subsidy is so large that it allows wind developers in some markets to literally give away their electricity." (15)

Responsible journals are speaking out. This from Forbes magazine: "A 2013 report titled *"Assessing Wind Power Cost Estimates"* published by the Institute for Energy Research found that the 2012 PTC extension alone cost taxpayers $12 billion. It also stated that details of many other wind power costs go unreported in government-funded study groups such as the Energy Laboratory (NREL). It observes that NREL's estimates exclude key categories such as the cost of transmission and grid balancing for far-away, intermittent wind sources." "Let these European experiences provide vital instruction for America. So long as this industry's survival depends upon preferential government handouts and regulatory mandates, two things are clear. Industrial wind is not a "free" or competitive free market source of energy. It is also not a charity we can continue to afford." (16)

In February, 2014, the IRS reported that certain federally subsidized wind turbine and solar facility owners may be double-dipping federal subsidies and it has no way of sorting out which companies may be doing so." ""http://www.kcet.org/news/rewire/policy/renewables-companies-may-be-double-dipping-stimulus-money.html Since then, the IRS has issued Notice 2014-39

making it clear that receiving cash payments from the 1603 grant program and then claiming the tax benefit from the PTC is clearly against the law.

Section 1603 Treasury Grant Payments are subject to audit, according to the IRS. http://www.windpowerengineering.com/featured/business-news-projects/irs-to-audit-section-1603-treasury-grant-payments/ By law, 1603 payments are made within 60 days of project completion, leaving little or no time for review of the claims made. According to the international law firm, Troutman Sanders, LLP writing on this subject, "Clearly, treasury is concerned about potential taxpayer abuse in the Section 1603 program." AHA thinks this concern is well placed and we have asked for audits of regional turbine facilities. We find it hard to believe that installing a turbine on a so-called industrial wind facility costs an average of $3 million each. Be reminded that more than $1 million of that claimed cost comes out of taxpayer's pockets.

Writing in Forbes magazine on October 23, 2014, Anthony J. Alexander, then president and CEO of First Energy, Christopher Crane, president and CEO of Exelon and Thad Hill, president and CEO of Calpine, agreed that the PTC is no longer needed to support the wind industry and they warn that subsidies are a source of market distortion that will cost electricity customers more in the long run.

Some experts inside the energy industry agree that it is time for the PTC to go. They say that subsidies are no longer needed by big wind and continuing them unbalances the market to the point that consumer electricity bills will rise, as they have in Europe.

http://www.forbes.com/sites/realspin/2014/10/23/the-ptc-is-no-longer-needed-to-support-the-wind-industry/

In the article, they state:

- Wind generators receive $35 per megawatt-hour (MWH) pre-tax PTC credit ($23 per MWH post-tax) on top of the wholesale price of power, which is approximately $28 per MWH;
- Therefore, Industrial wind producers are getting paid, on average, over double the price that other generators receive in the wholesale market.

- Even worse, the PTC's structure creates irrational incentives which lead owners of wind power facilities to generate as much as possible, even when the power is not needed by paying the market to take their power.
- This effect is creating negative wholesale prices in some regions of the country during certain periods of time meaning generators of any type have to pay the customer to take their product.
- The only generators who make money doing this are the subsidized industrial wind generators who get their PTC .
- Even when these instances of negative prices do not occur, the subsidy distorts power markets by artificially suppressing prices.
- The effects of these market distortions are far from academic.
- Several power plants have announced early retirements in part due to economic conditions caused by the PTC. Decisions to build new traditional generation plants are also being deferred.
- In Germany, generous subsidies for industrial wind and solar have driven the closure of clean base line power plants leading to higher prices.
- Highly reliable baseload power cannot be replaced with intermittent renewable resources alone –
- The mixture of renewables and new reliable generation needed to back up intermittent renewable power will likely be more expensive than the current mix, resulting in higher prices.

4-C - ARE THE IRS RULES FOR WIND POWER LEGAL

Congress extended the wind energy production tax credit (PTC) at the beginning of 2013 , relaxing the terms upon which developers could qualify for the credit by requiring projects "begin construction" by the end of 2013, the then expiration date of the PTC. The IRS released guidance a few months later defining what it meant to begin construction which requires projects show "continuous construction" to ensure that projects could not be delayed for an indefinite period and still claim the PTC.

The IRS released a third guidance, after considerable debate, wherein it offered developers the generous rule that if they were to get their projects in service by January 1, 2017, the IRS would not closely scrutinize their development efforts. In effect, the IRS imposed a 2016 deadline for projects that wind developers are racing to meet. (17)

In August 2014, the IRS provided still further guidance that relaxed the requirements even more by, in part, lowering the 5 percent safe harbor requirement to 3 percent.

The interpretation of what constitutes "begin construction" is very important. Yet during the two years since the PTC was extended with this wording the IRS did not bother to seek public comment under the Administrative Procedure Act (APA), the federal statute that requires federal agencies to provide notice and an opportunity to comment before promulgating rules. The question is, is it legal?

4-D – State and County Level Tax Credits and Mandates

Many states not only offer additional tax benefits to industrial wind developers but have passed legislation requiring the use of renewables. This requirement to use renewables such as industrial wind creates an artificial demand for a product which, by its intermittent nature, industrial wind cannot fulfill. Electricity generated from industrial wind sets its own schedule and, as explained above, will not arrive at the flip of a switch. Only demand-based fuels such as hydroelectric dams, nuclear and fossil fuels can support the needs of industry and private consumers by providing electricity at the exact time of need.

Ohio Gov. John R. Kasich signed legislation that ends Ohio's in-state wind energy mandate (18) which now requires industrial wind to compete with cheaper wind generated electricity from states where industrial wind power is produced more efficiently.

In September 2014, Susan Combs, the chief financial officer of Texas, issued a very critical report on the status of big wind in her state and called for an end to public subsidies for the industry. She said, "When it comes to the rich subsidies they (the wind industry) receive from the state and federal governments, wind generators and their turbines tower above other sources of electricity generation – this is particularly troubling considering the actual electricity they generate, particularly during the times when Texans really needs the power." So instead of generating jobs and providing a reliable and consistent energy source, wind projects just generate higher costs." "And there are increasing concerns about subsidies being used to encourage industrial wind turbines close to homes, airports, military bases and migratory bird routes."

Other states are taking another look at industrial wind. In September 2014, by a vote of 181 -11 the Pennsylvania House of Representatives directed the Joint State

Government Commission to produce a comprehensive report on the impact of turbine facilities on the state's landscape, wildlife and electric grid. No mention is made of the impact of industrial wind turbines on humans living near them. It is the opinion of the AHA that, if human impact is not considered, the study will be flawed.

County governments are also taking action against large wind turbine facilities. In October 2014, Marion County (Kentucky) passed an ordinance banning them within their borders. Next-door Maysville County is expected to follow suit. http://www.maysville-online.com/news/local/f3c5f6f1-22bf-5b8c-adc6-412c8844ee74.html

Unfortunately, the Obama administration does not appear to be getting the message, either from the European experience or from the situation described by these energy executives. Obama's 2016 budget proposal renews the PTC and makes it permanent.

5 - CLOSING CONSIDERATIONS

Having explored the dominant issues of effectiveness and cost of grid scale wind, this paper will close with a brief review of other assumptions that deserve critical thinking: jobs, human health concerns, environmental impact, and impacts on indigenous heritage values and finally, the greatest wish of all will be explored, the impact of industrial wind on global warming mitigation.

5-A – JOBS

We need jobs. Labor union organizations attend every industrial wind project hearing to make that point. While very few jobs are required to run a turbine facility, work is available to those who clear cut the ridge line timber and replace it with roads and to construction specialists as the turbines are erected and connected to the grid. For a typical installation this employment opportunity lasts approximately two years or less before the crew goes to another project. That is just the way it is and anyone in the business will tell you that.

However, that is not the whole story. For example, the London Telegraph recently reported, "A new analysis of government and industry figures shows that industrial wind turbine owners received £1.2billion in the form of a consumer subsidy, paid by a supplement on electricity bills last year. They employed 12,000 people, to produce an effective £100,000 subsidy on each job. The disclosure is potentially embarrassing for the wind industry, which claims it is an economically dynamic sector that creates jobs." (19)

Taxpayers spend about 15 times more on industrial wind energy jobs than in oil and gas jobs. (20)

An academic and peer reviewed study from Spain, Study of the "Effects on Employment of Public Aid to Renewable Energy Sources", revealed that wind jobs actually reduce jobs in other sectors. (21)

AHA asks that as long as industrial wind is receiving its out of proportion taxpayer subsidies, wouldn't the public be better off without industrial wind jobs?

5-B - HUMAN HEALTH IMPACTS

The mantra, "clean and green" has successfully been imprinted on the public attitude about industrial wind generated electricity. That would be nice if it were true. All forms of energy development have their own set of environmental and health hazards.

The data show that industrial wind is no exception. Studies have compared the health-related quality of life of individuals living in the proximity of an industrial wind project to those residing in a demographically matched area displaced from industrial wind turbines. The World Health Organization quality of life protocol reveals that residents living within 2 km (1.25 mi.) of an industrial wind energy turbine report overall diminished quality of life, physical quality of life and environmental quality of life. Those exposed to industrial wind turbine noise also experienced significantly lower sleep quality and rated their environment as less restful. This data strongly suggests that industrial wind facility noise can negatively impact quality of life. (22)

Noise associated with industrial wind turbines is often difficult to assess by the casual observer, especially someone who stands at the base of an industrial wind generator only to wonder what the fuss is all about.

According to the Cochlear Fluids Research Laboratory at Washington University in St. Louis, "Large industrial wind turbines generate very low frequency sounds and infrasound (below 20 Hz) when the wind driving them is turbulent. The amount of infrasound depends on many factors, including the turbine manufacturer, wind speed, power output, local topography, and the presence of nearby industrial wind turbines (increasing when the wake from one turbine enters the blades of another). The infrasound cannot be heard and is unrelated to the loudness of the sound that you hear. Infrasound can only be measured with a sound level meter capable of detecting it." (23)

Industrial wind turbine noise is attracting ever more interest as a public health issue says Purdue University professor Patricia Davies. She chaired the 2013 conference, which was organized in conjunction with the International Wind Turbine Noise Conference in Denver, Colorado. "A few years ago, there were just occasional papers," she says. "Certainly there's more interest right now, because of course there have been a lot more industrial wind turbines built." *Environ Health Perspect*; DOI:10.1289/ehp.122-A20

5-C - ENVIRONMENTAL CONCERNS - HABITAT

Regionally, industrial wind facilities are located on ridge tops along the Allegheny Front, a globally significant migratory bird pathway. This places chains of industrial wind turbines in competition for space that for centuries has been used by migratory songbirds and raptors. The US Fish and Wildlife is on record in disagreeing with wind promoters' assurances that bird morbidity will be non-consequential. The Agency is also concerned about the cumulative negative impact as noted in this study, "As more industrial wind facilities are built and turbine size increases, the cumulative effects of this rapidly growing industry may initiate or contribute to the decline of some wildlife populations and loss of their habitats. The potential harm to these populations from this potential additional source of mortality and habitat loss makes careful evaluation of proposed facilities essential." (24)

The American Bird Conservancy (ABC), one of the largest U.S. bird conservation organizations in the U.S., is also concerned about turbine installations sited along the Allegheny Front. In a press release commenting on the Take Permit for endangered bats obtained by Criterion, LLC, ABC had this to say: ""Federal officials have already reported that this industrial wind project has the highest per-turbine bird mortality ever estimated at a studied wind project in the United States and the highest per-turbine bird mortality ever documented in North America. It is regrettable that this project was allowed to be built in this sensitive area in the first place." "It is hard to see the industrial wind energy industry as 'green' when it is unnecessarily killing large numbers of protected birds, bats, and other wildlife—especially when such problems can be avoided early on through proper siting." (25)

Industrial wind projects on forested mountain ridges causes forest fragmentation and extensive loss of forest interior habitat. Interior forest is defined as habitat that is more than 100 meters from a clearing. For decades, professional foresters have been preaching the ills of forest fragmentation. It destroys deep woods habitat and interferes with wildlife corridors. Un-fragmented Appalachian forests are essential for maintaining viable populations of many bird and animal species.

The September 2014 Proceedings of the National Academy of Sciences published research that demonstrated industrial wind turbines actually attract bats and they are dying in unprecedented numbers at wind turbines. This is particularly true of tree roosting species. The paper concludes that fatalities of tree bats at industrial wind turbines may be the consequence of behaviors that evolved to provide

selective advantages when elicited by tall trees, but are now maladaptive when elicited by wind turbines.

5-D - ENVIRONMENTAL CONCERNS – GROUNDWATER

Forested mountain ridges are essential for maintaining adequate water resources and necessary functioning of aquatic habitats. The canopy trees on the Appalachian mountain ridges intercept rainfall so that it gently penetrates the ground as groundwater rather than flowing overland as runoff. This means that 1) the rain will gently fall to the ground and recharge groundwater and 2) the surface flow of rainwater on the ground will be slower than in cleared areas, thereby reducing the velocity and quantity of storm water drainage. Conversely, where development occurs on forested ridges or where there are numerous roads constructed on forested ridges, the protective tree canopy is lost, the storm water flow is greater in the cleared areas, groundwater is intercepted by road construction, and increased storm water drainage results in habitat destruction within streams and the consequent death of aquatic organisms.

Groundwater maintains seeps and springs which constitute the headwaters of watersheds. Forests provide the shade necessary for aquatic species to survive in the headwater areas. The River Continuum Concept, by Vannote, R.L., G. W. Minshall, K.W. Cummins, J.R. Sedell, and C.E. Cushing (The River Continuum Concept, 1980, Canadian Journal of Fisheries and Aquatic Sciences 37: 130-137) (26) illustrates the changes in dominant aquatic species in the headwater areas and in successive downstream aquatic habitats. Shredders, predominant in the forested headwaters, break down organic matter which is used downstream by collectors and filter-feeders. The filter-feeders are subsequently consumed by larger benthos and fish. Therefore, the headwater areas constitute the base of the aquatic food chain. In summary, deforestation of headwater areas results in destruction of the aquatic food chain, decreased groundwater recharge, and increased surface runoff which causes increased stream discharge and downstream bank erosion, resulting in destruction of downstream aquatic habitats.

Construction of industrial wind facilities on mountain ridges requires clear cutting of forests. Approximately 7 acres of forest must be timbered around each industrial wind turbine pad. Additionally, hundreds of acres are deforested for roads to be constructed to transport wind turbine components. Because of the special requirements for large vehicles transporting the wind turbine components, the roads must be less than six inches in height difference for each 50 feet of roadway. On the steep mountain slopes, this requires the roadway fill material to

be as much as 70 feet high, with fill embankment slopes making the roadway footprint as much as 100 feet wide. These construction requirements result in significant amounts of deforestation.

"The Importance of Imperviousness", an article presented in the Center for Watershed Protection's (27) Watershed Protection Techniques, 1(3): 100-111, provides data illustrating that only 10 percent of impervious cover within a watershed can negatively impact the watershed and receiving stream. Although there may be very few areas within the watershed that are strictly impervious, a discharge value can be determined for the situation of a ten percent impervious cover. Then, the area can be weighted in accordance with the type of ground covers in the watershed to calculate the post construction storm water discharge. If this discharge is equal to or greater than the discharge that would occur if there were a ten percent impervious cover in the watershed, then it is logical to conclude there will be a negative impact to the stream. When the DEP issues a NPDES permit for storm water discharge, they require that the change in discharge be calculated for only the construction site, not the watershed. They use this information to evaluate the erosion control structure at the discharge point from the construction site. Note that this does not take into account the impact of the increased discharge downstream. Even though the erosion control structure may control the amount of sediment entering the stream, the increased discharge will cause downstream erosion. Therefore, sediment will enter the stream downstream because of stream bank erosion, resulting in harm to aquatic habitats and allowing increased amounts of sediment to be transported to downstream areas in the watershed, such as the Chesapeake Bay. West Virginia's neighboring commonwealths (states) of Pennsylvania and Virginia have developed regulations requiring each county to develop a storm water management plan. Mifflin County, PA, has developed a comprehensive plan incorporating evaluations of watersheds and evaluations of stormwater resulting from development within each watershed in order to improve water quality of impaired waters and also to prevent degradation. (28) Such plans consider the attributes of the forested mountainous areas to protection of watersheds, the steepness of the terrain, the presence of karst terrain, the presence of springs and seeps, the presence of high water quality streams, and the presence of cold water spawning streams for cold water fishes (specifically salmon and trout). It is very clear that wind facilities cause environmental destruction and should not be constructed on mountain ridges.

5-E - HERITAGE VALUES

Why do we like living here? This question is often asked at planning meetings or

similar gatherings and usually the answer is, "Because we love our mountains". For those lucky enough to live here and for those drawn here to live, the serenity and beauty of mountain vistas loom large in our sense of security and happiness. This is one of our most intrinsic values.

That value is altered with the industrialization of mountain ridges by industrial wind turbine facilities and it is only a matter of time that we will become known more for the mountaintop industrial wind turbines than for the unblemished vistas we now enjoy.

The question is, "***Do we care enough to prevent this from happening?***"

5–F - Grid Scale Wind and Carbon Emissions.

Grid Scale Wind proponents claim that, by replacing fossil fueled power plants, carbon emission will be reduced.

AHA has determined that GSW has not performed this function to the level required to justify the massive environmental sacrifice and taxpayer funding via subsidies necessary to support this technology.

As example, on August 8, 2009, the Nature Conservancy and Northwestern University published an article in the rigorously peer reviewed online journal, PLOS, titled, **Energy Sprawl or Energy Efficiency: Climate Policy Impacts on Natural Habitat for the United States of America.** (http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0006802)

The article, which compared the land mass consumed by various energy sources projected to 2030, prompted Tennessee Sen. Lamar Alexander to address the large landmass consumed by wind turbines in a Wall Street Journal editorial stating that, "*We are about to destroy the environment in the name of saving it."*

Alexander, commenting on the government's plans to expand wind facilities said, "*This would require building about 186,000 50-story industrial wind turbines that would cover an area the size of West Virginia—not to mention 19,000 new miles of high-voltage transmission lines*."

Senator Alexander's lament, unfortunately, is being played out. For example, in 2013 and 2014, driven by federal and state subsidies significantly higher per MW

than the support received by other energy sources, the number of industrial wind turbines in the U.S. has grown dramatically.

According to the Global Wind Energy Council, at the end of 2012 there were more than 225,000 industrial wind turbines operating around the world in about 80 countries. www.gwec.net/.../how-many-wind-turbines

Evidence that industrial wind energy is not meeting the proclaimed carbon emission goals is accumulating. An agency of the federal government came to that conclusion. As reported by the non-profit Institute for Energy Research (IER), the Argonne National Laboratory, part of the Department of Energy, released a study in 2012 that found wind energy does not reduce carbon dioxide emissions from electricity generation as much as expected due to the need to ramp up and down fossil fuel plants when the wind is blowing or not blowing. http://instituteforenergyresearch.org/analysis/argonne-lab-study/

The Argon researchers say: *"The reduction in emissions during operational periods is great enough that the trend of total emissions is clearly decreasing with increasing wind power penetration. However… we see that for most pollutants, the marginal emissions benefits are reduced for high wind power penetration levels, mainly driven by the higher start-up emissions [of fossil-fuel plants]."*

The quote from IER, "When fossil fuel plants are operated at less than full power, they operate less efficiently from a fuel use perspective. Thus, when their demand is reduced to make room for wind power, which generally occurs at night when winds are the strongest, base-load fossil plants are cycled down. As the wind dies down, these fossil plants are started up again, using more fuel and releasing more emissions upon start-up. The concept is similar to the inefficient fuel use of a vehicle in stop-and-go traffic."

This study concentrated on the situation in Illinois but it is not a new finding. A study in Colorado by Bentex Energy, LLC found the same thing. This study also explains why emissions are often increased when wind power needs back up from fossil fuels: "Most coal plants are not designed to be cycled, and doing so makes their operations inefficient, increasing SO, NO and CO." http://www.wind-watch.org/documents/wp-content/uploads/BENTEK-How-Less-Became-More.pdf

The message of these studies is that when fossil fuel back up is required a decrease in the exaggerated carbon emissions occurs.

When considering carbon emission reduction, one must recognize that GSW also has a significant carbon footprint, as noted in a government report.
The U.S. Department of Interior and the U.S. Geological Survey published a report on June 16, 2011 (revised on September 4, 2012) titled, **Wind Energy in the United States and Materials Required for the Land-Based Wind Turbine Industry From 2010 through 2030**. http://pubs.usgs.gov/sir/2011/5036/

The analysis is based on the assumption that wind will be supplying 20% of the nation's electricity by 2030. The foundation and accuracy of the current U. S. administration's assumption is unclear, but this report describes a very high carbon footprint for the wind industry.

The study projects annual consumption of the building blocks needed to install industrial wind turbines:

- 6.8 million metric tons of concrete,
- 1.5 million metric tons of steel,
- 310,000 metric tons of cast iron,
- 115,000 metric tons of fiberglass,
- 40,000 metric tons of copper, and
- 150,000 metric tons of aluminum. (1 metric ton = 1.102 tons)
- 380 tons of the rare-earth element neodymium
- 50,000 square kilometers of land, (4.047 sq. kilometers = 1000 acres (Whether or not this includes acres needed for roads and transmission lines is not clarified.)

Other wind requirements that increase carbon emissions not included in the report include:

- CO2 release during turbine decommissioning,
- Fossil fuel combustion during turbine construction, maintenance and decommissioning,
- CO2 release when coal and natural gas are used as a backup fuel,
- Methane release when natural gas is used as a backup fuel,
- CO2 consequences of deforestation. (This is particularly important in the eastern U.S. where trees must be cleared to maximize the available wind. It is widely accepted that an important remediation for global warming is to plant trees. Yet, the first step in establishing a wind turbine facility on eastern mountain ridges is to cut down the trees.)

The USGS report concluded that, with the exception of neodymium, the anticipated materials needed for onshore wind development through 2030 are easily accommodated. (The role of Neodymium and other "rare earth minerals" is discussed below.)

The USGS report would have been more helpful if it had analyzed the CO2 cost of building, maintaining and disposing of turbine facilities. It would have also been more enlightening if a global perspective was used.

While the prevalent opinion is that wind energy helps reduce carbon emissions, convincing evidence is lacking and the agreement that carbon dioxide emissions are reduced by wind is far from being universally accepted. This debate has been raging for ten years or more.

We agree with a January 9, 2012 editorial for Britain's newspaper, **The Guardian**, "*Wind energy remains a highly controversial way to generate electricity for a variety of reasons, not least the costs and aesthetic impact*." Further, "*Such an important question (whether wind actually increases CO2 emissions because of its dependence on back up fossil fuels) needs to be discussed and analyzed – advocates of wind power shouldn't shy away from such a debate – but we are no nearer to uncovering the truth about this issue. . .*" and "*Until some independent, peer-reviewed research is published on this matter, this question will remain unanswered*."
http://www.theguardian.com/environment/blog/2012/jan/09/wind-turbines-increasing-carbon-emissions

As we have documented in Section 3, describing Germany's experience, an in-depth study was done in 2014 by Germany's Expert Commission on Research and Innovation. It concluded that their law that promoted wind energy is "*neither cost-effective nor is it an effective tool for climate protection*."
http://windresistanceofmelancthon.com/2014/02/27/german-government-advisers-call-for-abolition-of-renewables-subsidies/

The U.S. government may be taking another look at its role in the industrial wind industry. In March of 2013 the U.S. General Accounting Office said the U.S. government has not justified its financial support of industrial wind energy and that failure could lead to unnecessary federal funding to boost the industrial wind industry. Washington (Platts)--28Mar2013/606 pm EDT/2206 GMT

We conclude this discussion on carbon emission and industrial wind by describing the industries' growing dependence on rare earth minerals, particularly neodymium. It is ironic that harvesting rare earth minerals, a business claiming to be "clean and green," depends on strip mining and a very environmentally harmful smelting process. Rare earth minerals, when combined with iron and boron forms a strong permanent magnet which replace the turbine gearbox for greater efficiency and maintenance.

The two major uses for Neodymium are for permanent magnets in wind turbines and hybrid cars. Over 700 pounds of Neodymium are in one turbine and each Prius automobile requires 2.2 pounds. www.reuters.com/.../us-mining-toyota-idUSTRE57U02B2009083...

The problem is that not only does the ore containing neodymium require blasting and strip mining, a large number of steps are required in the refining process that involve a series of chemical treatments. There is a huge amount of toxic and radioactive waste generated which must be handled either through costly recycling or pumping it into holding tanks and ponds.
http://web.mit.edu/12.000/www/m2016/finalwebsite/elements/ree.html

China has controlled the market because weak or non-existent environmental laws have allowed them to undersell other sources. The result has been a major environmental disaster for northern China. In January of 2011 an expose' by the London **Daily Mail** documented the devastation in and around the city of Baotou involving smoking factories, a five mile lake of toxic chemicals, the killed farm land for miles around and thousands of people made ill from breathing the acrid air.

The article and the public outcry from it and other reporting prompted China to pass its first environment protection law that is designed to address these insults. But it will take 15 years for them to do it.

China is also removing herself from controlling the market. On January 5, 2015 the Wall Street Journal reported on China's decision to end export quotas on rare earth minerals. The result is that China, which produced about 93% of the world's rare earths, as of 2015 has about an 86% share.

There are sites all over the world, in California, Canada, Sweden, for example, and they are gearing up to fill the slack in the current market. The big question is, will other nations, including ours, enforce strict environmental protections as they mine and refine rare earth minerals? The record of ineffective protections in the U. S. regarding strip mining points to potential for problems.

At any rate, AHA believes it is obvious that wind in neither clean nor green.
http://www.usnews.com/news/national/articles/2009/07/01/americas-new-energy-dependency-chinas-metals

6 – Footnoted Links

1. http://greatercc.org/workgroups/energy/
2. http://www.nrel.gov/gis/wind.html
3. http://rogerpielkejr.blogspot.com/2014/06/treading-water.html
4. http://opinion.financialpost.com/2014/03/18/governments-rip-up-renewable-contracts/
5. http://windresistanceofmelancthon.com/2014/02/27/german-government-advisers-call-for-abolition-of-renewables-subsidies/
6. http://www.businessweek.com/news/2014-02-26/merkel-advisers-urge-germany-to-end-clean-energy-subsidy-program
7. http://dailycaller.com/2014/02/07/spain-ends-subsidies-to-nearly-40-percent-of-its-wind-energy-capacity/
8. http://www.aweo.org/problemwithwind.html
9. http://www.engerati.com/article/germany%E2%80%99s-energiewende-destabilizing-grid
10. http://www.nltimes.nl/2014/06/13/massive-dutch-fund-sticks-fossil-fuel-investments-avoids-wind-farms/
11. http://www.gao.gov/assets/660/652957.pdf
12. http://online.wsj.com/news/articles/SB10000872396390444517304577653403069902104?mg=reno64wsj&url=http%3A%2F%2Fonline.wsj.com%2Farticle%2FSB10000872396390444517304577653403069902104.html
13. http://www.treasury.gov/initiatives/recovery/Pages/1603.aspx
14. http://www.usnews.com/opinion/blogs/nancy-pfotenhauer/2014/05/12/even-warren-buffet-admits-wind-energy-is-a-bad-investment
15. http://blogs.rollcall.com/wgdb/sparring-resumes-over-wind-tax-extenders/
16. http://www.forbes.com/sites/larrybell/2014/02/09/loss-of-production-tax-credits-brings-big-wind-chill-to-cooling-subsidy-dependent-market/
17. http://www.irs.gov/pub/irs-drop/n-15-25.pdf
18. http://www.michigancapitolconfidential.com/20207
19. http://www.telegraph.co.uk/earth/energy/windpower/10122850/True-cost-of-Britains-wind-farm-industry-revealed.html
20. http://www.nationalreview.com/articles/316854/cost-wind-energy-jobs-robert-bryce
21. http://www.juandemariana.org/pdf/090327-employment-public-aid-renewable.pdf
22. http://www.ncbi.nlm.nih.gov/pubmed/21959113
23. http://oto2.wustl.edu/cochlea/wind.html
24. http://www.fws.gov/southwest/es/oklahoma/windpower.htm
25. http://www.abcbirds.org/abcprograms/policy/collisions/wind_policy.html

26. http://limnology.wisc.edu/courses/zoo548/RCC%20handout.pdf
27. http://www.cwp.org/
28. http://www.co.mifflin.pa.us/PlanningandDevelopment/Documents/Stormwater%20Management/FINAL%20County%20Act%20167%20Plan/Final%20Mifflin%20County%20Act%20167%20Plan.pdf

7 - RESOURCES AND REFERENCES

For the sake of simplicity, there are many ramifications of this issue that are not visited in this presentation. For additional information, please review the following web sites:

National Watchdog Websites

www.windaction.org Industrial Wind Action Group provides information on understanding wind energy to enable communities and Government officials to make informed decisions.

www.wind-watch.org National Wind Watch presents research material and news about Industrial Wind Power and comprehensive steps of what you can do if your community is targeted.

http://www.masterresource.org/ MasterResources A free-market energy blog. MasterResource is a blog dedicated to analysis and commentary about energy markets and public policy.

West Virginia Public Service Commission

www.psc.state.wv.us WV Public Service Commission on this site you can read all documents filed with the PSC. by case number or you can look at daily incoming documents.

Informational Websites

www.stopillwind.org Jon **Boone from Maryland is very knowledgeable about all aspects of the impact of industrial wind facilities. The site provides information and educational resources for the public. It is not interactive or responsive to inquires.**

http://alleghenytreasures.com/ great informational blog

www.northnet.org/brvmug/WindPower/articles.html John Droz, Jr, is a physicist who has also been an environmental activist for some 25 years. John is also very knowledgeable about the impact of industrial wind facilities. The site provides information and educational resources for the public.

www.vawind.org addressing environmental issues with industrial wind turbines maintained by Rick Webb of UVA and Dan Boone.

http://www.mdwind.org/ addressing environmental issues with industrial wind turbines, Dan Boone

Grid Monitoring Websites

http://www.bpa.gov/corporate/WindPower/ see link for Wind Generation in the Last Seven Days

http://www.ieso.ca/imoweb/siteshared/windtracker.asp IESO Wind Tracker

Specific Projects Websites

www.laurelmountainpreservationassociation.org provides information and avenues for education, research and outreach concerning threats to the natural and historical attributes of the Laurel Mt. region of WV

http://saveouralleghenyridges.org/ an organization devoted to preserving Pennsylvania's Allegheny Mountains, a valuable scenic and wildlife resource

Industry Website

www.awea.org American Wind Energy Association obviously pro industrial wind