CLEO Consulting Partners

A Constructive Critique of T. Boone Pickens' Plan

April 12, 2009

This analysis of the "Pickens Plan" is the second in a series of CLEO Consulting Partners reports on issues related to creating an economically and environmentally sustainable energy policy for the next forty years. Our first report, issued on April 2, 2009, is an analysis of President Obama's "New Energy for America Plan".

On March 31, 2009 the DOE publically released its final 2009 Energy Forecast which forecasts energy supply, demand and prices through 2030. We tested the reasonableness of achieving the goals of the two plans in comparison to the DOE forecast data. With respect to the Pickens Plan we also used the July 2008 DOE report "20 Percent Wind Energy by 2030, Increasing Wind's Contribution to U.S. Electrical Energy Supply" as a benchmark. It is important to understand that the 20 percent wind energy report "forced" the DOE economic model to create a 20 percent market share. The 2009 DOE Energy Forecast, which weighs all the options, only allocated 2% of the national electric generating capacity to wind power by 2025 and less than 0.1% for solar power.

We are disappointed to see the exaggerated claims and unachievable goals posted on the PickensPlan.com website. The same is true of the White House website describing the goals of President Obama's New Energy Plan for America. Now is not the time to raise false hopes. The American people need to be educated on the difficult choices facing U.S. policymakers and the realistic options we have for solving our problems. We need a greener America and we need to create more employment in all sectors of the economy. The issues are complex. In 2050 the quality of life of 400 million Americans will depend on the decisions we make over the next several years.

Despite the exaggerated claims, the Pickens Plan is a valuable contribution to the national debate. We should continue to expand our ability to produce electricity from wind wherever it is economically feasible. Based on the DOE data, it appears that wind power can economically provide approximately 10% of our electricity by 2050. However, even if the U.S. were to supply 22% of our electrical power generation, our GHG emissions from electrical generation will be higher in 2050 than it is today. To reduce emissions to the 2050 target level will require the retrofitting of existing plants and the construction of new nuclear and clean coal power plants. Pickens' suggestion to convert our heavy vehicle fleet to natural gas has merit. This conversion would directly reduce our imports of foreign oil and contribute to a reduction in GHG emissions.

Over the past thirty years, five administrations have taken an unbalanced, piecemeal approach to energy policy. The green energy aspirations of President Obama are admirable but are as unbalanced, with respect to the overall policy, as those of previous administrations.

As turnaround professionals, CLEO Consulting Partners offer suggestions on how to achieve the President's goals while spending less, taxing less, speeding up the transformation process, reducing costs and lessening our risk of default on our Chinese line of credit. We trust that you will find the attached report informative and that it stimulates additional suggestions on improving America's long term energy and environmental policy.

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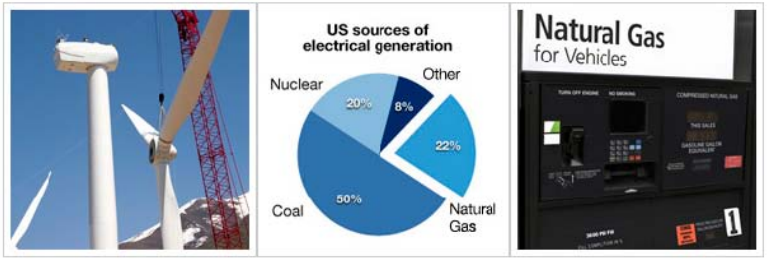
A Constructive Critique of T. Boone Pickens' Energy Plan

By H. Andrew Thornburg, Principal and Founder, CLEO Consulting Partners



The Pickens Plan *(Text verbatim as it appears on the website PickensPlan.com)*

"There are several pillars to the Pickens Plan:

1. **Create millions of new jobs by building out the capacity to generate up to 22 percent of our electricity from wind. And adding to that with additional solar capacity;**
2. **Building a 21st Century backbone electrical grid;**
3. **Providing incentives for homeowners and the owners of commercial buildings to upgrade their insulation and other energy saving options; and**
4. **Using America's natural gas to replace imported oil as a transportation fuel."**

Executive Summary

We tested the reasonableness of achieving the Pickens Plan's benchmark goals set forth above against the Department of Energy's (DOE) 2009 Energy Forecast released on March 31, 2009. The DOE report forecasts energy supply, demand and prices through 2030. A summary of this data is included in this report. Our findings related to the Pickens' principal goals are as follows:

- **Generating up to 22 percent of our electric power from wind.** *It will be well beyond 2030 before wind energy will approach a 22% share of our electric power. Pickens cites a 2007 DOE study as the basis for his claims. In July 2008, the DOE issued a 228 page, "what if" report that set forth what will be required to install 20% wind power capacity by 2030. The DOE model "forced" the 20% result. In contrast, the annual DOE energy forecast is based on a comprehensive model that evaluates all alternatives. The results are quite different. The 2009 Energy Forecast projects that wind will produce 2% of our electric power by 2025, a 350% increase from its 2007 market share. This paper summarizes the key exhibits and conclusions from both DOE reports, including the need to expand the national electrical grid. Clean fossil fuels and nuclear energy are going to be the primary technologies available to significantly reduce Green House Gas (GHG) emissions by 2050 on an economically feasible basis.*
- **Using natural gas to replace imported oil as a transportation fuel.** *This idea appears to have great merit given that heavy vehicles are forecast to account for the equivalent of 2.3 million barrels per day of petroleum in 2009. This is equal to 22% of 2009 forecast oil imports and approximately 5% of U.S. Green House Gas (GHG) emissions. This idea should be analyzed.*
- ***S*upplementing wind with additional solar capacity.** *According to the DOE 2009 Energy Forecast, solar energy will account for less than 0.1% of our electrical capacity in 2025 due to its high cost.*
- **The public is being oversold on the potential of solar and wind.** *Many of the claims made in President Obama's New Energy Plan for America and the Pickens Plan are simply not supported by DOE studies. For example, if we were to have a crash program to produce 20% of our electricity from wind by 2030, the DOE estimates we will create an average of 286,000 jobs over 24 years, not millions of new jobs.*

Exaggerated claims made on the PickensPlan.com website:

(Non-italicized text verbatim as it appears on the website)

1. "In 1970, we imported 24% of our oil. Today it's nearly 70% and still growing. Projected over the next 10 years the cost will be $10 trillion — it will be the greatest transfer of wealth in the history of mankind."

   We agree with Mr. Pickens that we cannot afford our level of petroleum imports. However, he is overstating the case. The DOE forecasts that we will import: 53% of our liquid fuels in 2009; 46% in 2018; and 41% in 2030. Increased domestic oil and bio-fuel production is responsible for 70% of the decline in oil imports. Table 11 of the DOE 2009 Energy Forecast estimates the ten-year cost from 2009 to 2018 will be $3.154 trillion dollars in 2007 dollars. This is still an enormous amount of money. The DOE forecasts that the U.S. will be spending more than $1 billion per day for oil starting every year from 2015 through 2030, the equivalent of three Iraq wars without end. The 2009 DOE reference case forecasts oil at $124 per barrel in 2007 dollars. In the high cost case, it is forecast at $200 per barrel. At this price level, the adverse impact on the economy is so severe that the balance of payments deficit will only be slightly higher. In the reference case, gasoline in 2030 is forecast to cost $5.63 per gallon and, in the high cost case, $7.89 per gallon in 2007 dollars. By 2015 the DOE projects gasoline prices in excess of $4.00 per gallon, not including the additional taxes associated with the cap-and-trade taxes proposed by Congress. The next energy crisis is close at hand.

2. "Building new wind generation facilities, conserving energy and better utilizing our natural gas resources can replace more than one-third of our foreign oil imports in 10 years. But it will take leadership."

   "Nearly 20% of every barrel of oil we import is used by 18-wheelers moving goods burning imported diesel. An over-the-road truck cannot be moved using current battery technology. Fleet vehicles like buses, taxis, express delivery trucks, and municipal and utility vehicles (any vehicle which returns to the "barn" each night where refueling is a simple matter) should be replaced by vehicles running on clean, cheap, domestic natural gas rather than imported gasoline or diesel fuel."

   Building new electrical generation facilities will not save a significant amount of oil as only 220,000 barrels per day in 2009 are forecast to be used to generate electricity, 2.5% of 2009 estimated oil imports. According to the DOE, improving the U.S. fleet mileage to 35 miles per gallon will save approximately 1.1 million barrels per day, 12% of our existing oil imports. Therefore, we would have to convert all of our heavy fleet vehicles to natural gas within 10 years to achieve a one-third reduction in our foreign oil imports. This is not a realistic ten-year goal. The DOE also warns that: if new nuclear, renewable and fossil fuel plants are not constructed in time, more natural gas plants will be required to meet stricter emission standards. In the worst case DOE scenario gas prices quadruple by 2030, if the cap-and-trade program is also implemented.

3. "Any discussion of alternatives should begin with the 2007 Department of Energy study showing that building out our wind capacity in the Great Plains – from northern Texas to the Canadian border would produce 138,000 new jobs in the first year, and more than 3.4 million new jobs over a ten-year period, will also producing as much as 20 percent of our needed electricity."

   The above characterization of the DOE's findings is extremely misleading. It should be noted that this study "forced" the 20% wind capacity into the planning model without taking into account existing sources of energy that would have to be retired before the end of their economic lifetime. It also creates distribution systems that may not be constructed over this period of time. The full 228 page DOE (Report DOE/GO 102008-2567 issued in July 2008 "20 Percent Wind Energy by 2030, Increasing Wind's Contribution to U.S. Electrical Energy Supply") makes no such claims. For the 24-year period from 2007 to 2030 it calculates that under these forced assumptions there will be an average of 285,755 jobs per year, including construction workers, and a total of 216,578 full time operating jobs in 2030. The CUMULATIVE JOB YEARS created over this 24 year period are 6,210,129 and the AVERAGE ANNUAL JOBS are 285,755.

Discussion

The DOE report, “20 Percent Wind Energy by 2030” contains a number of observations and exhibits which are key to understanding both the promise and problems associated with wind energy, despite the fact that it is based on a model that **”forces”** wind capacity. As one can see below, solar energy plays no meaningful part in these studies. In 2030 we are still dependent on coal for 55% of our electrical energy in 2030.

Figure A-5. 20% Wind Scenario electricity generation mix 2000–2030

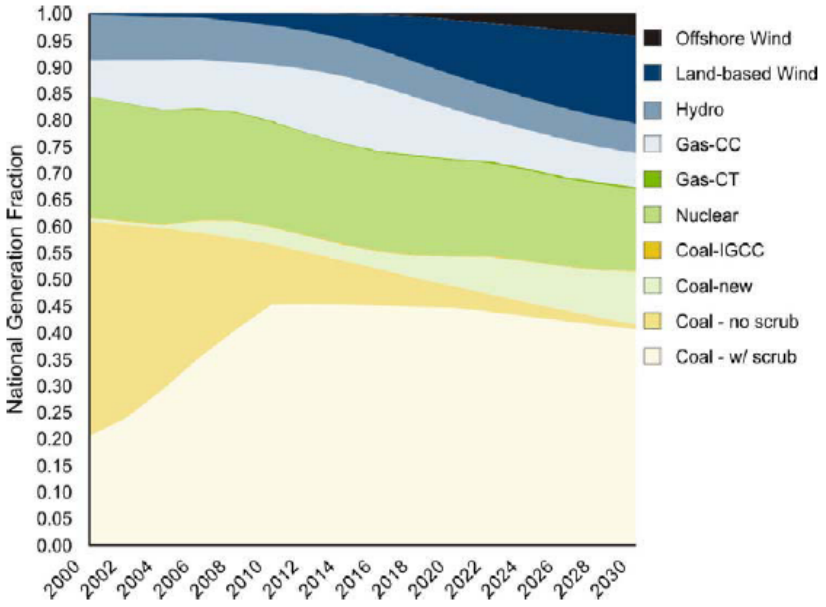
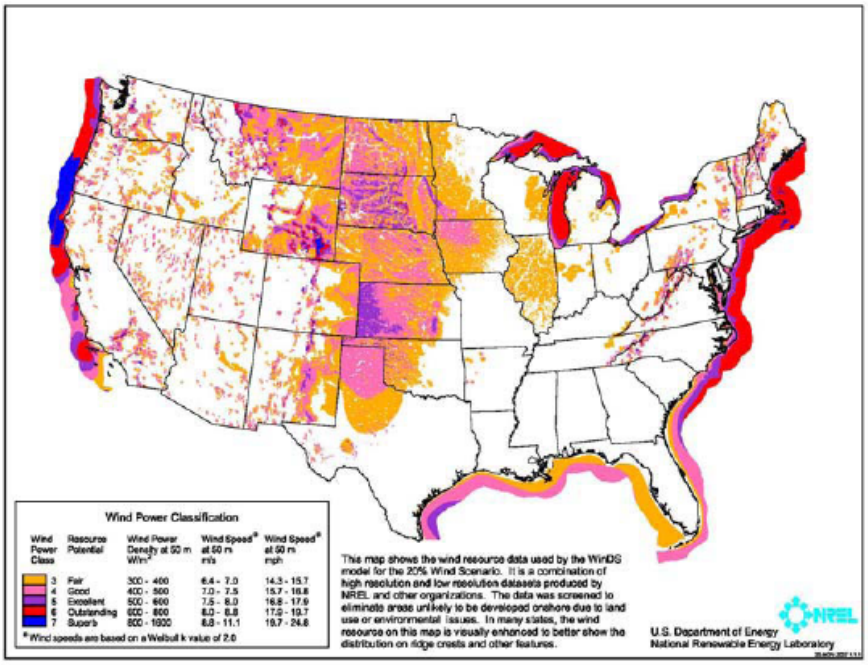


Figure 2-1. The wind resource potential at 50 m above ground on land and offshore



1. How realistic is a 20% goal? Electric energy generating capacity is projected to grow by 19% between 2010 and 2025. To achieve the Administration's goal, the only plants that could be built over this entire period would have to be based on wind energy. Wind energy technology is ready to make an economically significant contribution to the country's energy supply. However, because of the uncertainty of weather conditions, the DOE limits the percent contribution of wind generated electricity in any region of the country to a maximum of 12%. Wind energy is not the only way to reduce the emission of greenhouse gases.

2. The table below shows the relative cost advantages of competing electric generating technologies.

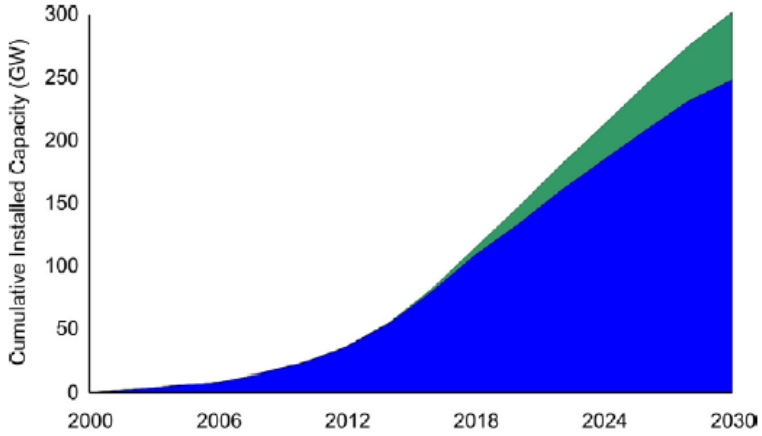
Comparative Cost Characteristics for Electric Generating Technologies vs. Nuclear

Cost Difference vs. Nuclear	2015			2030		
% cost per kw	Low Cost	**Reference**	High Cost	Low Cost	**Reference**	High Cost
Adv Gas Turbine	-71%	**-71%**	-71%	-69%	**-70%**	-71%
Adv Gas w/Carbon Capture	-44%	**-43%**	-43%	-43%	**-44%**	-46%
Wind	-41%	**-41%**	-41%	-31%	**-32%**	-35%
Adv Coal	-28%	**-28%**	-28%	-23%	**-24%**	-27%
Adv Nuclear	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**
Adv Coal w/Carbon Capture	5%	**5%**	5%	8%	**7%**	2%
Wind Offshore	15%	**15%**	15%	22%	**21%**	15%
Solar Thermal	43%	**43%**	43%	32%	**30%**	24%
Solar Photovoltaic	75%	**75%**	75%	64%	**61%**	54%

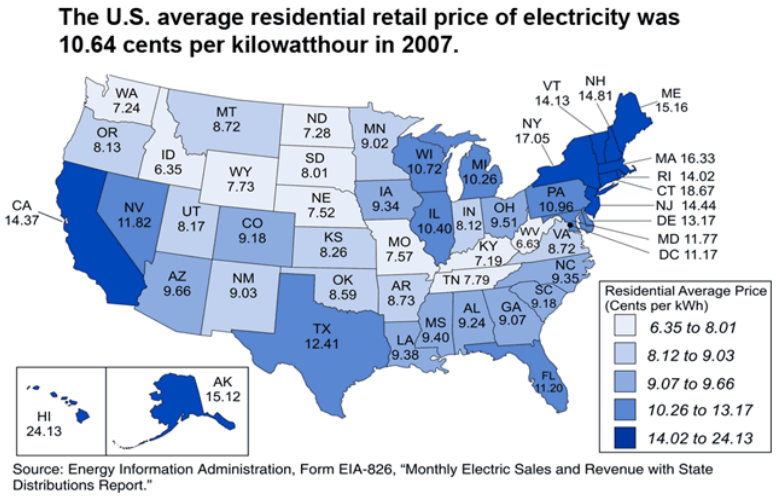
Source: DOE 2009 Energy Forecast Assumptions, Table 8.13, March 2009

There is no getting around the fact that anything we do to limit emissions is going to result in higher costs for energy. To keep job losses in the overall economy to a minimum, we must evaluate the financial impact of all of the competing technologies. If zero emissions is the national goal, onshore wind is the lowest cost alternative. Offshore wind is significantly more expensive than nuclear power. Wind and solar sources are dependent on nature; therefore the energy they produce cannot at present be stored for later use at a reasonable cost. This limits their total potential contribution of solar and wind to 20-25% of our energy supply, even with an expanded national grid. Therefore, nuclear power and advanced coal technologies are going to continue to be the source of 70% of our electrical generating capacity.

Figure A-4. Cumulative installed wind power capacity required to produce 20% of projected electricity by 2030

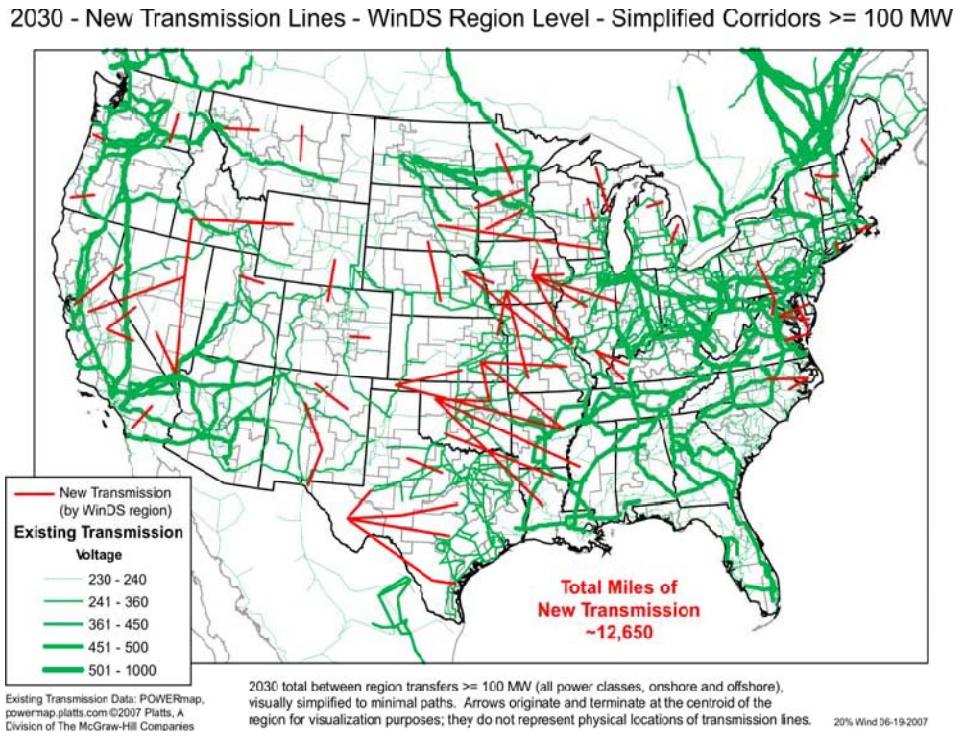


3. Electric utility rates matter. Increases in electric utility rates, if they are not offset by corresponding increases in efficiency, are the equivalent to a tax on individuals and businesses. California has been a leader in the production of green energy. It also has a residential retail electric price 35% higher than the national average and 85% higher than Tennessee which produces much of its power from hydroelectricity. The production technology mix determines electric rates and the competitiveness of US products which require large amounts of electrical energy per unit of production.



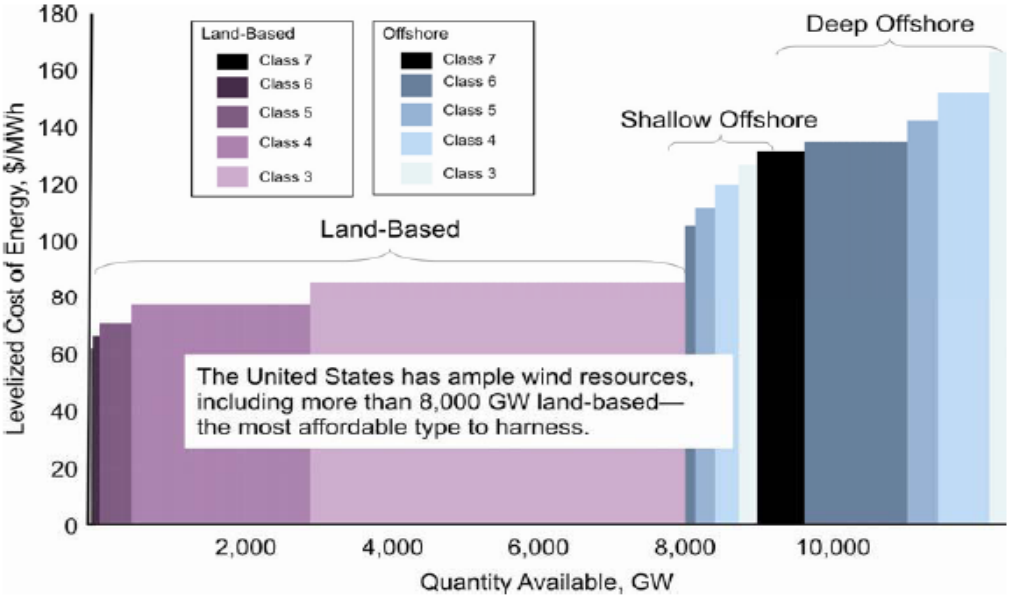
Source: Energy Information Administration, Form EIA-826, "Monthly Electric Sales and Revenue with State Distributions Report."

4. The cost of adding 12,000 miles of new transmission lines to our existing 200,000 mile system is estimated to cost $20 billion in 2008 dollars. The industry spends approximately $5 billion per year on the electrical distribution system. Thus, this incremental cost is relatively small.



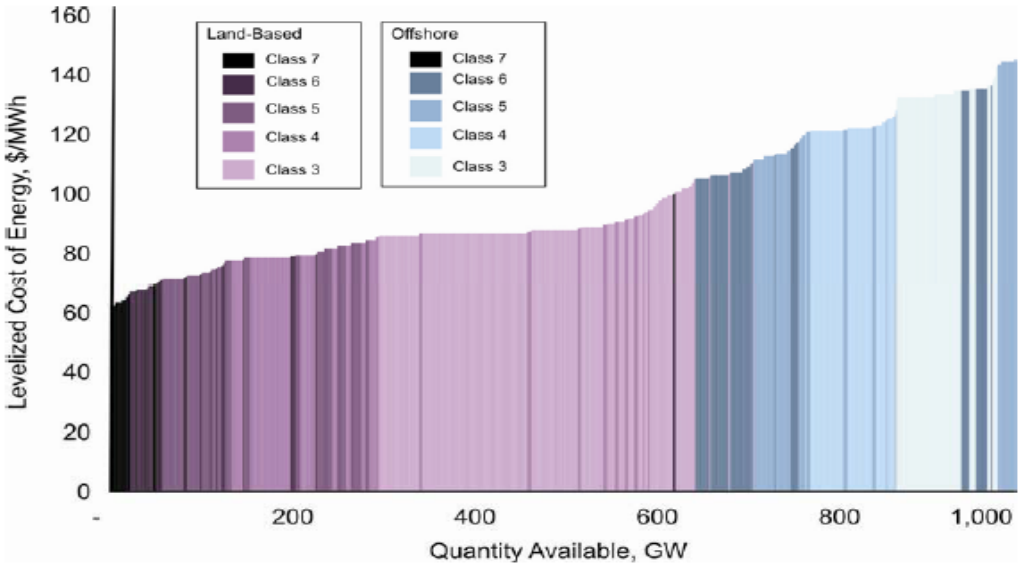
5. The real challenge is to determine how much of wind resources should be utilized. The incremental costs, as shown below, are significant.

Figure A-2. Supply curve for wind energy—current bus-bar energy costs



A 10% wind power market share appears to be a more economically viable target. This will keep maximum costs below 14 cents per kilowatt hour. At 10%, the uncertainty of availability of wind power is within the excess power 15% reserve capacity of the existing systems. This would minimize or eliminate the need to build additional capacity when the wind is not blowing.

Figure A-3. Supply curve for wind energy: energy costs including connection to 10% of existing transmission grid capacity



6. Even if the 20% goal could be achieved technically, the financial issues are complex. Who pays for the creation of a national grid? What is the cost of electricity paid by the consumer? Can investor and taxpayer owned utilities and distribution companies make an acceptable return on their past and future

investment? There are approximately 200 investor-owned utilities, 70 large municipal, federal or state systems, and 50 rural generating and transmission cooperatives that supply power for more than 3,000 local distribution companies. Do the taxpayers cover the national debt service on their investment, or would some of this investment have a higher return in the President's education and healthcare initiatives? Will higher US electric rates force energy intensive US manufacturing businesses to move offshore?

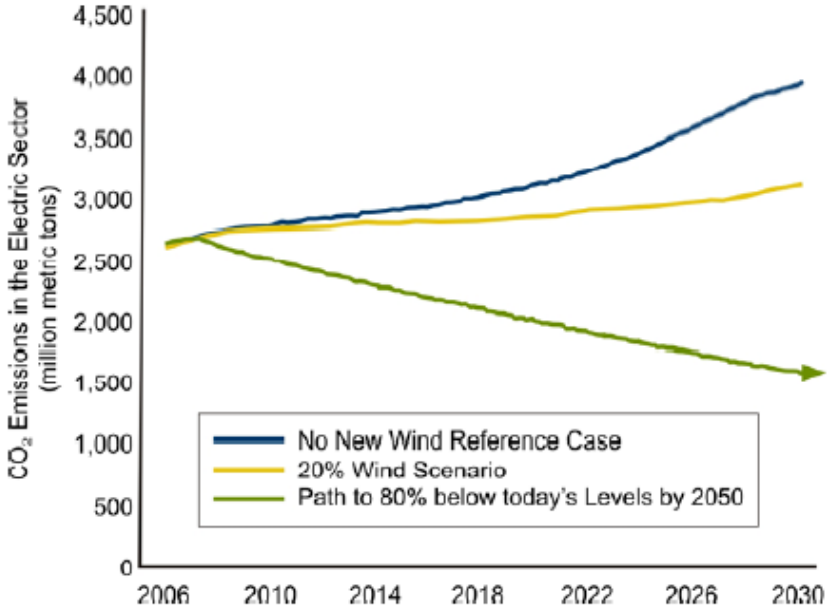
7. Water conservation is an added benefit of wind power that is usually overlooked in most discussions of benefits. With 20% of our energy produced from wind, the DOE estimates up to 8% of our water consumption can be saved. Seventy percent of the savings are in the West and Great Plains.

Table A-5. Water consumption rates for power plants

Generation Type	Water Consumption Rate: Gallons per MWh	Source (see list of references for full citation)
Coal-Fired Steam	541	EIA Form 767 for 2002
Gas-Fired Combined Cycle	180	EPRI; Clean Air Task Force & Western Resource Advocates
Nuclear	609	EIA Form 767 for 2002
Oil- or Gas-Fired Steam	662	EIA Form 767 for 2002
Combustion Turbine	0-100	See note below
Wind	0	Clean Air Task Force & Western Resource Advocates

8. CO2 reductions are significant if 20% of our capacity generated by wind. However, in 2030 we will still be producing more CO2 than we are today. Building clean coal and nuclear power plants are the only way we will be able to meet our 2050 emission targets.

Figure 1-13. CO_2 emissions from the electricity sector



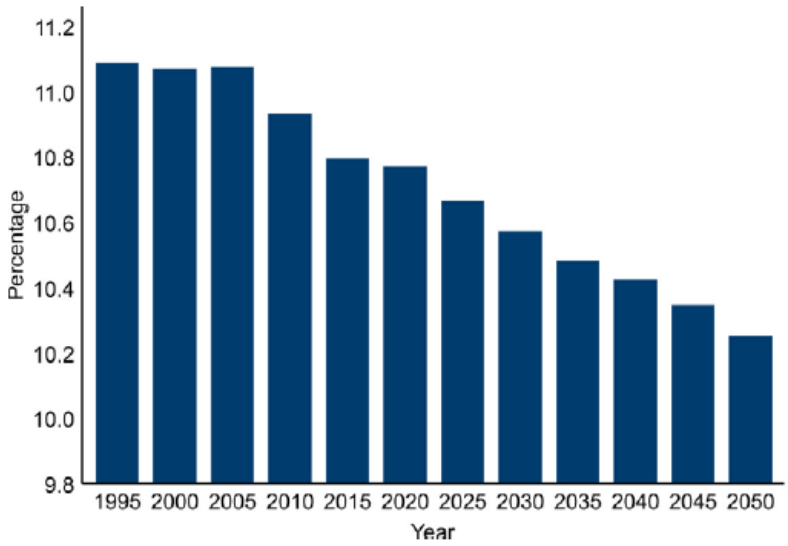
9. New jobs created by wind power will not be in the millions. It will be in the hundreds of thousands, as shown in the following chart for the forced 20% capacity case. Including construction workers, an average of 286,755 workers are employed during the 24-year period. In this particular study, the DOE did not estimate the jobs lost elsewhere in economy because of higher energy prices. As reported in our critique of President Obama's New Energy for America Plan, the DOE estimated that the cap-and-trade program could reduce the GDP output in the industrial sector by 2.9% to 7.4%.

Table C-4. U.S. operations-related economic impacts from 20% wind

Operation of 300 GW in 2030	Jobs	Earnings	Output	
Direct Impacts	76,667	$3,643	$8,356	
Plant Workers Only	28,557	$1,617		
Nonplant Workers	48,110	$2,026		
Indirect Impacts	37,785	$1,624	$5,642	
Induced Impacts	102,126	$3,822	$13,429	
Total Impacts (Direct, Indirect, Induced)	216,578	$9,090	$27,427	

10. One of the limiting factors on the development of the green initiatives is the projection of a continuing erosion of the U.S. engineering and scientific base. In the past, the U.S. has relied heavily on foreign born engineers to make up our shortfall in engineers and scientists. In California, one of six new high technology companies has a founder that is an Indian engineer or scientist. With the emergence of the Indian and Chinese economies, more U.S. trained foreign nationals are returning home. We graduate approximately 80,000 engineers and scientists a year while the Chinese are graduating over 400,000 annually. Today the quality of education might not be the same, but the Chinese undoubtedly will close the gap. Our high school students rank 32 in math and science among the industrial countries. These are trends that must be reversed if we are to maintain our standard of living and international competitiveness.

Figure 3-4. Projected percentage of 22-year-olds with a bachelor's degree in science and engineering through 2050



Conclusions

We are disappointed to see the exaggerated claims and unachievable goals posted on the Pickens Plan website. The same is true of the White House website describing the goals of President Obama's New Energy Plan for America. Now is not the time to raise false hopes. The American people need to be educated on the difficult choices facing U.S. policymakers and the realistic options we have for solving our problems. We need a greener America and we need to create more employment in all sectors of the economy. The issues are complex. In 2050 the quality of life of 400 million Americans will depend on the decisions we make over the next several years.

The Pickens Plan is a valuable contribution to the national debate. We should continue to expand our ability to produce electricity from wind wherever it is economically feasible. However, even if the U.S. were to supply 20% of our electrical power generation, our GHG emissions from electrical generation will be higher in 2050 than it is today. To reduce emissions to the 2050 target level will require the retrofitting of existing plants and the construction of new nuclear and clean coal power plants. Pickens' suggestion to convert our heavy vehicle fleet to natural gas has merit. This conversion would directly reduce our imports of foreign oil and contribute to a reduction in GHG emissions.

The majority of our politicians and a large segment of our population do not understand the magnitude of the energy and environmental problems facing the U.S. Unfortunately, this is also true of the leaders of the Big 3 auto companies. In the U.S. 98% of our light vehicles are powered by gasoline engines instead of diesel engines which are 20% to 40% more efficient than gasoline engines. The average mileage of our light vehicle fleet in 2007 was 25.3 mpg down from its peak of 25.9 mpg in 1987, twenty years earlier. The DOE does not expect the U.S. to achieve Europe's current fleet average of 35 mpg until 2020. The progress that has been made by France, a country that has had a sound energy and environmental policy for the last forty years, is striking in comparison to the U.S. As a measure of how far we are behind consider: new cars in France are 70% diesel powered; they produce 79% of their electricity from nuclear power; their goal is to produce 90% of their electricity from nuclear power; and they reduce their nuclear waste by 90% because they recycle spent fuel and other nuclear waste. In contrast, less than 2% of our new vehicles are diesel powered; only 19% of our electrical energy is produced by nuclear power and no new plants have been authorized; we do not recycle nuclear wastes; and the President has just cancelled the nuclear waste burial site at Yucca Mountain that has been under development for more than 22 years. As a consequence, our greenhouse gas emissions, which represent 20% of the world's total, have increased by 21% between 1980 and 2007. All the nuclear waste ever produced by our nuclear power plants has not been reduced by recycling and is stored at each of our 104 nuclear reactors. This sad state of affairs is the result of five administrations taking an unbalanced, piecemeal approach to energy over thirty years. The green energy aspirations of President Obama are admirable but are as unbalanced as those of previous administrations. We are restructuring the US automobile industry. Now is the time for the US to finally develop an economically and environmentally sustainable energy policy for the next forty years.

More information has to be provided to Congress and our citizens if we are going to mobilize taxpayer support. We trust that this report and our companion report on President Obama's New Energy for America Plan helps define the major issues that must be addressed.

Please share this analysis with individuals who can help make a difference in the direction of our energy policy.

About the Author

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For forty years, as an engineer, investment banker, CEO and early stage investor in new technology, I have been concerned about the lack of a coherent national energy and environmental policy. My energy advisory experience includes conventional oil and gas development, coalbed methane production, oil from shale, wind farms, solar energy, co-generation projects, refineries, mining and nuclear power. In 1970, as a graduate student at NYU, I participated in an eighteen month study of the US automobile industry and the emergence of OPEC as a potential threat to US economic interests. The group correctly predicted that there would be an energy crisis before 1975 and that Detroit was already well behind its competitors in designing fuel efficient cars to cope with the end of cheap energy. It was clear that we could learn from Europe. These mandated fuel efficiencies and well conceived taxes on non-renewable energy encouraged efficiency and provided the pricing support required to encourage the development of alternative energy sources including nuclear, solar and wind energy. For ten years following the Arab Oil Embargo, US policymakers paid attention to improving efficiency and developing domestic energy supplies, but as energy prices declined, so did our interest in having balanced energy policies. US vehicle fleet fuel efficiency was higher in 1987 than it was in 2007. As a consequence, forty years later, the US still does not have an effective energy policy that reconciles often competing forces: the need to maintain and improve the standard of living for a growing population, protecting the environment, keeping the country from becoming a debtor nation and reducing vulnerability to disruptions in energy supplies. Based on frequent trips to Asia, by 2000 I became convinced that rapidly increasing demand for energy in the developing countries was going to create serious future financial problems for the US. In 2006, I started warning my clients that our balance of payments deficit would balloon to an unsupportable level when energy prices exceeded $100 per barrel and that the Big Three were going to be fighting for survival. In 2008, the nation had a wakeup call when oil topped $147 per barrel and gasoline prices exceeded $4.50 per gallon. Now is the time for the US to finally develop an economically and environmentally sustainable energy policy for the next forty years. It is both instructive and humbling to contrast our current energy situation with that of France where: 79% their electricity is produced from nuclear power with zero green house gas emissions; they reprocess their nuclear waste; 70% of all new cars are diesel powered; and they have the most extensive high-speed and urban mass transportation systems in the world. I hasten to add, that while I envy France's energy position vis-à-vis the US, the reverse is true with respect to their over regulation of business and labor practices. I was a director of a French subsidiary of a US company that shut down its French and German operations and moved them to a more business friendly England. California, my home for more than thirty years, is learning to its regret that businesses leave if the state does not provide quality public education, competitive personal and corporate tax rates and a favorable business climate.

My professional experience includes: Manager of International Finance at The Ralph M. Parsons Company responsible for project financing worldwide; Vice Chairman of Security Pacific Capital Market Group responsible for corporate and project finance; and as CEO/CFO managed the turnarounds of more than 30 companies in the US, Mexico and Asia. I received a BS in Mechanical Engineering with honors from the University of Wisconsin, MS in Industrial Engineering from UCLA, MBA in International Business and Quantitative Analysis from New York University. I am a graduate of Harvard Business School's Advanced Management Program. I also studied engineering on a Carnegie Scholarship at the Instituto Tecnologico y de Estudios Superiores de Monterrey, Mexico and was granted a Teaching Fellowship at UCLA College of Engineering.

SUPPORTING DOCUMENTATION

A Constructive Critique of T. Boone Pickens' Energy Plan

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Many of T. Boone Pickens' claims are not supported by DOE data.

Department of Energy/Energy Information Agency 2009 Energy Forecast

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Release date full report: March 31, 2009

TABLE 1 - LIQUID FUELS SUPPLY AND DEMAND

Liquid Fuels Supply and Demand Million Barrels Per Day	2009	2010	2015	2018	Change 2009 to 2018 %	 mmbpd	2030
Liquid Fuels							
Domestic Crude Production /1	5.38	5.61	5.72	6.12	114%	0.74	7.38
Domestic Ethanol /2	0.69	0.84	1.06	1.16	169%	0.47	1.45
Other Domestic Production ex. Ethanol	3.03	3.22	3.56	3.50	116%	0.47	3.94
Net Imports	10.32	10.12	9.91	9.33	90%	(0.99)	8.88
% imports	53%	51%	49%	46%	87%		41%
Consumption per day	19.42	19.79	20.25	20.11	104%	0.69	21.65
Venezuelan & Persian Gulf Imports 2007	3.52						
Imported low sulfur crude	$ 60.89	$ 77.97	$ 109.96	$ 114.33	188%	$ 53.45	$ 130.50
Imported crude oil	$ 54.40	$ 71.97	$ 107.64	$ 110.64	203%	$ 56.24	$ 123.81
Net import DOE Price	$ 51.91	$ 66.77	$ 99.56	$ 104.41	201%	$ 52.51	$ 114.60
Imports $mm/day	**$ 536**	**$ 676**	**$ 987**	**$ 974**	**182%**		**$ 1,018**
Imports $billions per year	$ 196	$ 247	$ 360	$ 355	182%		$ 371
Gasoline Price per gallon (2007 dollars)	**$ 2.38**	**$ 2.86**	**$ 4.01**	**$ 4.39**	**185%**	**$ 2.01**	**$ 5.65**
	100%	120%	168%	185%			237%

1/ domestic oil production expected to peak in 2018 in the EIA 2008 report. In the 2009 report, it is forecast that we will still be importing 8.88 million bpd of liquid fuels in 2030.

2/ half of the decrease in imports is dependent on increasing ethanol from corn by 69%.

In 2009, after 30 years of subsidies, the ethanol from corn industry is bankrupt, corn base ethanol energy conversion efficiency is marginal, there are serious crop rotation and Gulf of Mexico pollution issues and there is no estimate of the adverse impact on food prices and loss of export income from both corn and soy beans.

Table C5. Petroleum Product Prices
(2007 Cents per Gallon, Unless Otherwise Noted)

Sector and Fuel	2007	Projections								
		2010			2020			2030		
		Low Oil Price	Reference	High Oil Price	Low Oil Price	Reference	High Oil Price	Low Oil Price	Reference	High Oil Price
Crude Oil Prices (2007 dollars per barrel)										
Imported Low Sulfur Light Crude Oil[1]	72.33	58.61	80.16	91.08	50.43	115.45	184.60	50.23	130.43	200.42
Imported Crude Oil[1]	63.83	55.45	77.56	88.31	46.77	112.05	181.18	46.44	124.60	197.72
Transportation										
Liquefied Petroleum Gases	213.8	194.4	231.2	249.9	224.9	360.3	522.0	250.5	431.0	621.7
Ethanol (E85)[3]	253.0	194.4	254.5	276.8	199.7	359.1	442.1	227.8	414.0	532.5
Ethanol Wholesale Price	212.4	171.9	203.1	207.0	254.4	259.8	282.5	212.1	280.9	291.8
Motor Gasoline[4]	282.2	232.4	299.0	324.3	262.8	464.9	649.8	294.3	563.1	789.4
Jet Fuel[5]	217.3	178.6	228.0	257.7	193.7	386.4	591.2	215.2	482.0	719.5
Diesel Fuel (distillate fuel oil)[6]	287.0	239.2	289.6	318.2	278.8	460.9	670.1	315.2	567.9	804.2
Residual Fuel Oil	140.0	142.7	190.8	220.8	147.0	337.7	563.8	157.7	426.5	700.8

Price Case Comparisons

Table C4. Liquid Fuels Supply and Disposition (Continued)
(Million Barrels per Day, Unless Otherwise Noted)

Supply and Disposition	2007	Projections								
		2010			2020			2030		
		Low Oil Price	Reference	High Oil Price	Low Oil Price	Reference	High Oil Price	Low Oil Price	Reference	High Oil Price
Domestic Refinery Distillation Capacity[15]	17.4	18.0	18.0	18.0	18.7	18.2	18.2	19.1	18.4	18.3
Capacity Utilization Rate (percent)[16]	89.0	78.5	77.8	77.3	82.6	77.1	70.5	89.7	79.2	71.3
Net Import Share of Product Supplied (percent)	58.3	50.8	50.1	49.8	54.6	44.0	35.4	56.9	40.9	29.8
Net Expenditures for Imported Crude Oil and Petroleum Products (billion 2007 dollars)	280.13	194.37	261.60	294.55	196.02	344.32	425.05	220.00	376.65	387.94

Thornburg & Co., Inc. comments on achieving liquid fuels energy independence

1. **In ten years we will be using 4% more liquid fuels than we do in 2009 and 11.4% more in 2030.**
2. **By 2018 net imports will only decline because current domestic crude production is projected to peak in 2018 and we will be increasing the production of ethanol from corn by 69%, an industry that is currently bankrupt.**
3. **According to the DOE in 2030 we still will be importing 8.88 million bpd, down only .45 million bpd from 2018. There is no end to an addiction to foreign oil in this forecast.**
4. **The net decease in imports could more than double with production from ANWR and new offshore fields which President Obama opposes.**
5. **By 2018 gasoline prices are expected to return to 2008 levels of $4.39 per gallon, an 85% increase over 2009. In 2030 the price of gasoline in 2007 dollars is expected to reach $5.65 per gallon.**
6. **Even though imports will decrease by 10%, our balance of payments deficit is expected to increase by 85%. In 2018 we will be spending more than $1 billion per day for imported oil.**
7. **We should immediately start oil and gas production at ANWR, the Bakken Field in North Dakota and offshore. Not only would this not require any investment from the government, it would provide tax revenues to the states and federal government. For California, this is estimated to be $5 billion per year.**
8. **Producing ethanol from corn is a very controversial strategy based on both poor economics and its damage to the environment and world food supplies. This policy was rammed through Congress in 2008 without adequate debate. Despite 30 years of subsidies, the industry is currently bankrupt, and yet, Washington's goal is to triple 2007 production. There is no estimate of the cost of ethanol subsidies or loss of food export income.**

Thornburg & Co., Inc. comments on the advantage of converting to natural gas to power heavy vehicles

1. **We have 238 million cars and 8 million heavy trucks and buses on the road. By 2015, when we build 1 million plug in cars, we will have built 75 million more gas guzzlers.**
2. **At a production rate of 15 million cars per year it will take the US 16 years to covert its automobile fleet to a new technology. Fully converting to electric cars will take at least 25 to 30 years. Diesel power seems to be a proven and more logical intermediate step. In several European countries diesel vehicles represent 70% of new car sales while less than 1.7% of our new cars are diesel powered.**
3. **According to the DOE heavy vehicles will use 2.68 mbpd in 2009. This represents 37% of our imported oil.**
4. **Converting to abundant and clean burning LNG is especially attractive for heavy trucks and also feasible for automobiles. T. Boone Pickens has it right.**

TABLE 3 - TRANSPORTATION FUEL USEAGE

Transportation Fuel Usage					**Change 2009 to 2018**		
Million Barrels Per Day Oil Equivalent	**2009**	**2010**	**2015**	**2018**	**%**	**mmbpd**	**2030**
Light-Duty Vehicles	8.59	8.74	8.65	8.65	101%	0.07	9.31
Commercial Light Trucks	0.30	0.31	0.33	0.33	109%	0.03	0.36
Bus Transportation	0.13	0.13	0.13	0.13	102%	0.00	0.14
Freight Trucks	2.25	2.31	2.66	2.76	123%	0.51	3.31
Rail, Passenger	0.02	0.02	0.02	0.03	116%	0.00	0.03
Rail, Freight	0.27	0.27	0.30	0.31	116%	0.04	0.35
Shipping, Domestic	0.14	0.15	0.16	0.17	118%	0.03	0.19
Shipping, International	0.31	0.35	0.39	0.39	125%	0.08	0.40
Recreational Boats	0.13	0.14	0.14	0.14	106%	0.01	0.15
Air	1.25	1.19	1.27	1.34	107%	0.08	1.71
Military Use	0.36	0.36	0.35	0.35	97%	-0.01	0.37
Lubricants	0.07	0.07	0.07	0.07	104%	0.00	0.07
Pipeline Fuel	0.33	0.32	0.33	0.33	100%	0.00	0.36
Total	14.16	14.35	14.79	15.01	106%	0.85	16.75

Source: Table 7, DOE/EIA Annual Energy Forecast 2009

Thornburg & Co., Inc. comments on producing 25% of our electric power from renewables by 2025:

1. **At present only 9.9% of our electricity is generated by non-renewables of which 71% is from hydro and geothermal sources. Solar and wind power represent 0.8% of total capacity. We do not have to wait to 2012 to produce 10% of our energy from renewable sources. We will be at 10.5% by 2010. It is getting to 25% by 2025 that is not economically feasible.**
2. **Electric energy generating capacity is projected to grow by 14% over the 10 year period 2010 to 2025. To achieve the Administration's goal, the only plants that would be built over this entire period would have to be based solely on renewables. If these plants were built, 5% of our existing electrical plant generating capacity would have to be retired and projects in construction and in the planning stages cancelled. Thus the required new additions to our electrical capacity will be greater than 19%, not including the the construction of the standby capacity required for solar and wind power.**
3. **Assuming the DOE's estimates of growth in renewable capacities are reasonable, that additional capacity must come from wind and solar, we will have to increase their share of capacity from 1.9% to 14.3% in just 15 years. This means constructing additional wind and solar capacity at the compound rate of 14.4% per year. Keep in mind that electrical demand is growing at just over 1% per year. Who is going to speculate on such a massive investment in plant and equipment for this forced march? Who is going to pay for the 5% of capacity retired by investor owned utilities? Who pays for the stand by capacity required? And the most important question: What is the cost of electricity to the consumer? Thornburg & Co., Inc. has prepared utility rate case applications so we are well aware of the complexity involved in this process.**
4. **Clearly, the Administration sees no future role for nuclear power in our energy future. It has stopped funding Yucca Mountain. With 102 nuclear reactors the US is the leading producer of energy from the atom and we have twice as many reactors as France even though the last US reactor was started in 1973. There are 434 nuclear reactors in the world. The supply of engineering services and equipment is a major source of export earnings. The reprocessing of nuclear fuels is a major business for France. We have the technology to do the same safely but there has not been political leadership in this area for over forty years.**

TABLE 4 - ELECTRIC POWER GENERATION

Electric Power Generation						**Change 2010 to 2025**		
(billions kilowatt hours)	**2009**	**2010**	**2018**	**2025**	**%**	**bil. Kwh**	**2030**
DOE Forecast							
Total Electric Generation	3842	3904	4160	4436	114%	533	4665
Nonrenewable sources	3462	3494	3643	3855	110%	362	4057
Nuclear Power	806	807	809	831	103%	25	905
% nuclear power	21.0%	20.7%	19.5%	18.7%			19.4%
Renewable Sources /1	379	410	518	581	142%	171	607
% renewable	9.9%	10.5%	12.4%	13.1%			13.0%
Wind subtotal	73	74	83	89	120%	15	121
% total capacity	1.9%	1.9%	2.0%	2.0%			2.6%
Solar subtotal	0.5	1	2	2			3
% total capacity	0.0%	0.0%	0.1%	0.1%			0.1%
Obama Administration goals		**2010**		**2025**			
Total Electric Generation		3904		4436	114%	533	
Nonrenewable sources /2		**3494**		**3327**	**95%**	**-166**	
Renewable Sources		410		1109	270%	699	
% renewable		10.5%		**25.0%**			
Wind and Solar subtotal /3		**75**		**617**	821%	541	
% total capacity		1.9%		13.9%			

/ 1 President Obama's 10% of energy from renewable sources is in the DOE forecast. The DOE forecasts do not contain data on the feasibility and cost of creating 25% of our electric power from renewable resources by 2025.

/ 2 The consequence of the Administration's goal is that 5% of existing power generating capacity is retired and 19% new plant capacity must be built in 15 years instead of 14%. This does not include standby capacity required for wind and solar energy facilities.

/ 3 If the additional demand is to be met by wind and solar power it will require increasing capacity by 14.4% every year for 15 years.

Source: Table 8 and Table 14, DOE/EIA Annual Energy Forecast 2009