# Making Green Jobs Work for Ohio

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EXTENSION
OARDC

The Ohio State University

December 2010

# Executive Summary

As states continue to recover from recession, unemployment rates remain high and many workers still find themselves without a job. Job growth is first and foremost on everyone's mind, particularly in Ohio where unemployment rates, although decreasing, remain at nearly 10%, while job growth has lagged the national average for decades.[1]

Policymakers continue to fund green jobs as a means to create jobs while simultaneously addressing environmental concerns. With many states pursuing green jobs, it becomes imperative for each to pursue an optimal green job strategy specifically tailored to their unique resources. It is also important to understand that green job growth cannot come close to fixing high unemployment rates or the manufacturing losses states such as Ohio have experienced. Ohio should not simply follow the green job strategy of others, but should consider its own resources, both renewable and in terms of its industrial infrastructure and labor force, before allocating funding.

We find that while Ohio certainly has a place in the green economy, it is not in large solar or wind farms due to a marked lack in both of these renewable resources. We find that Ohio has a unique and strategic opportunity in the green economy if it utilizes its resources to meet the challenges and limitations of renewable energy. Ohio should pursue the following green economy sectors by continuing:

- Conservation and pollution mitigation amenities, which likely has the greatest job producing capabilities through making the state an attractive place to live
- Research and development in alternative energy and energy efficiency supported mainly through Ohio Third Frontier funding. However, in these efforts, the funding should be directed by scientific considerations rather than other considerations.
- Energy efficiency by encouraging consumers and firms to purchase energy efficient products and other energy efficiency measures

And by increasing funding toward:

- The transmission and storage of renewable energy through smart grid investments and advanced instrumentation as many agree this is the current limitation in renewable energy
- Other environmentally friendly production in niche cases when market fundamentals support it.

1. U.S. Bureau of Labor Statistics, 2010.

# Introduction

In a previous policy brief, "Green Policies, Climate Change, and New Jobs," we analyzed the employment effects of various alternative energy policies such as cap and trade and subsidies for green jobs.

We noted that policies that penalize the use of fossil fuels such as cap and trade (or energy taxes) would reduce carbon emissions by ensuring energy is priced at a more socially optimal level to better account for the costs of pollution and carbon emissions. These increased energy costs would incentivize both firms and consumers to reduce energy consumption more optimally than subsidies for "clean energy." Cap and trade would result in minimal effects on jobs as prices adjust, as evidenced by a similar program enacted as part of the 1990 Clean Air Act.

Similarly, we also found that investing in clean energy job subsidies would have minimal impact on job growth. Furthermore, there are opportunity costs to be considered for these subsidies, including diverting monies that could be used by the government to fund higher valued services, or implementing a more productive energy tax which has a 'double dividend' that taxes "bad" activities such as the use of fossil fuels while allowing governments to lower taxes on productive activities such as work and investment (i.e., lower income and business taxes).

Cap and trade is implemented more effectively as a national policy because it is challenging for individual states to pursue this policy alone. If a state implemented a binding cap and trade in isolation, there may simply be a redistribution of energy intensive firms and pollution to states without cap and trade rather than a reduction in carbon emissions. The predominance of national and international firms as opposed to firms that exist within only one state also adds to the infeasibility of a state cap and trade program because an individual state implementing cap and trade would lose considerable employment. Ultimately, even if pollution could be reduced with state measures, it is unfair for one region to pay the costs of cap and trade when other regions benefit from reduced pollution.

With U.S. cap and trade efforts stalled in Congress, efforts have instead focused on clean energy solutions as a way to reduce pollution emissions and as a solution for unemployment. Thus, in this policy brief, we examine the alternative energy policies and green jobs subsidies that states, in particular Ohio, should focus on. [We will alternatively use the terms "green" and "clean."]

As mentioned in our previous policy brief, there may be more effective job growth strategies than subsidizing green jobs, such as improving infrastructure or R&D investments. If policy-

makers in Ohio are willing to pay the costs (including opportunity costs of either higher taxes on everyone else or lower public services) of subsidizing green energy jobs while understanding that the job growth will be minimal, then Ohio should focus on a green energy strategy that is optimal and specific to Ohio. Such a strategy should not merely copy the green job strategy of a myriad of other states, which would be neither strategic nor creative.

Although wind and solar power are among the most politicized green job strategies, the majority of green jobs are not in wind, solar or even clean energy. Thus, there are many green job strategies that receive much less attention and are worth considering. Before an optimal green job strategy for Ohio can be chosen, we need to assess where Ohio is starting from in terms of its green jobs and clean energy and what resources it can better utilize to develop its green economy. Finally, we examine Ohio's current green job strategy and the changes that can be made to make green jobs better suit Ohio.

# Green Employment and Investment

We first examine the current green job and energy profiles of the U.S. and Ohio shown in Figure 1.

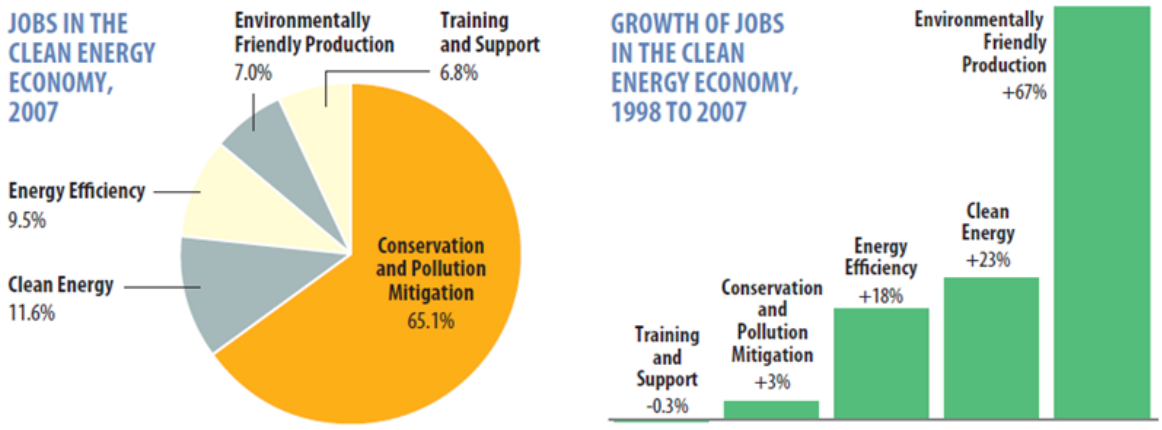


**Figure 1:** U.S. Clean Energy Jobs[2]

In comparison, Figure 2 depicts the breakdown of green jobs for Ohio. Other than the categories of energy efficiency and training and support, Ohio's green job profile is very similar to the U.S.

By far the biggest green jobs sector is conservation and pollution mitigation, while clean energy accounts for only 11.6% of green jobs. Increasing employment in the conservation and pollution mitigation sector does not directly displace jobs in the coal industry like the clean energy sector would. It is also important to note that environmentally friendly production, part of the manufacturing sector, has had the most significant growth among all of the green energy sectors. Its growth has been significantly higher than either the clean energy or energy efficiency green economy subsectors.

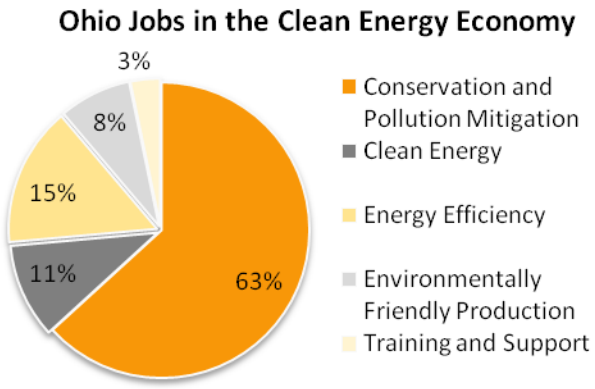


**Figure 2:** 2007 Ohio Clean Energy Jobs[3]

2. The Pew Charitable Trusts, 2009. http://www.pewcenteronthestates.org/uploadedFiles/Clean_Economy_Report_Web.pdf
3. Created using data from The Pew Charitable Trusts, 2009.

In every category except training and support, Ohio ranks in the top 10 states in terms of employment numbers. This should not be too surprising as Ohio is also the 7th most populated state,[4] though the state also ranks 10th for the percentage of jobs that are classified as green.[5]

If Ohio policymakers are to catch up in any area of green employment, training and support is an opportunity. Training and support is clearly labor intensive compared to the other green jobs such as wind and solar, which are quite capital intensive and employ relatively fewer workers. Training and support occupations also include energy research, which would likely include higher-paying jobs. As mentioned in our previous policy brief, R&D is an effective job strategy for the long-term, though it does provide a handful of higher wage jobs even in the short term. Ohio has some related R&D assets such as Battelle labs, a fuel cell cluster in Northeast Ohio, and its research universities that are forming the core of such efforts. While fiscal environments will likely be tough for the foreseeable future, energy R&D is one area that has a higher probability of being well funded.

As shown in Figures 1 and 2, Ohio's energy efficiency sector is a significantly higher proportion of its clean energy economy than the U.S. Jobs in energy efficiency include occupations that retrofit houses and commercial buildings, as well as occupations in meters, measuring devices, and other instrumentation. Ohio may have proportionately more jobs in energy efficiency because of its historic intensity in manufacturing. If this is the case, then a good green energy strategy may be to invest in energy efficiency occupations such as weatherization and instrumentation. Because of its manufacturing sector, we expect Ohio's environmentally friendly production sector to be higher as well, but in reality this sector is only marginally larger than the U.S.

The green energy sectors that government should promote can also be informed by examining the areas that profit maximizing firms have produced the most patents. Figure 3 shows capital investments and patents in the green economy of the U.S.

In terms of patents, batteries and fuel cells far outnumber solar and wind. It seems the storage and transmission of energy is be-

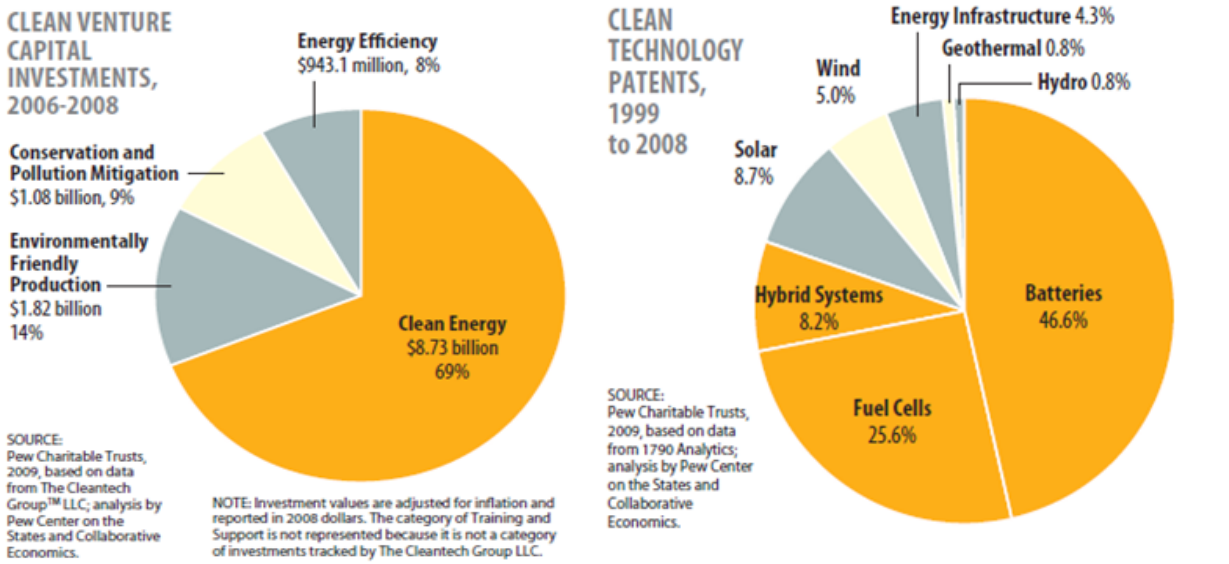


**Figure 3:** Green Energy Investment Strategies[6]

4. U.S. Census Bureau, 2010. http://www.census.gov/popest/states/NST-pop-chg.htm
5. The Pew Charitable Trusts, 2009.
6. Ibid.

coming increasingly important not only for clean energy but the energy industry in general. Indeed, because solar and wind technologies have an irregular feature, storage technologies would greatly facilitate their widespread use. The majority of U.S. capital investments are in the clean energy sector and not in conservation and pollution mitigation where most of the green energy jobs are. Only 4 out of 10 jobs in the "clean energy" sector are responsible for energy transmission or storage as opposed to generation, but there may be room for significant growth in this subsector of clean energy.[7] Hybrid systems also account for a significant portion of patents which may relate to Ohio being ranked 7th in total green technology patents, but it is only 17th in venture capital between 2006 and 2008. However, note that the clean energy sectors where private industry expects the largest profits may not be the sectors with the largest job growth, as private industry may be investing in sectors receiving the largest government subsidies or that are the most capital intensive.

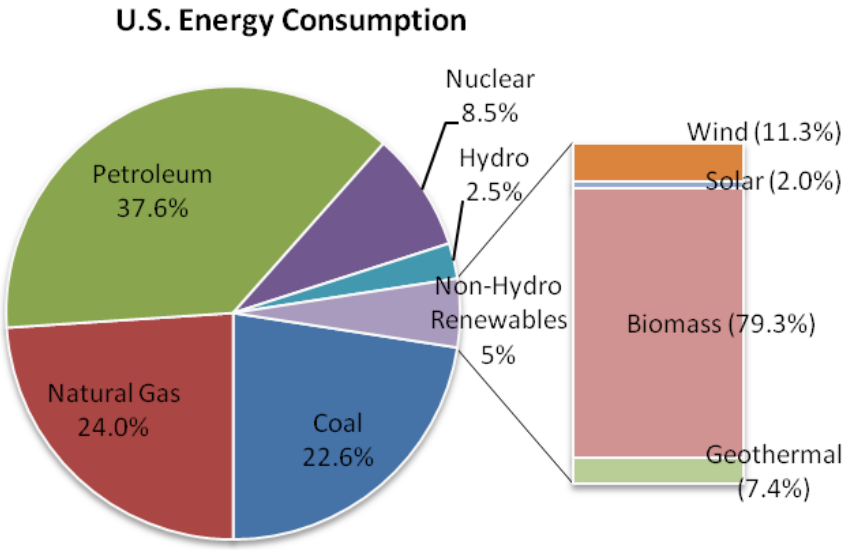


**Figure 4:** U.S. Total Energy Consumption by Source in 2008[8]

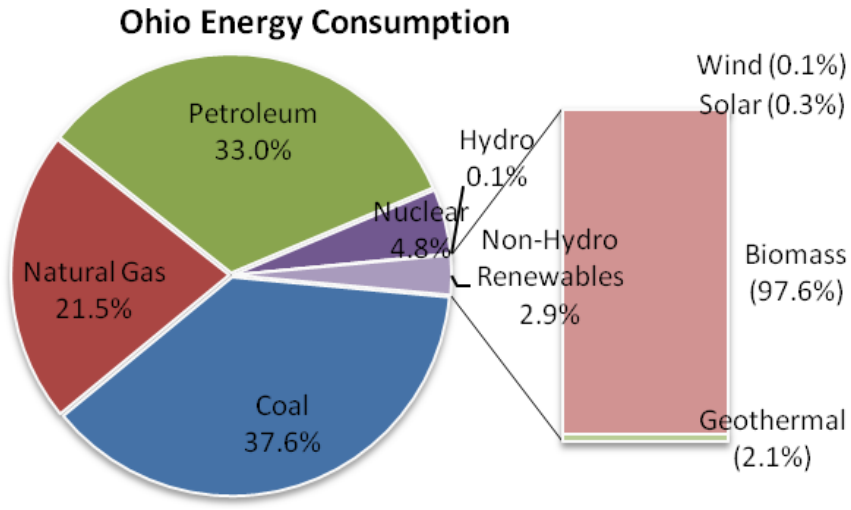


**Figure 5:** Ohio Total Energy Consumption by Source in 2008[9]

***Green Energy Consumption and Generation:***

It is important to look at both private industry and current government investment before we determine the direction of future government investment for the purpose of green job growth. Ohio's advanced energy portfolio exemplifies the importance the state places on alternative energy and reducing carbon emissions. However, Ohio's current energy portfolio compared to the U.S. does not show a commitment to clean energy, the sector where most of the venture capital is invested. Figure 4 and 5 show energy consumption by source for the U.S. and Ohio.

By percentage, Ohioans consume much more energy

7. The Pew Charitable Trusts, 2009.
8. U.S. Energy Information Administration, 2008. http://www.eia.doe.gov/states/hf.jsp?incfile=sep_sum/plain_html/sum_btu_totcb.html
9. Ibid.

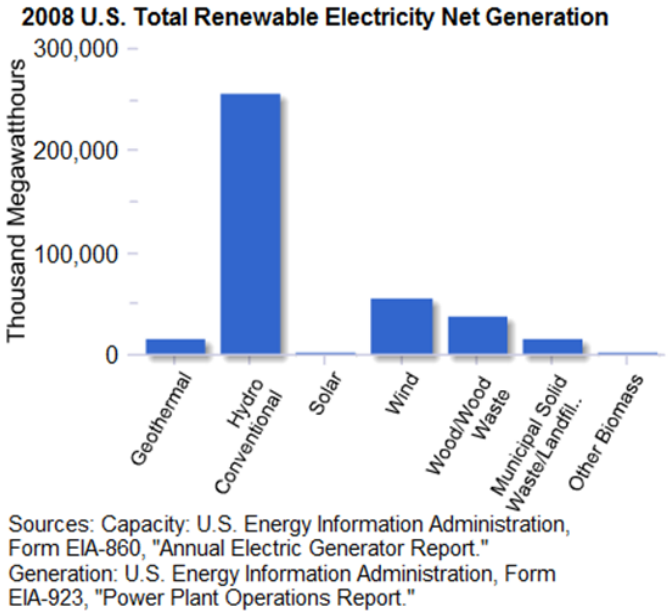


**Figure 6:** U.S. Renewable Energy Generation[10]

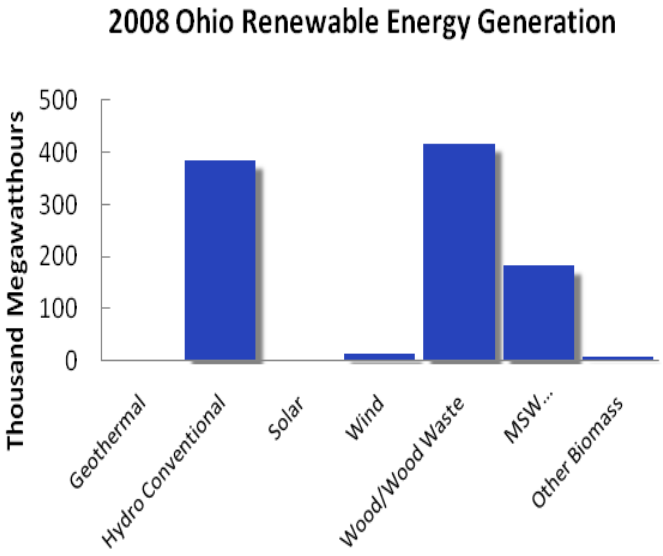


**Figure 7:** Ohio Renewable Energy Generation[11]

from coal than the U.S. They also consume significantly less renewable energy (as a percentage) and significantly less wind and solar energy than the nation despite passing a renewable energy portfolio. Figure 6 shows the renewable energy generation portfolio of the U.S. in comparison to Figure 7 which shows the renewable energy portfolio of Ohio.

Although Ohio ranks 3rd in total clean energy employment with 3,653 jobs in 2007 (compared to about 5 million total jobs), it ranks 48th in renewable energy capacity and 43rd in renewable energy generation.[12] Clean energy employment includes only those jobs related to renewable energy generation, transmission, and storage. Employment should not be a concern for the state's clean energy subsector. Ohio should be more concerned with its renewable energy efficiency so that it can competitively produce alternative energy. Ohio employs more people in clean energy, but produces far less than other states. The state's clean energy sector may be attempting to compensate for renewable energy resources that are simply lacking.

Ohio is significantly behind the rest of the nation in its renewable energy generation. Ohio may try to catch up in renewable energy generation, but it seems unlikely that it will be a leader with any type of competitive advantage in clean energy generation. Not only is its starting point behind as the 48th ranked state, but other states will not be sitting still. Perhaps most importantly, Ohio lacks many of the key natural assets such as steady wind or sun.

At this point in time, generating the same kWh with a renewable source as opposed to fossil fuels is more expensive, though it does reduce carbon emissions. In 2009, the national average retail price of electricity

10. U.S. Energy Information Administration, 2008. http://www.eia.doe.gov/cneaf/solar.renewables/page/state_profiles/ohio.html
11. Ibid.
12. Ibid.

was 9.83 cents per kilowatt-hour whereas Ohio's national average was 8.91 cents.[13] Ohio's energy prices are over 9% less than the national average, which is consistent with using fewer, more expensive renewable options. With lower energy prices, there will also be less demand for energy efficient products such as hybrid cars and energy efficient dishwashers when compared to areas with high energy prices such as California. Hence, locating such production in California will have an advantage because there will be a greater demand—though in terms of jobs, this would be offset by Ohio being more competitive in energy-intensive production.

Policymakers often tout their state's low energy costs while investing government funds in renewable energy and passing renewable energy portfolio standards that would increase energy prices. Ohio's Senate Bill 221 requires 25% of the state's electricity to be generated from alternative energy and at least half of that from renewable sources such as solar or wind.[14] Our previous paper showed that replacing 25% of Ohio electricity with electricity generated from wind would decrease emissions by approximately 58 billion pounds, increase energy costs by about $1.4 billion, and add at most 6,000 net jobs, and at worst, lose 1,000 net jobs.

Ohio's renewable energy portfolio and investment in wind and other renewable energy sources will not produce the job growth people are expecting, then Ohio must create a more focused approach when investing in green jobs that considers the specific resources and industries either unique to Ohio or those in which the state has a competitive edge.

13. U.S. Energy Information Administration, 2010. http://www.eia.doe.gov/electricity/epm/table5_6_b.html
14. Ohio Department of Development. http://development.ohio.gov/strategicplan/documents/StrategicPlan.pdf

# U.S. and Ohio Energy Resources

In order to find Ohio's green job competitive edge, we must examine all of the resources at its disposal. It is most important to examine Ohio's resources within the context of its region. We start by examining Ohio's natural resources, both renewable and nonrenewable, compared to other U.S. regions.

***Fossil Fuel Energy Resources:***

Figure 8 shows the coal and natural gas resources of the U.S. (and Ohio). Ohio's abundance of coal resources (and abundance in close proximity) implies that the transportation costs of coal are less for Ohio than other areas. To be efficient, renewable energy in Ohio would also need to be abundant. Additionally, Ohioans consume a lot of energy produced from coal (as shown in Figure 5) because of its abundance.

Not surprisingly, many of the largest power plants are located in close proximity to coal resources. They are also located in close proximity to popula-

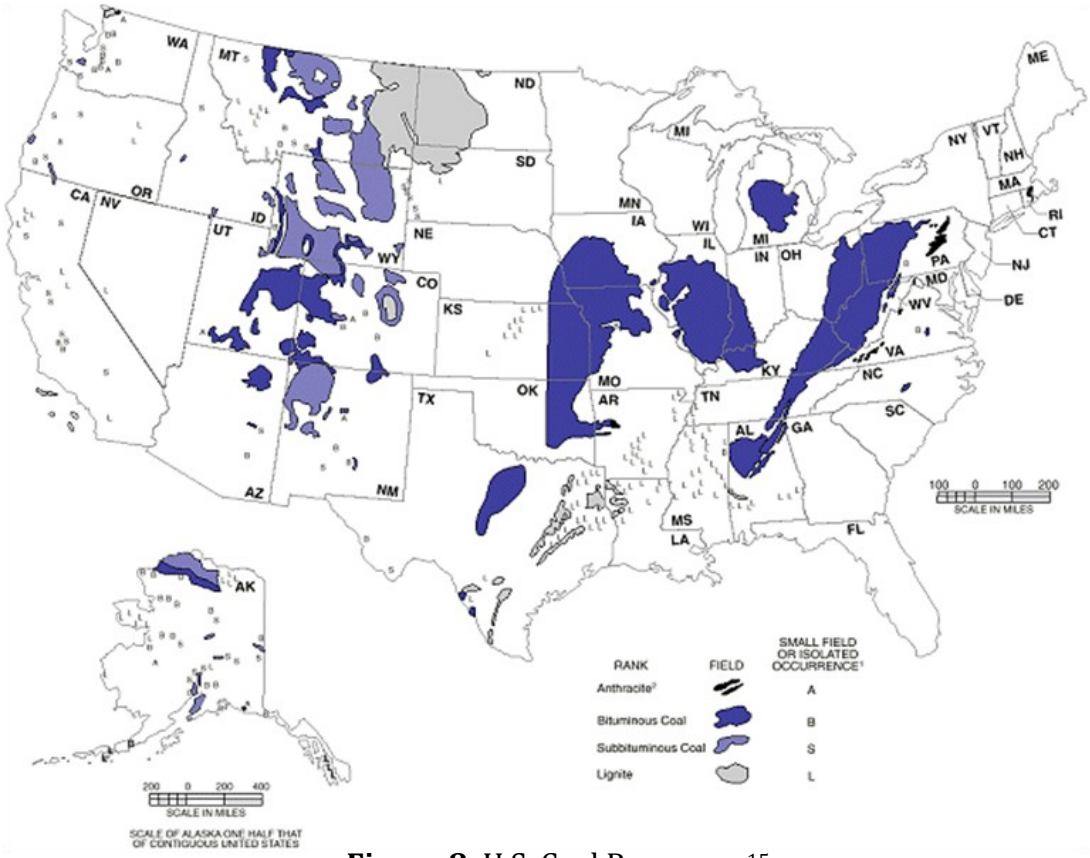


**Figure 8**: U.S. Coal Resources[15]

15. U.S. Energy Information Administration, 1997. http://www.eia.doe.gov/cneaf/coal/reserves/

tion centers where the largest energy demand is located, minimizing transportation costs and energy storage costs. Figure 9 on the next page shows the location and size of power plant emissions across the U.S. Although the abundance of fossil fuels in these areas makes producing energy from them more inexpensive, it also implies that pollution will be greater and thus the social cost of producing energy from fossil fuels is also greater.

With 114 coal-fired power plants, Ohio has more than any other state in the U.S. and ranks number 1 in terms of total coal power plant employment with 4,289 jobs.[16] The existence of a significant number of power plants implies that there must be an established energy grid for the transmission of this energy to population centers or large manufacturing centers. A map of U.S. transmission lines is shown in figure 10. Many of the largest transmission lines in the U.S. run through Ohio and the surrounding region, connecting population centers to energy sources.

The Director of Energy Services for the Ohio Farm Bureau, Dale Arnold, suggests that Ohio, like other states, will reach limitations with renewable energy but will constraint first by its energy infrastructure and not with its renewable energy generation capacity. Arnold adds that Ohio's location and proximity to a large portion of the U.S. may make it ideal for the transmission of renewable energy if not for the generation of renewable energy. At a renewable energy conference, the Ohio Department of Development stated the following:

Ohio's geographic advantage is enor-

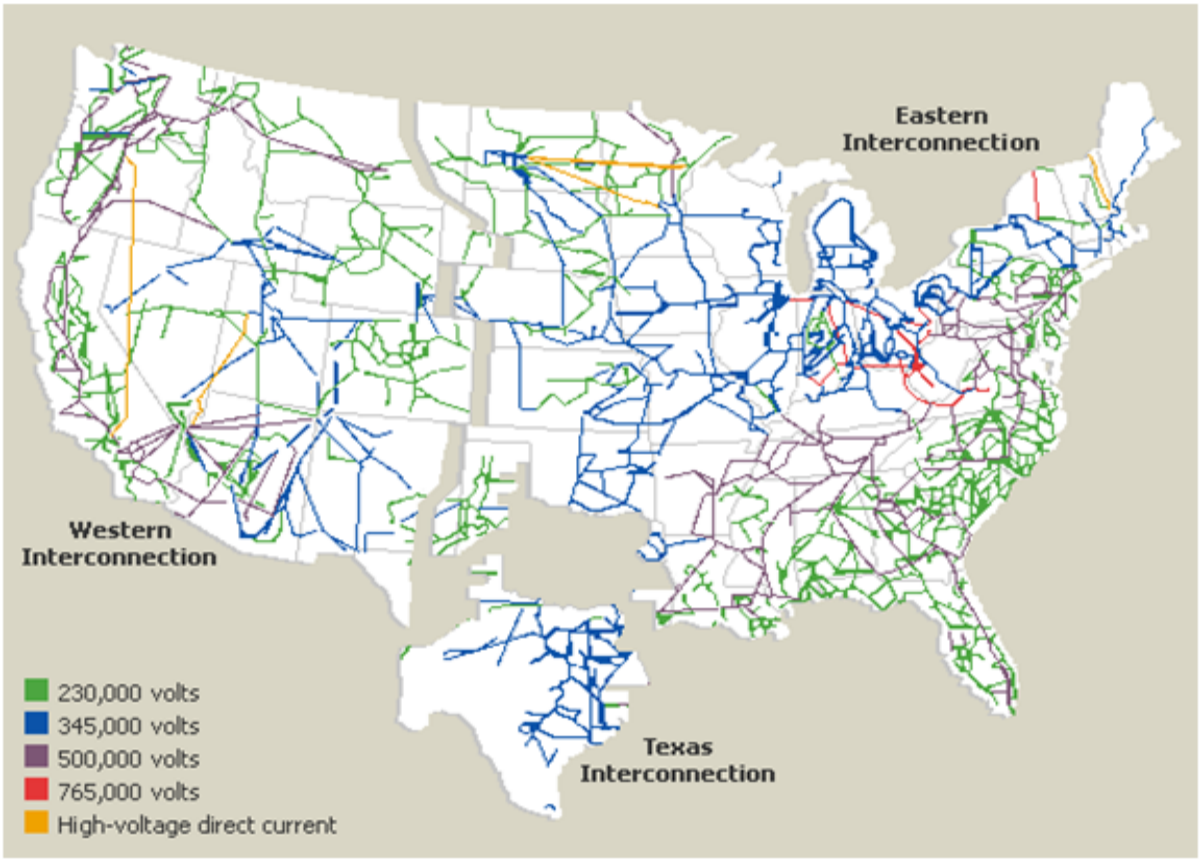


**Figure 10**: U.S. Energy Grid[17]

16. Sourcewatch.org. http://www.sourcewatch.org/index.php?title=Coal_and_jobs_in_the_United_States
17. Global Energy Network Institute.

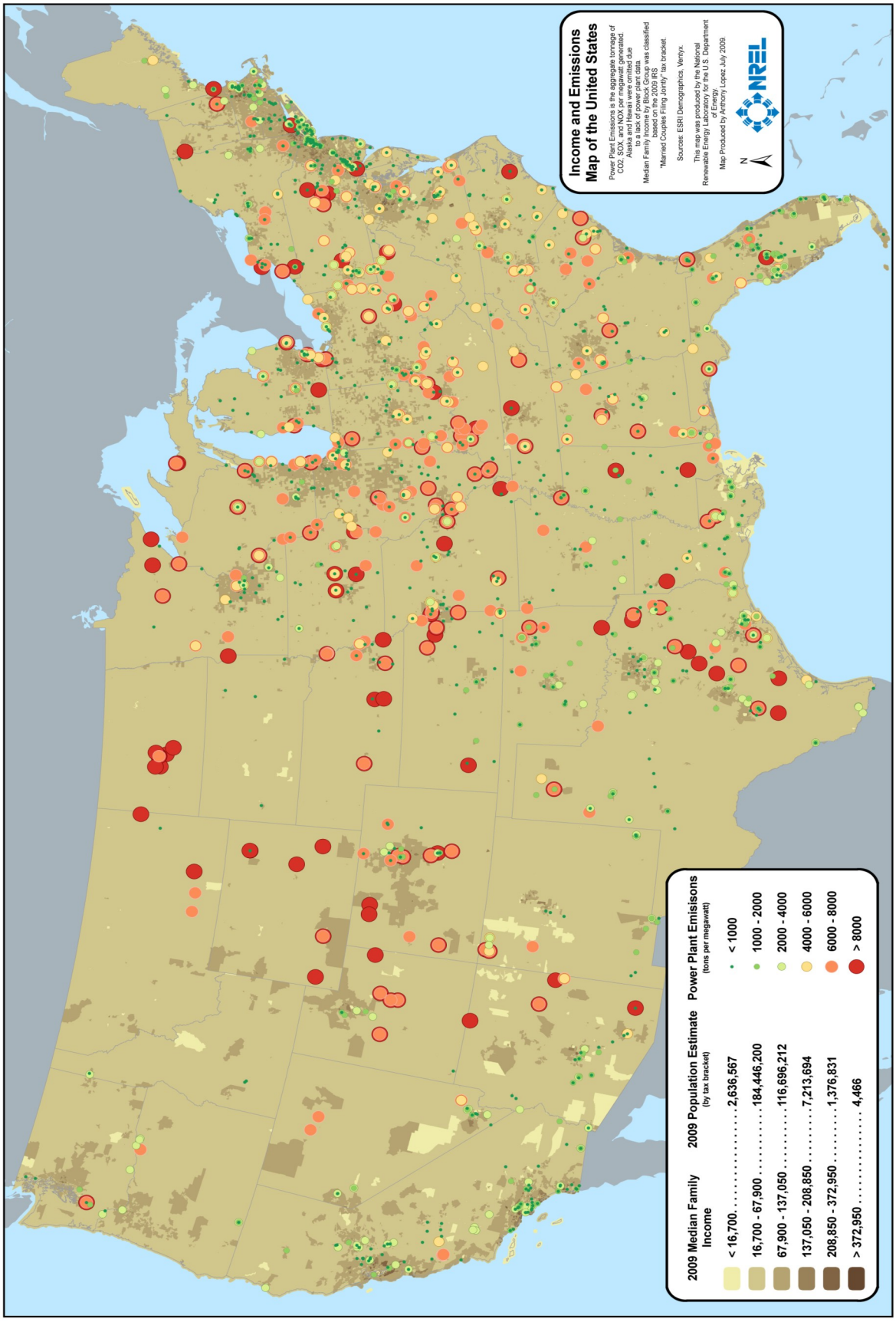


**Figure 9**: Income and Emissions Map[18]

18. National Renewable Energy Laboratory. http://www.nrel.gov/gis/mapsearch/

> mous. Within 600 miles of Ohio is the majority of the U.S. population, the majority of U.S. manufacturing facilities, and the vast majority of U.S. corporate headquarters. Because of our central location, there is no state better suited than Ohio for logistics and distribution centers and the jobs they bring.[19]

Although the department of development was generally referring to the distribution of products, it may also apply to the transmission of energy. The Dayton/Columbus region is one of two "centroids" in the U.S. defined as an area with a high proportion of the country's population and manufacturing.[20] The transmission lines in Figure 10 are evidence of this. A recent *Daily Caller* article agrees with Arnold's assessment, calling transmission lines "the missing link in energy evolution."[21] Marita Noon, the article's author, claims that because wind and solar are more land intensive, it requires renewable energy to be located away from population centers (even farther than coal power plants) requiring significant power lines for transmission. If the U.S. and Ohio wishes to switch to renewable sources of energy, it must consider the location of renewable resources and the transmission of this energy to meet the demands of its consumers. Indeed, as we discuss below, the national electric grid will need revamping if the country is to greatly increase its use of renewables, and it is in this area where Ohio could make major inroads in taking advantage of the emerging greener economy.

***Renewable Energy Resources:***

When thinking about Ohio's resources, many first think of Ohio's vast amounts of soy and cornfields. Biomass therefore seems like a viable source of renewable energy for Ohio. Figure 11 depicts U.S. biomass resources.

Ohio appears to be above average in biomass potential, but other states in the upper Midwest are even better endowed. However, there are local areas within Ohio and elsewhere that have a biofuels niche. Of course, the real constraint is whether biofuel technologies are competitive with other fossil and alternative energy sources. Many studies focus solely on electricity consumption and renewable sources of electricity, but more than one third of all energy consumption is petroleum. Ethanol can replace at least a portion of imported petroleum with a renewable oil although it is generally more expensive given current technology and feedstock prices.[22] Ohio ranks 7th in the U.S. for total ethanol production capacity.[23] POET opened its first ethanol plant in Ohio in 2008,[24] whereas there are now 5 total ethanol plants in Ohio. Mark Borer, general manager of POET Biorefining in Leipsic, OH argues that, "The ethanol industry has made a significant impact on Ohio's economy in recent years, especially the rural economy."[25] Because renewable energy generation is land intensive and needs to be located at some distance from population centers, it can be a great boon to local farmers, though its broader impacts on the rural economy are likely relatively small.

19. Ohio Department of Development, 2007.
20. Dayton Daily News, 2009.
21. The Daily Caller, 2010.
22. U.S. Energy Information Administration. http://www.eia.doe.gov/oiaf/analysispaper/biomass.html
23. U.S. Department of Energy. http://apps1.eere.energy.gov/states/energy_summary.cfm/state=OH
24. The Adviser Tribune, 2008.
25. Ohio Ethanol Producers Association.

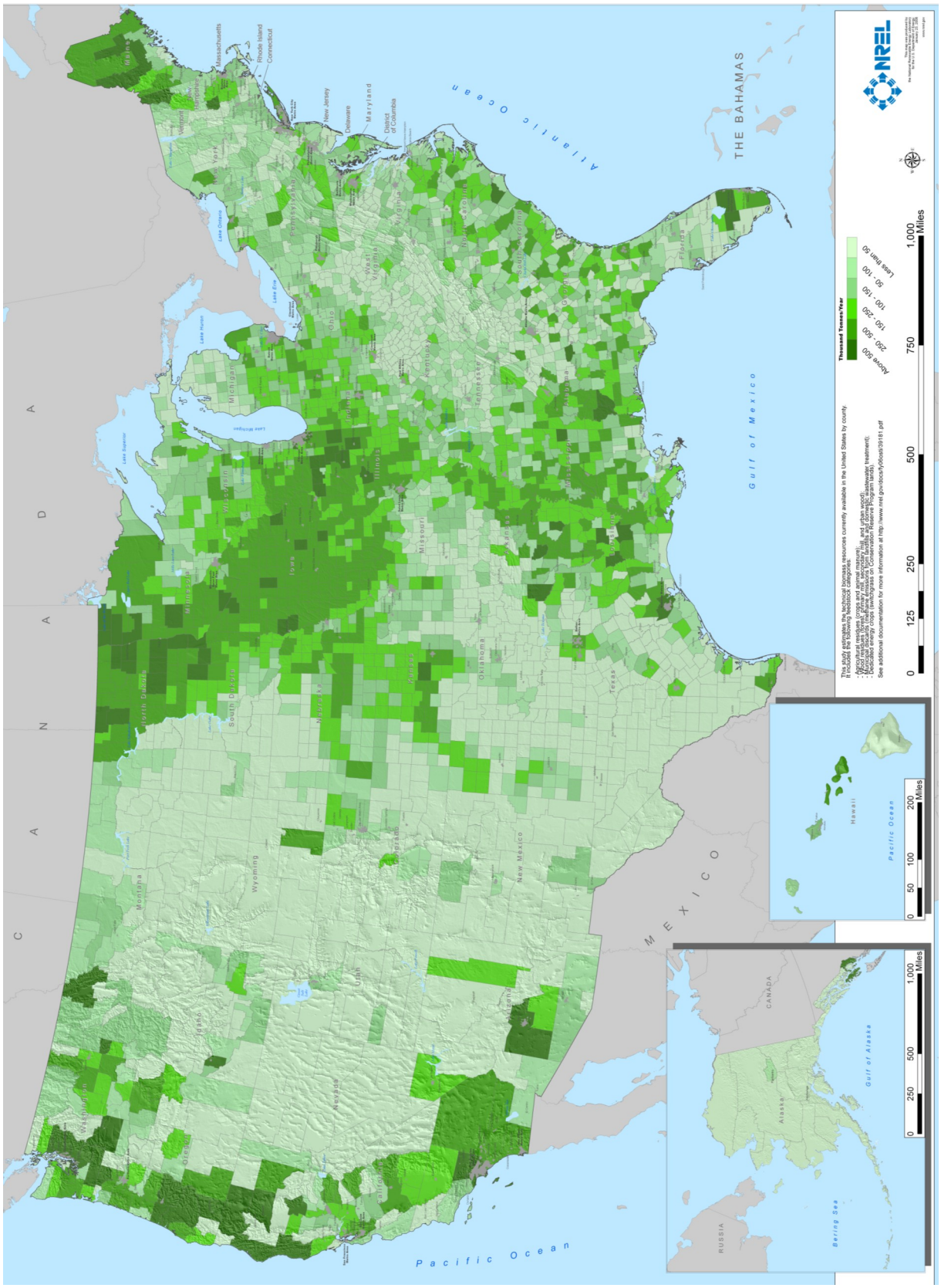


**Figure 11**: U.S. Biomass Resources[26]

26. National Renewable Energy Laboratory.

A new renewable fuel source similar to ethanol which has also been receiving recent attention is algae oil. In 2008, in *Columbus Business First*, Ross Youngs, CEO of Univenture, stated that Ohio was part of the "greenbelt" which is uniquely suited to the production of algae oil because of its cloudy skies.[27] Figure 12 below showing the solar resources of the U.S. verifies this assertion. However, after being awarded more than $6 million in stimulus funds, Youngs says he is considering moving his algae oil company to San Diego, Florida, Georgia, and Michigan because of difficulty in getting credit lines.[28] Of the locations he is considering, Figures 11 and 12 show that only Michigan has the unique "greenbelt" resource of "cooler temperatures and cloudy skies. Problems with access to credit for new firms are not unique to the green energy sector. Ensuring small businesses have access to credit is a strategy that will help all small businesses in Ohio. However, this example also shows that awarding government subsidies is not sufficient to keep recipient firms in Ohio.

Figure 12 clearly shows Ohio does not have a competitive advantage in solar energy over any state except Alaska. Nevertheless, it was recently announced that Ohio plans to construct its largest solar farm, a 49.9 megawatt facility housing 240,000 solar panels on 500 acres (the size of the state's subsidies have not as of yet been announced). By comparison, a typical Ohio coal-fired power plant's capacity is well over 200 megawatts on average.[29] The solar farm is reported to bring about 300 permanent jobs, mostly in manufacturing. Although the solar panels will be produced by a Spanish manufacturer, they have agreed to open a manufacturing facility in Ohio to build the panels.[30] The proposed solar farm became possible with the passing of Ohio's renewable energy portfolio as AEP has agreed to purchase power from the facility to meet the portfolio standards.[31]

Ohio's wind resources, shown in Figure 13, fare only marginally better than solar. Wind resources are rated marginal in northeast Ohio with a few spots along Lake Erie rated as fair. The southwest region receives a generally poor rating for wind. Although there are locations in the state rated fair, the U.S. map clearly shows that many other regions and many other states have a distinct competitive advantage over Ohio in generating wind energy.

Ohio's first commercial wind farm is located at Bowling Green with 4 turbines can generate up to 7.2 megawatts under optimal conditions.[32] However, there are other wind sites slated to be built, including one Lake Erie site that would generate up to 20 megawatts.[33] Another wind farm is slated to be built by EverPower Renewables Inc. in Champaign County with 54 turbines. Mike Pullins of EverPower stated that although areas such as the Dakotas have more wind, they simply do not have the transmission infrastructure found in Ohio and nearby population centers. Although wind energy may not currently be as cost effective as coal, as energy prices continue to rise and especially because demand for energy increases approximately 2% per year, wind energy and other renewable energies are slated to meet the increasing energy de-

27. Columbus Business First, Jan 2, 2008.
28. Columbus Business First, Jan 18, 2010.
29. SourceWatch.org.
30. Glass City Jungle.
31. Bloomberg Businessweek, 2010.
32. The City of Bowling Green, OH.
33. Columbus Business First, May 24, 2010

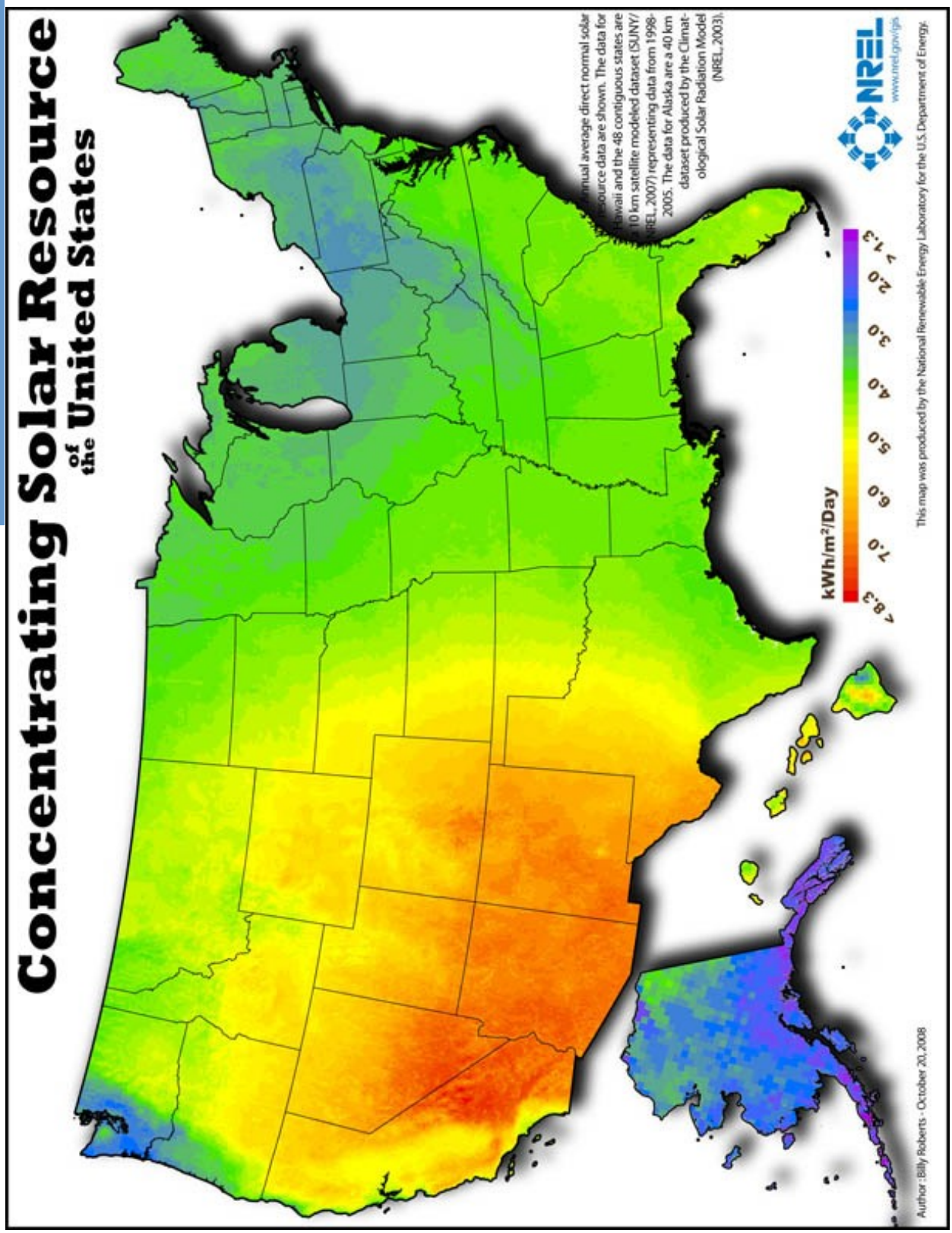


**Figure 12**: U.S. Solar Resources[34]

34. National Renewable Energy Laboratory

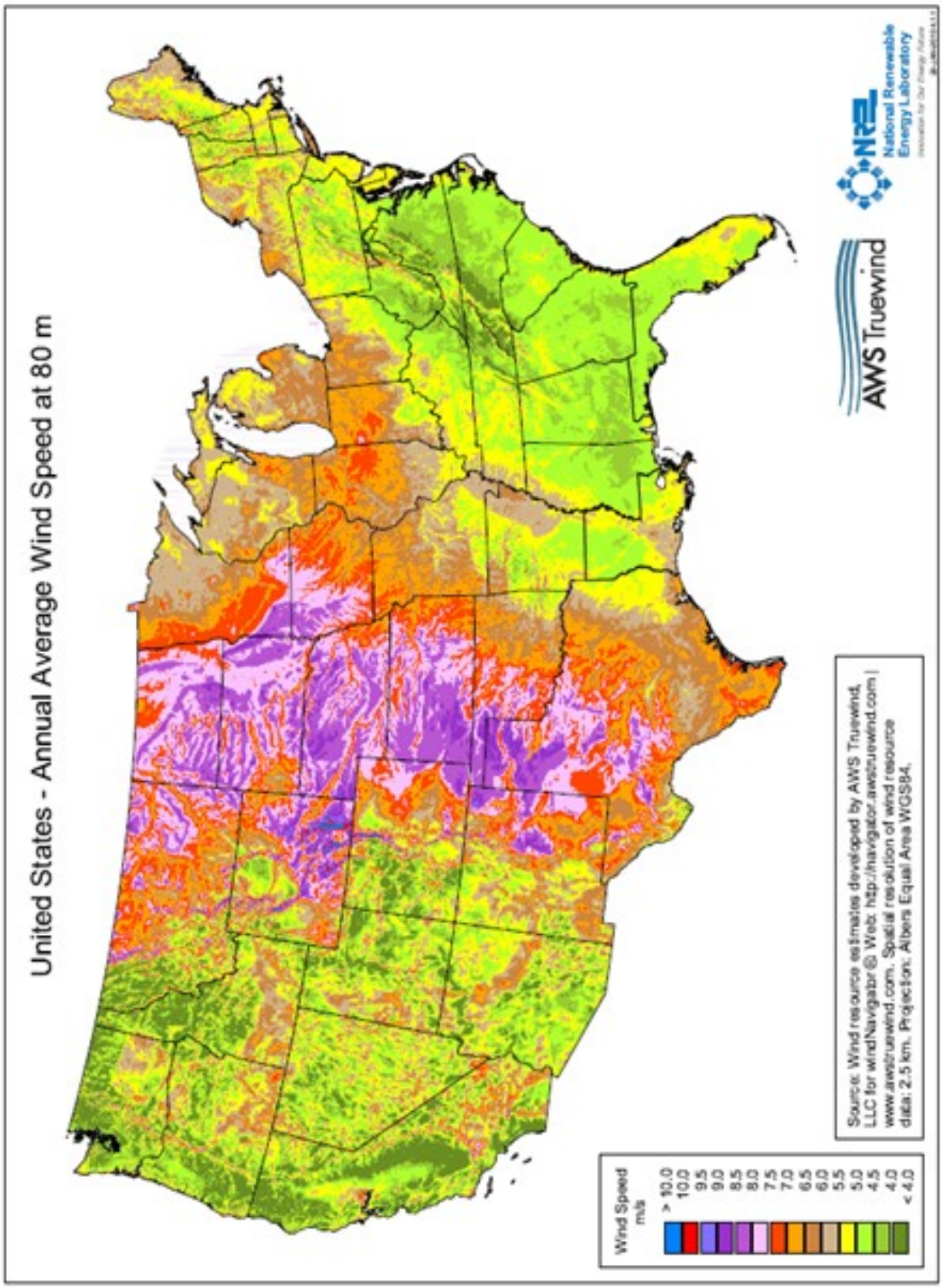


**Figure 13**: U.S. Wind Resources[35]

35. National Renewable Energy Laboratory

mands rather than building more fossil fuel plants.

The state's advanced energy program offers grants for the installation of residential wind or solar panels. Generally, residential wind and solar systems are less cost effective than commercial wind and solar systems.[36] These types of grants and state rebates offset the increased energy costs of these systems for residents, which then increases the demand in Ohio for residential wind and solar energy generation. Although residential generation of electricity reduces the transmission requirements of homes, it requires a more advanced energy grid with advanced meters. This increases the demand for investments in the country's smart grid.

The reasons behind Ohio's renewable energy portfolio and its efficiency in generating renewable energy become more apparent after viewing its natural resources. Ohio is not a particularly sunny portion of the U.S. nor is it particularly windy. Biomass has the best potential in Ohio, then wind, whereas solar remains the least feasible option. Although renewable energy technology continues to improve, making these areas more viable for renewable energy production, other areas with an abundance of solar and wind resources will outperform those with significantly less solar and wind resources. In terms of renewable energy generation, they will have a competitive advantage. It is important to note that the country's centers of renewable energy sources are not also population centers. The increased distance between renewable energy sources and population centers increases the transportation or transmission costs of renewable energy, making less abundant areas such as Ohio more viable. Figure 14 on the next page shows the geographic location of the U.S.'s population.

The question then becomes whether proximity to population and manufacturing centers that use energy, as well as the existence of significant transmission lines, can make up for a clear lack of renewable resources like wind and solar.

The Atlantic coast region is betting that building underwater transmission lines to transport offshore wind energy to population centers along the eastern seaboard will remove one of the most significant obstacles in making alternative energy viable.[37] Increased government spending on the transmission and storage of alternative energy including smart grids is evidence of the importance of considering the location of both renewable energy sources and population centers.

Not only is the location of consumers important, but also the timing of their energy demand is important. Peak times of energy consumption may not match up with the peak times for wind or solar energy generation. The intermittence of renewable sources such as wind and solar can be problematic for an energy grid with little to no energy storage capabilities. Ohio's scarce wind and solar resources also imply that that these resources may be very intermittent. With more intermittent energy sources on the grid, coal power plants will become less efficient being turned on and off in an attempt to better match both increased consumer demand and a decrease in the supply of wind or solar energy (which increases costs). Better prediction of wind and solar energy thus becomes even more important for efficiency along with transmission and storage of energy. Variable energy pricing can help smooth

36. Solarbuzz.com
37. The New York Times, Oct 12, 2010.

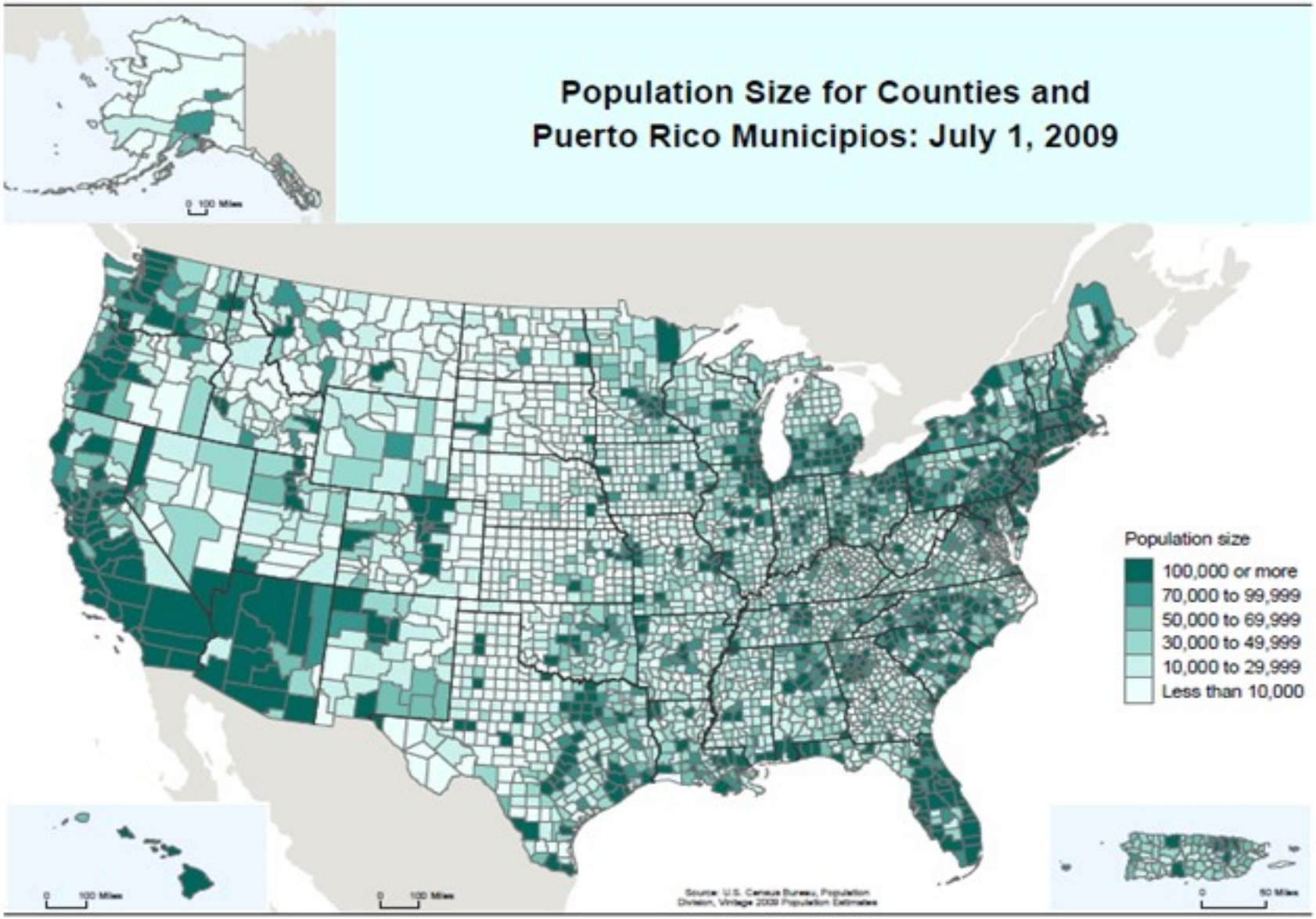


**Figure 14**: U.S. Population by County[38]

38. U.S. Census Bureau

energy demand but also requires a smart grid with advanced instrumentation or advanced residential energy storage.[39]

The point is that in Ohio and across the country, before we will be able to significantly increase the size of the alternative energy sector for electrical generation, significant steps are needed to improve interregional distribution and storage. The problem is that, for example, on cloudy days and calm days in Ohio, the state will need to import electricity from other regions (and vice versa). Thus, there is first a need for significantly better transmission and storage facilities if significant production of clean energy is going to become a reality. While this is vastly overlooked by the public and political leaders, it is in this sector that Ohio has its best advantages to capitalize in the clean energy economy. In sum, there are many sectors in the green economy other than energy generation. Ohio may not have the natural resources for renewable energy generation, but there may be other green energy sectors better suited to the state.

***Labor and Industry Resources:***

We need to look beyond Ohio's natural resources. It may be more important to see if the state's labor and industry resources can be strategically utilized to meet the needs of the renewable energy sector specifically addressing its limitations. We start with a basic comparison of the Ohio economy to the U.S. Figure 15 shows that Ohio's economy at a glance is very similar to the U.S. economy, with the exception of manufacturing.

Although trade, transportation, and utilities accounts for 19% of Ohio employment, utilities account for only 0.4% of employment.[41] The utilities sector includes all electric power generation, transmission, and distribution. Energy generation is not a significant source of jobs in Ohio (or in the

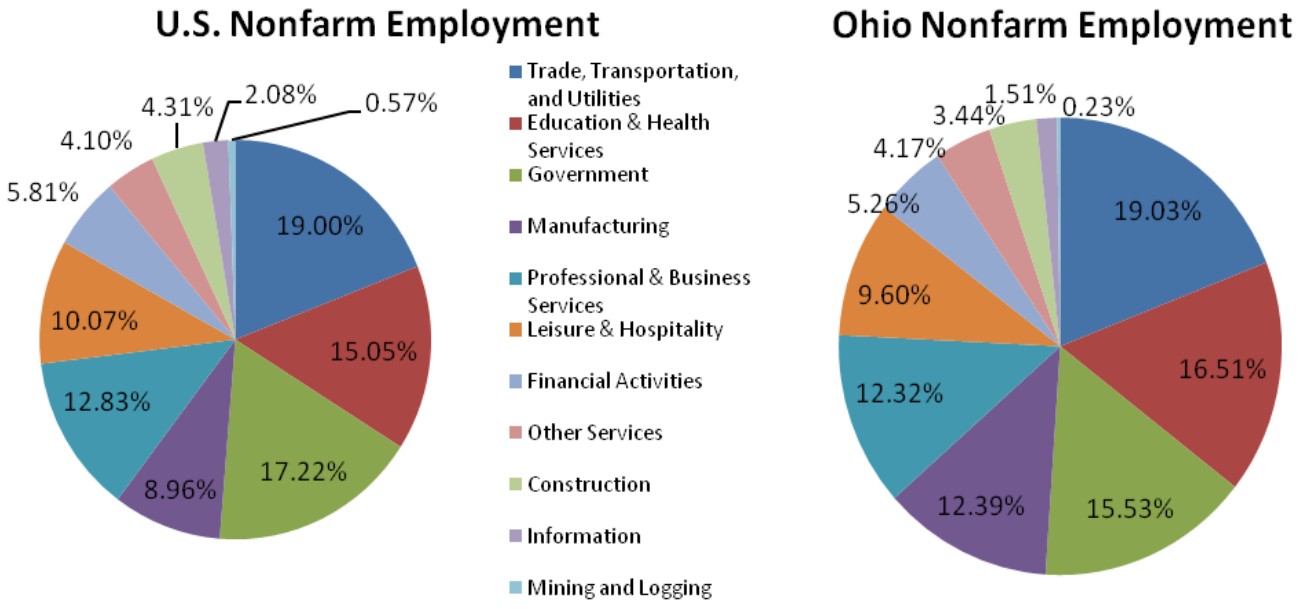


**Figure 15:** U.S. and Ohio Economy at a Glance August 2010[40]

39. Pew Center on Global Climate Change, 2009. http://www.pewclimate.org/docUploads/wind-solar-electricity-report.pdf
40. U.S. Bureau of Labor Statistics, 2010.
41. Ibid.

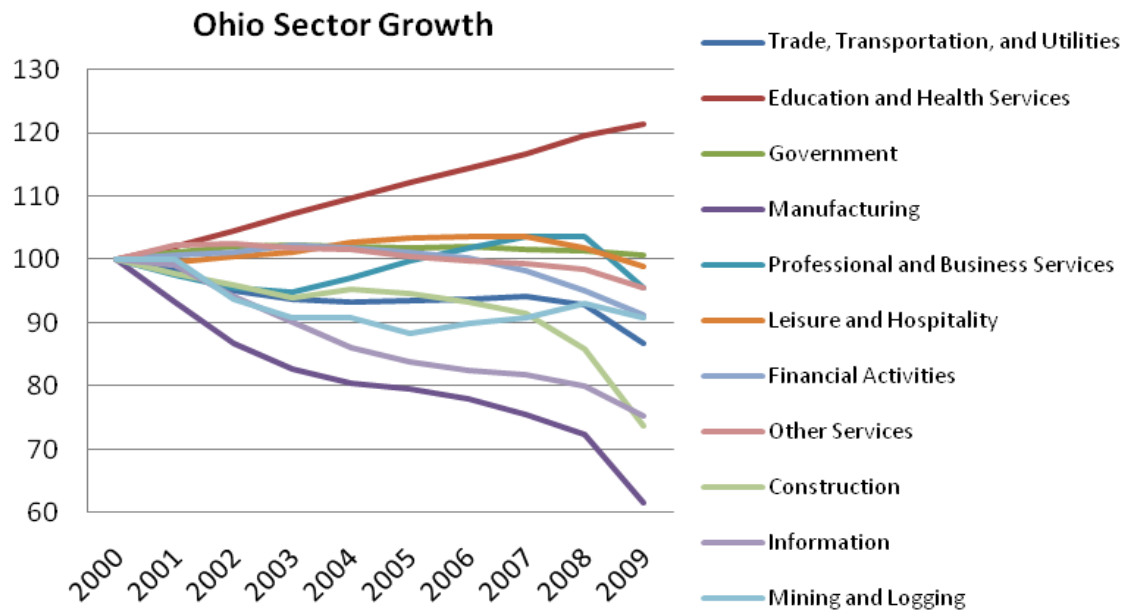


**Figure 16**: Ohio Sector Growth Since 2000[42]

U.S.) and thus, Ohio should not expect renewable energy generation to be a significant source of jobs as well. Figure 16 shows the change in Ohio's main economic sectors since 2000. The manufacturing sector has experienced a steady decline dating back to at least the late 1960s.

The intersection of manufacturing and green jobs would lie in the clean economy sector of environmentally friendly production. This includes but is not limited to manufacturing hybrid cars, wind turbines, solar panels, and advanced packaging. Although Ohio is not ideal for wind energy generation, the U.S. is currently among the largest markets for wind energy products and most of the equipment is manufactured in Europe.[43] Moreover, we already noted that production for energy transmission and storage will be required to fulfill the potential of clean energy. Conversely, education and health services are both one of the largest sectors as well as the fastest growing Ohio sector. Figure 17 below shows Ohio's top 10 employers. Many of the largest employers are in the health and education sector. None of the largest employers are generally considered to be part of Ohio's green economy.

| Rank | Company | Ohio Employment Estimate Headcount | Headquarters Location | Sector |
|---|---|---|---|---|
| 1 | Wal-Mart Stores, Inc | 54,200 | Bentonville, AR | Retail: General Merchandise |
| 2 | Kroger Co | 38,000 | Cincinnati, OH | Retail: Food Stores |
| 3 | Cleveland Clinic Health System | 37,800 | Cleveland, OH | Health |
| 4 | Catholic Healthcare Partners | 28,200 | Cincinnati, OH | Health |
| 5 | Ohio State University | 26,800 | Columbus, OH | Education and Health |
| 6 | Wright-Patterson Air Force Base[1] | 23,800 | Dayton, OH | Government: Air Force base |
| 7 | University Hospitals | 21,800 | Cleveland, OH | Health |
| 8 | JP Morgan Chase & Co | 17,500 | New York, NY | Finance: Bank |
| 9 | Giant Eagle, Inc | 17,000 | Pittsburgh, PA | Retail: Food Stores |
| 10 | Sears Holdings Corp (Sears & Kmart) | 16,400 | Hoffman Estates, IL | Retail: Department Stores |

**Figure 17**: Largest Ohio Employers [44]

42. U.S. Bureau of Labor Statistics
43. Ohio Department of Development, 2007.
44. Ohio Department of Development, April, 2009. http://www.development.ohio.gov/research/files/b100000002.pdf

Ohio would be better off investing in its smaller firms and entrepreneurs. In 2006, small employers (employers with less than 500 employees) accounted for 48.6% of Ohio's total employment and 98.2% of Ohio's employers.[45] Thus, it is especially important to take a closer look at Ohio's economy rather than just its largest sectors such as manufacturing. As we discussed in our previous brief, one of the biggest problems for job growth when investing in green energy is that it displaces workers in fossil fuel energy (or the taxes to fund subsidies displace jobs elsewhere in the economy). When thinking about adding jobs with minimal or no displacement, we should focus on adding jobs that are truly innovative and strategic in filling in gaps other states are ignoring. This green job strategy is in stark contrast to trying to catch up with other states in green energy generation for example. Not only does such a strategy lack creativity, but it is unlikely to succeed.

The industry targeted green job strategy in Figure 18 is sensible in many ways if conducted in the manner laid out (with the caveat that tax incentives for outside firms would unlikely be successful) and is consistent with the Ohio Department of Development's targeted strategy.[46] Likewise, the more that monies are used to incentivize consumers to change behavior rather than subsidize firms, the more likely that the funds will have lasting impact. With 4 of the top 100 universities in Ohio, R&D in renewable energy seems more viable than renewable energy generation.[47] It then becomes key to capitalize on successful research employing the services of business professionals. The targeted green job industries not only address some of the strengths of Ohio but also some of the weaknesses or shortcoming in renewable energy. The distribution and storage of renewable energy is a key weakness not just for renewable energy but for energy efficiency in general.

Many states invest large sums of money in renewable energy generation without considering how this energy will be distributed and the effects this intermittent renewable energy generation will have on the grid and other sources of energy. Investment in a smart gird seems to be largely overlooked along with the advanced instrumentation required by a smart grid. Ohio's share of U.S. production of electronic instruments ranks 15th.[48] Additionally, more than 70% of green energy patents have been in batteries and fuel cells as shown in figure 3. For example, advances in batteries and fuels cells are essential in hybrid car manufacturing in Ohio's large auto sector.[49]

The above discussion assumes that the Ohio Department of Development targeted indus-

**Ohio's Statewide Targeted for Green Jobs Industries**

- Research in Renewable Energy and Environmental Technologies
- Energy Efficient Aviation
- Biomass Energy and Biofuels
- Corporate and Professional Services in the Green Economy
- Distribution and Storage of Renewable Energy
- Instruments, Meters, Controls, and Electronics for the Smart Grid
- Hybrid Vehicles and Parts Manufacturing
- Advanced Packaging Materials

**Figure 18**: Green Job Growth Strategy for Ohio

45. U.S. Small Business Administration.
46. Ohio Department of Development. http://development.ohio.gov/strategicplan/documents/StrategicPlan.pdf
47. U.S. News & World Report
48. Ohio Department of Development. http://www.development.ohio.gov/research/files/b404000002.pdf
49. Ohio Department of Development. http://www.development.ohio.gov/research/files/B401000000.pdf

try strategy is optimal for state job growth. One sector distinctly missing from Figure 20 is the green economy sector of conservation and pollution mitigation, which is the largest employer in the green economy for both the U.S. and Ohio. By focusing on nine main industries in Ohio, the Department of Development is likely to overlook smaller industries that are just as economically viable as the nine targeted industries. Conservation and pollution mitigation contributes to the quality of life in an area through activities such as water treatment, environmental safety, and environmental cleanup. Conservation and pollution mitigation will also not have the same displacement effects that green energy jobs would have. Likewise, by cleaning the environment and improving quality of life, they can attract and retain population in that manner—which research show is likely the most potent of all green development strategies. [50]

50. Partridge, M. D. 2010 "The Dueling Models: NEG vs Amenity Migration in Explaining U.S. Engines of Growth." *Papers in Regional Science*. 89: 513-536. doi:10.1111/j.1435-5957.2010.00315.x.

# Ohio's Current Green Job Strategy

To discover whether Ohio's current green job growth strategy is in line with its own Department of Development's job growth strategy, we examine current spending on green jobs starting with stimulus spending. It is much more difficult to classify government programs and funds into distinct categories than it is to classify employment in these categories. Approximating government funding into these categories does provide us with a general look at the differences between green energy employment, green energy funding, and optimal green energy economic development, but the analysis has its own limitations. Figure 19 to the right shows national stimulus spending toward the green economy.

The largest portion of federal stimulus spending in the green economy has been toward tax credits for renewable energy and energy efficiency. There has also been significant spending on improving infrastructure including the energy grid. Figure 20 on the next page shows state stimulus funding with the state energy funds broken out into its various subcategories. Most but not all of the state energy funds are dedicated to renewable energy projects.

Very little of the spending shown in Figure 20 is used toward the green economy sector of environmentally friendly production or toward the transmission

EXHIBIT 17

**THE AMERICAN RECOVERY AND REINVESTMENT ACT OF 2009**

**Energy- and transportation-related spending**

The federal stimulus bill enacted in February 2009 includes an array of provisions to spur clean energy generation and energy efficiency businesses, jobs and investments. A total of $84.8 billion has been set aside for energy- and transportation- related spending. Amounts are in thousands.

| AREA OF INVESTMENT | TOTAL INVESTMENT |
|---|---|
| Energy efficiency and conservation | $16,470,000 |
| Improving the grid | $11,000,000 |
| Energy research | $7,900,000 |
| Clean energy generation | $6,000,000 |
| Jobs training | $500,000 |
| Vehicle spending | $2,600,000 |
| Transportation spending | $18,400,000 |
| Climate science research | $570,000 |
| Tax credits for renewable energy and energy efficiency | $19,668,000 |
| Tax credits for alternative fuel pumps | $54,000 |
| Investment credits in energy generation and energy efficiency technologies | $1,600,000 |
| **Total** | **$84,762,000** |

SOURCE: Pew Center on Global Climate Change, Key Provisions: American Recovery and Reinvestment Act, March 2009 (updated April 16, 2009), http://www.pewclimate.org/docUploads/Pew-Summary-ARRA-Key-Provisions.pdf (accessed April 28, 2009).

**Figure 19:** U.S. Green Job Stimulus Funding[51]

51. The Pew Charitable Trusts, 2009.

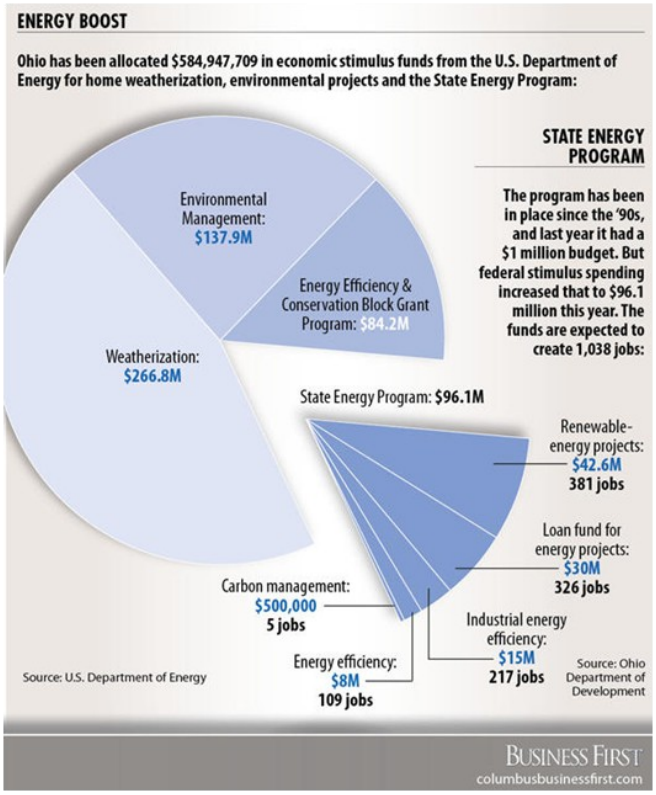


**Figure 20**: Ohio Stimulus Spending[52]

and storage of renewable energy. When American Recovery and Reinvestment Act funds are distributed to Ohio, policymakers are presumably accounting for the fact that state funds are already being directed towards various green economy subsectors. For example, two of the main sources of state funding supporting the green economy are the Ohio Advanced Energy fund and the Third Frontier program. "The Ohio Department of Development's Energy Resources Division administers the Advanced Energy Fund. Since its inception in 1999, the Advanced Energy Fund has made more than $41.9 million in investment in nearly 400 advanced energy projects."[53] Approximately 52% of all Advanced Energy Fund awards have been spent on the energy efficiency and approximately 48% on clean energy (mostly solar and wind).[54] Figure 21 shows Ohio Third Frontier funding toward Ohio's green economy.

The Ohio Third Frontier program has the stated strategic goal of "increasing the quantity of high-quality research that has commercial relevance to Ohio companies."[56] Thus, it is not surprising to see such a large portion of Third Frontier green energy funding spent on training and support, the subsector that includes research in alternative energy. However, the proportion of spending on either clean energy research or clean energy projects is somewhat surprising given the lack of solar and wind resources in Ohio.

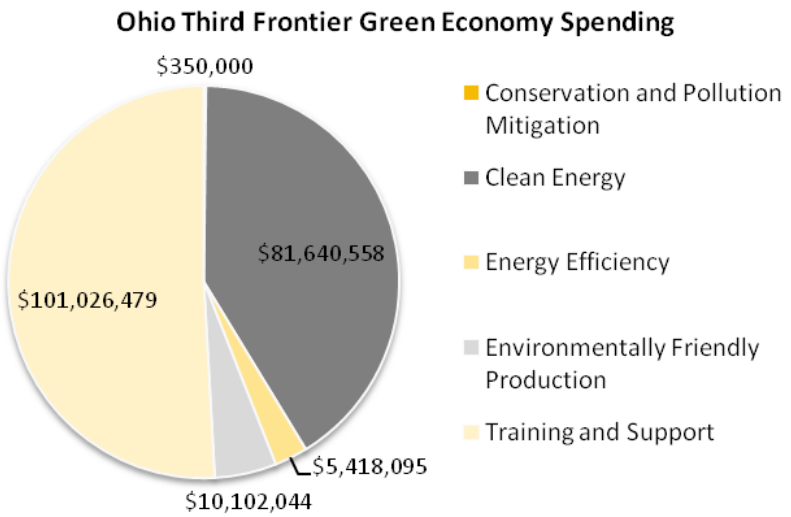


**Figure 21**: Ohio Third Frontier Funding[55]

52. Columbus Business First., Aug 1, 2009.
53. Ohio Department of Development. http://www.development.ohio.gov/Energy/Incentives/AdvancedEnergyFundGrants.htm
54. Ohio Department of Development. http://www.development.ohio.gov/Energy/Incentives/documents/AEF_Report_Website_Fonts.pdf
55. ThirdFrontier.com
56. Ohio Department of Development. http://www.development.ohio.gov/ohiothirdfrontier/Goals.htm

Clean energy spending does include spending on the transmission of renewable energy and the smart grid. This becomes especially important given the state's prominence in instrumentation. Gary Walzer, Senior Principle Engineer of Alternative Energy Technology at EMTEC agrees that the current limits of renewable energy are in its transmission and storage. Ohio may have significant transmission lines and a large portion of the U.S. population nearby, but nearby states such as Pennsylvania also have these attributes and are already generating more wind than Ohio. Figure 24 below shows the installed wind capacity for each state. Relying on transmission capabilities may not be a sustainable green energy strategy for the long run. Transmission lines though expensive can be built, but there is nothing Ohio can do to create more natural resources such as wind and sunlight.

The intermittence of renewable energy is a problem not just for Ohio, but for all states pursuing renewable energy generation. Walzer states that one of the keys to solving problems with the variability in energy demand and the intermittent supply of renewable energy is either large scale storage or some smaller scale storage located near end users. Advanced meters and instrumentation are also important for more efficient energy generation, storage, and transmission. FirstEnergy received $57.4 million in stimulus funds to install smart meters in 5,000 Cleveland homes that "allow customers to better manage their electricity use,

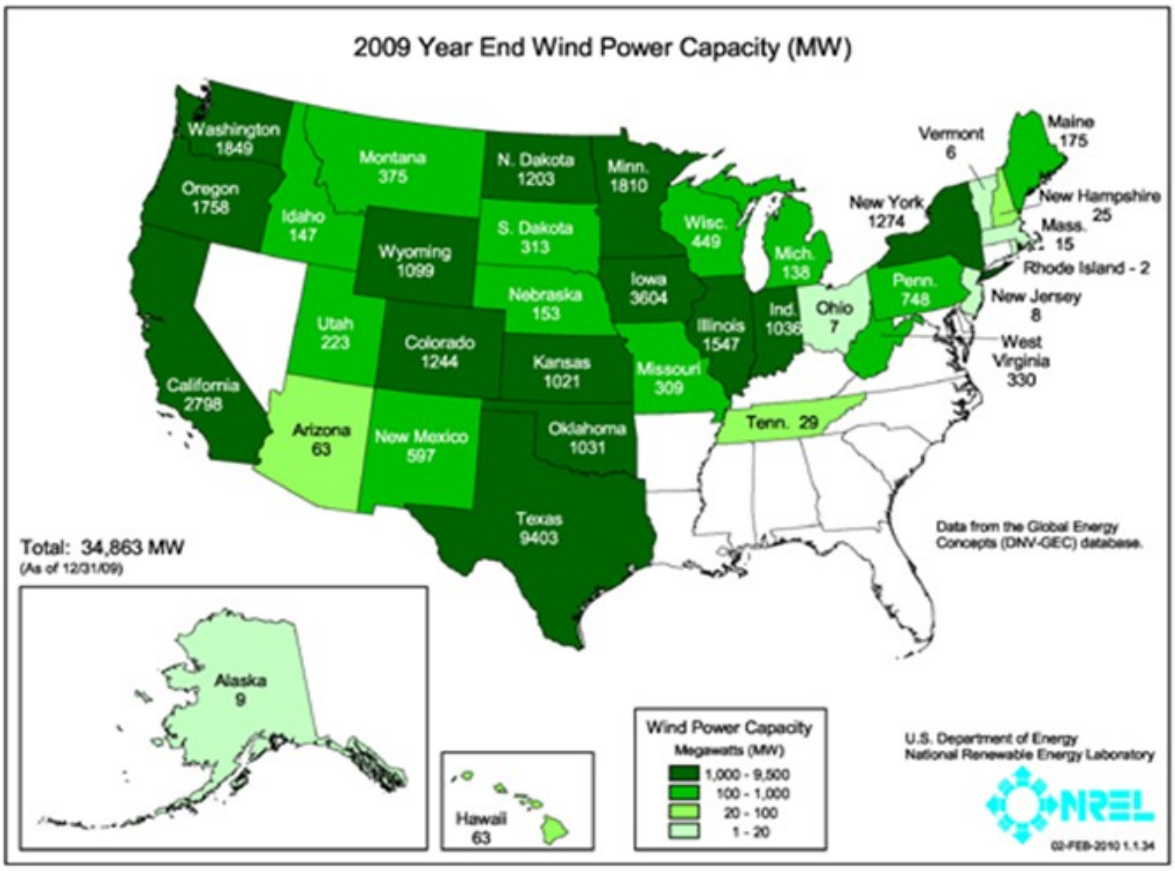


**Figure 22**: U.S. Installed Wind Capacity[57]

57. National Renewable Energy Laboratory
58. The Cleveland Plain Dealer, Oct, 28, 2009.
59. The Columbus Dispatch, Sept, 1, 2010.

including identifying how much power different appliances use."[58] This type of advanced instrumentation can help deal with residential energy efficiency as well as help customers smooth their demand when variable pricing reflects higher prices during peak demand periods. AEP was also given federal funds to test similar advanced meters in 100,000 homes in greater Columbus.[59] Better transmission lines can also help with issues with intermittent renewable energy. With transmission lines to windier areas, for example, Ohio can supplement its own renewable energy during times with low amounts of wind. New transmission lines are planned to do just this connecting Ohio to windier states such as Iowa and the Dakotas.[60] Smart grids should be a green energy focus for all states, but Ohio may find a unique role in manufacturing the meters and instrumentation that a smart grid requires.

Walzer states that significant reductions in greenhouse gases will require cultural changes in almost every aspect of our daily lives to change how we consume energy. Many new products designed to be energy efficient can allow Americans to continue similar lifestyles while consuming less energy. Dramatic changes in energy consumption and greenhouse gas emissions will require dramatic behavioral shifts. Ohio has clearly placed a significant amount of funding toward incentives for residents, firms, and the government to pursue energy efficiency through a number of avenues, one of which is by providing tax incentives to purchase these energy efficient products. However, consumers and firms will instinctively pursue more energy efficient products and energy saving methods as energy prices rise.

Ohio's specific role in energy efficiency may more appropriately be in producing these energy efficient goods utilizing its manufacturing sector. Following from Figure 21, the Ohio green sector needing the most attention is the environmentally friendly production sector. In 2007, Ohio ranked 4th in total employment in environmentally friendly production.[61] In fact, the world's largest manufacturers in thin film solar panels, First Solar, is located in Perrysburg. Ohio. First Solar recently received stimulus funding for green job training. They employed approximately 200 people just five years ago and they now employ over 1,000.[62] The funding for First Solar is classified as training and support, but is clearly supporting environmentally friendly production.

60. The Columbus Dispatch, Nov 2, 2010.
61. The Pew Charitable Trusts, 2009.
62. ABC Local Toledo News, Sept 30, 2010.

# Conclusion

Ohio's green job strategy should be targeted in areas with the highest net returns. Even with a green job strategy targeted for Ohio, we still should not expect green job growth to be the silver bullet solution to the state's economic woes. With that realization comes other unsettling realizations. Even if state funding is able to attract start-up ventures to Ohio, most of these small firms will not be able to offer wages as high as the large manufacturing firms which have shut down and may even require more advanced skills.[63] Thus, it is especially important to fund job training and education and ensure the public's expectations are appropriately handled.

With established programs such as Ohio Third Frontier and the Advanced Energy Fund, the state appears to be adequately funding alternative energy R&D and should continue to do so. Ohio's Advanced Energy fund has also been instrumental in pursuing statewide energy efficiency, which our last policy brief argued is one of the most cost effective methods in reducing carbon emissions. Ohio should also be careful not to ignore its largest green economy sector of conservation and pollution mitigation which make Ohio a more desirable place to live (attracting talent) while actively reducing Ohio's environmental impact. In terms of job growth, there is little displacement effect with these jobs and they are labor intensive. However, these are strategies that every state should pursue. Ohio also needs strategies that uniquely consider its assets.

Ohio, and every other state, should not merely be following some "leader" in alternative energy or copying other states. When each state finds its area of specialization in the green economy rather than all doing the same thing, significant gains for the U.S. economy can be found.

In our previous brief, we used California as an example of a "leader" in green energy. California is ranked number one in employment for every green economy sector.[64] California is ranked 2nd in renewable energy generation.[65] There are reasons California is a leader in both green energy employment and green energy generation. It has some of the best potential solar resources with pockets of "superb" wind resources and great biomass resources. Not only does California have a significant advantage with its abundance of renewable energy resources, but it also has large population areas near those resources. Finally, California has expensive electrical rates which provide incentives to use alternative energy. Comparatively, Ohio has a large population and significant trans-

63. The Columbus Dispatch, May, 16, 2010.
64. The Pew Charitable Trusts, 2009.
65. U.S. Energy Information Administration. http://www.eia.doe.gov/cneaf/solar.renewables/page/state_profiles/r_profiles_sum.html

mission lines but is lacking renewable resources especially wind and solar and has energy prices below the national average.

Ohio continues to spend a significant amount of funding on solar and wind hoping to compensate for a lack of resources with people and capital. Ohio is hoping its nearby population and manufacturing centers coupled with its transmission infrastructure can compensate for this lack of renewable resources. At this point in time, wind and especially solar energy are simply not cost competitive and are rather expensive methods of reducing carbon emissions. Thus, this strategy may or may not work in the short run, but in the long run when better transmission infrastructure is constructed, Ohio will likely fall further behind with its lacking renewable resources. Nearby states with abundant renewable energy will simply be able to provide renewable energy at a lower cost and thus, more efficiently than Ohio can.

At this point in time, even Ohio's biofuel potential shown below in Figure 23 cannot make up for the economic climate in which biofuels finds itself. With lower energy costs and higher corn prices, ethanol plants in Ohio are struggling.[67] Figure 23 reiterates the fact that Ohio is surrounded by states with better renewable energy potential much of which is already established in current electrical plants. If Ohio simply allows nearby states with more abundant renewable resources to provide renewable energy to Ohio, it can then use its own resources more effectively and efficiently.

Ohio's long-term green job strategy should take into account not only Ohio's natural resources but more importantly its labor resources and its business infrastructure. Manufacturing and environmentally friendly production utilizes Ohio's long history of manufacturing and does not require significant wind or solar resources. Ohio's specialized green job strategy should be in manufacturing energy efficient products. Meters and instrumentation for a smarter grid especially appear to be the most promising areas. Indeed, we pointed out that nationally, better electrical transmission and storage will be needed before clean fuels will be a feasible alternative. It is precisely in those areas where Ohio could be a leader and capture a significant share of the market.

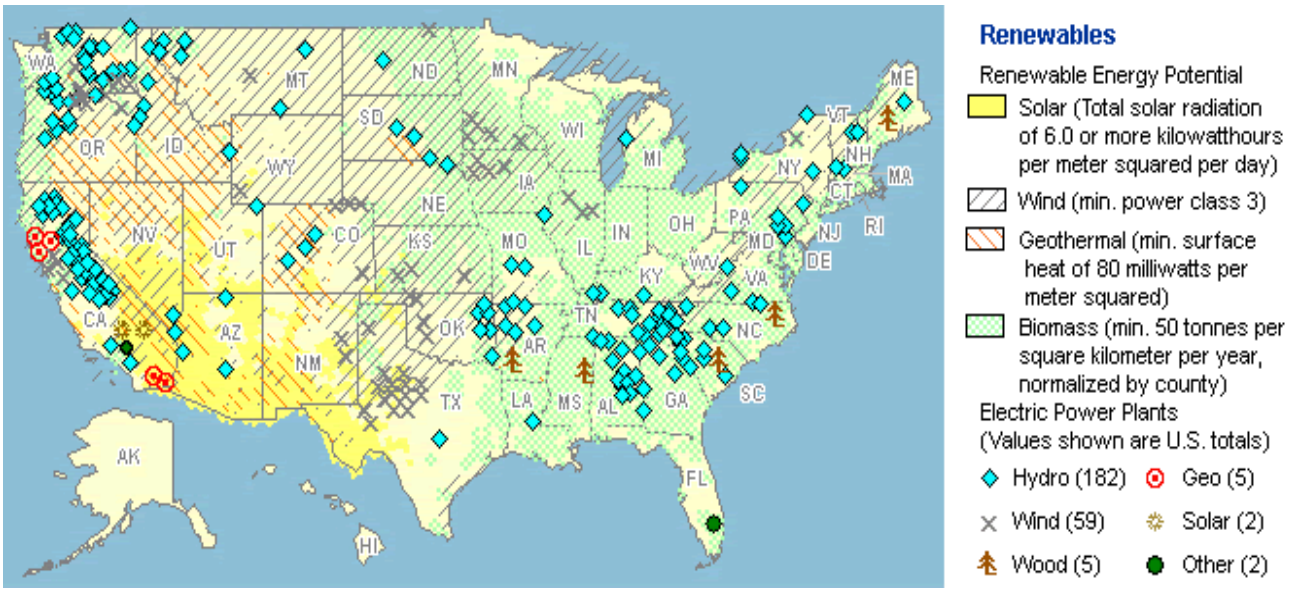


**Figure 23**: U.S. Renewable Energy Potential and Electric Power Plants[66]

66. U.S. Energy Information Administration. http://www.eia.doe.gov/state/
67. The Columbus Dispatch May 12, 2009.

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