

# Can Low-Income Households Afford Alternative Energy?

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### Abstract

Over the past several years, the United States and other countries have moved away from fossil fuels and toward energy sources that are purported to have less of a negative impact on the environment. In 1980, 51 percent of US electricity was generated by coal (The Shift Project 2014). In 2014, that measure decreased to 39 percent (<sup>3</sup>EIA 2014). While a shift away from coal reduces carbon emissions, the higher price of electricity generation using alternative energy has resulted in higher overall electricity prices (<sup>1</sup>EIA 2011 and <sup>2</sup>EIA 2014). This paper investigates the effect of the shift toward alternative energy on low-income households. It was concluded that eliminating coal in favor of solar or wind energy will increase the annual electricity bill for an average American family by up to \$254. Furthermore, the shift away from coal places an unbalanced burden on the poor, raising their electricity bills by as much as 23 percent, while the wealthier will only see increases of up to 14 percent.

# Can Low-Income Households Afford Alternative Energy?

## Introduction

Over the past several years, the United States and other countries have moved away from fossil fuels and toward energy sources that are expected to have a more positive impact on the environment. Policy is ahead of reality on alternative energy; while policymakers are busy trying to find ways to promote alternatives to coal (<sup>1</sup>The White House 2014), they are not considering the cost of energy and its differential impact on the poor. This investment in alternative energy comes at a price. Not only is the federal government relying on subsidies to support households' conversion to alternative energy, the effect of these actions on certain demographic groups is uncertain.

This paper will consider the effects of phasing out the use of fossil fuels in favor of moving toward alternative energy solutions in the United States. Additionally, the study will estimate the impact on electricity costs of moving to a higher share of US electricity produced by alternative energy. The paper will end with a critical look at the potential contribution to income inequality in America resulting from this shift toward alternative energy sources.

## Ignoring the Costs

In 2013, renewable energy (biomass, geothermal, hydropower, solar, wind) accounted for 37 percent of new US energy capacity, compared to only 11 percent for coal (Bossong 2014). Pro-clean energy groups like Citizens for Responsible Energy, the Union of Concerned Scientists, and the Renewable Energy Group praise this movement to alternative energy. However, while proponents, including the White House, continue to advance the notion that alternative energy will not result in higher costs for consumers, the numbers tell a different story.<sup>1</sup>

The most obvious differences in prices are between solar thermal energy and coal. Solar thermal energy is the most common form of solar energy used and is utilized in many households to heat underground water tanks. As shown in Table 1, in 2011 solar thermal energy at 31 cents per kilowatt-hour was almost three times as expensive as coal at 12 cents per kilowatt-hour, and by 2014 solar thermal energy was still much more expensive than coal – almost twice as much at 24 cents per kilowatt-hour compared to 13 cents per kilowatt hour for coal. The comparison between natural gas and solar thermal energy is even larger, as solar thermal energy was over two times as expensive as natural gas at 24 cents per kilowatt-hour compared to 9 cents per kilowatt-hour in 2014 (“Solar Thermal” 2014).

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<sup>1</sup>“That is why this Administration has made the largest investment in clean energy in American history and has launched several initiatives to advance clean energy deployment. Since President Obama took office, the US has increased solar electricity generation by more than ten-fold, and tripled electricity production from wind power.” (<sup>1</sup>The White House 2014)

	<u>2011</u>	<u>2014</u>
Coal	0.12**	0.13**
Natural Gas	0.09**	0.09**
Nuclear*	0.11	0.10
Wind	0.17**	0.14**
Solar PV*	0.21	0.13
Solar Thermal*	0.31	0.24

Source: Adapted from the <sup>1</sup>EIA 2011 and <sup>2</sup>EIA 2014

\*Costs do not reflect national tax credits for nuclear, solar PV, and solar thermal technologies as imposed by the Energy Policy Acts of 1992 and 2005.

\*\*Midpoint of cost by source used.

While fossil fuel energy appears to be cheaper for consumers, renewable portfolio standards (RPS) are making it increasingly difficult for them to utilize energy from non-renewable sources.

Table 2 below shows that from 2001-2010, the top seven most coal dependent states that saw new RPS requirements experienced an average increase in electricity costs of 54.2 percent – ranging from 35.3 percent (OH) to 86.7 percent (MD). But the average increase in electricity costs of the top seven most coal-dependent states that *did not* see new RPS requirements were much lower. The average increase in electricity costs for these states from 2001-2010 was 24.3 percent.

In 2009, Congress attempted to pass a nationwide RPS bill, requiring that by 2020, 20 percent of an energy supplier's demand be met with renewable electricity. While the House passed their version of the bill, it never came before the Senate for a vote, a success for Senator Kent Conrad (D-ND), for instance, who stated that the 2020 target was "problematic" because of North Dakota's reliance on coal (Johnson 2009).

Seven Most Coal Dependent States Without RPS Requirements		Seven Most Coal Dependent States With RPS Requirements	
Georgia	30.4%	Maryland	86.7%
Utah	29.6%	Delaware	60.3%
Wyoming	29.5%	Wisconsin	60.1%
Oklahoma	25.7%	Michigan	50.9%
North Dakota	25.7%	Colorado	47.7%
South Dakota	16.2%	Minnesota	39.2%
Arkansas	14.8%	Ohio	35.3%
Average	24.3%	Average	54.2%
Median	25.7%	Median	50.9%

Source: Manhattan Institute analysis of data from the Energy Information Administration, 2012

Tables 1 and 2 suggest that moving away from coal and toward renewable energy will likely increase the costs of electricity for the average household. In 2012, the average American household used 10,837 kWh of electricity (<sup>3</sup>EIA 2014).

As outlined in Table 3 below, 39 percent of US energy came from coal in 2013. The average price of the coal, natural gas, solar, and wind portion of a household's electricity bill in 2013 was \$877.03. Totals do not include energy from nuclear, hydropower, biomass, geothermal, petroleum, and other gasses.

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**Table 3: American Energy Consumption in 2013**

Source	Percent Share of Total Electricity Generation	Average Household Use of Total Electricity Generation (kWh)*	Average Cost of Electricity (\$/kWh) (2014)	Average Household-Cost of Total Electricity Generation (\$) **
Coal	39.0%	4,226	0.13***	\$549
Natural Gas	27.0%	2,927	0.09***	\$263
Solar	0.2%	25	0.19***	\$5
Wind	4.1%	448	0.14***	\$63
<b>TOTAL</b>				<b>\$880</b>

Source: <sup>2</sup>EIA 2014 <sup>3</sup>EIA 2014

Note: Totals do not include energy from nuclear, hydropower, biomass, geothermal, petroleum, and other gasses.

\*Average Household Use of Total Electricity Generation (kWh) is calculated by multiplying the Percent Share of Total Electricity Generation by 10,837 kWh of electricity, which was the amount of electricity the average American household used in 2012 (<sup>3</sup>EIA 2014).

\*\*Average Household Cost of Total Electricity Generation (kWh) is calculated by multiplying Average Household Use of Total Electricity Generation (kWh) by the Average Cost of Electricity (\$/kWh) (2014) as used in Table 1. Total is calculated by adding all sources.

\*\*\*Midpoint of cost by source used.

As listed in Table 4 below, if the 39 percent of energy that came from coal had come instead from *solar* energy, the average household's annual electricity bill would increase \$254, or 29 percent, assuming that prices stay constant at the ranges reported in Table 3. And according to Table 5, if the 39 percent of energy that came from coal had come instead from *wind* energy, the average household's annual electricity bill would increase by \$42, or 13 percent.<sup>2</sup>

<sup>2</sup>It's unclear what the actual effect on total prices of electricity would be. An increase in demand of electricity, an electricity shortage, or an increase in the cost of producing electricity could increase the price of electricity, while better technology to generate more electricity or an electricity surplus could decrease the price of electricity. Overall, prices could change, which is why this study gives a conservative estimate and assumes that prices stay constant at the ranges reported in Table 3.

**Table 4: Moving Coal Energy to Solar Energy**

<b>Case 1: Average Household Cost of Total Electricity Generation With Coal Energy Moving To <u>Solar</u> Energy (\$)</b>			
Source	Percent Share of Total Electricity Generation	Average Household Use of Total Electricity Generation (kWh)*	Average Household Cost of Total Electricity Generation (\$)**
Coal	0%	0	\$0
Natural Gas	27.0%	2,926	\$263
Solar	39.2%	4,251	\$808
Wind	4.1%	448	\$63
<b>TOTAL</b>			<b>\$1,134</b>
<b>Average Bill Increase</b>			<b>\$254***</b>

Source: <sup>3</sup>EIA 2014

Note: Totals do not include energy from nuclear, hydropower, biomass, geothermal, petroleum, and other gasses.

\*Average Household Use of Total Electricity Generation (kWh) is calculated by multiplying the Percent Share of Total Electricity Generation by 10,837 kWh of electricity, which was the amount of electricity the average American household used in 2012 (<sup>3</sup>EIA 2014).

\*\*Average Household Cost of Total Electricity Generation (kWh) is calculated by multiplying Average Household Use of Total Electricity Generation (kWh) by the Average Cost of Electricity (\$/kWh) (2014) as used in Table 3. Total is calculated by adding all sources.

\*\*\*Average Bill Increase is calculated from subtracting Household Total Cost of Electricity by Source from Table 4 from Household Total Cost of Electricity by Source from Table 3.

**Table 5: Moving Coal Energy to Wind Energy**

<b>Case 2: Average Household Cost of Total Electricity Generation With Coal Energy Moving To <u>Wind</u> Energy (\$)</b>			
Source	Percent Share of Total Electricity Generation	Average Household Use of Total Electricity Generation (kWh)*	Average Household Cost of Total Electricity Generation (\$)**
Coal	0%	0	\$0
Natural Gas	27.0%	2,926	\$263
Solar	0.23%	25	\$5
Wind	43.13%	4,674	\$654
<b>TOTAL</b>			<b>\$992</b>
<b>Average Bill Increase</b>			<b>\$42***<sup>3</sup></b>

Source: <sup>3</sup>EIA 2014

Note: Totals do not include energy from nuclear, hydropower, biomass, geothermal, petroleum, and other gasses.

\*Average Household Use of Total Electricity Generation (kWh) is calculated by multiplying the Percent Share of Total Electricity Generation by 10,837 kWh of electricity, which was the amount of electricity the average American household used in 2012 (<sup>3</sup>EIA 2014).

\*\*Average Household Cost of Total Electricity Generation (kWh) is calculated by multiplying Average Household Use of Total Electricity Generation (kWh) by the Average Cost of Electricity (\$/kWh) (2014) as used in Table 3. Total is calculated by adding all sources.

\*\*\*Average Bill Increase is calculated from subtracting Household Total Cost of Electricity by Source from Table 4 from Household Total Cost of Electricity by Source from Table 3.

<sup>3</sup>While domestically-generated wind energy could decrease a household's total cost of electricity, the lack of capacity for wind farms in the United States limits the amount of energy that the US can harness from the wind. The US Department of Energy's Wind Program has been working to install offshore wind farms, but energy from this wind source is currently over two times the cost of domestically-generated wind (Office of Energy Efficiency & Renewable Energy 2015).

## The Effect on the Poor

The current administration's energy policy and poverty programs are in conflict, and the effect of alternative energy policy on lower income households has not been acknowledged. Even a quick internal search on the White House website didn't yield more than a provision in the American Recovery and Reinvestment Act that dealt with energy and poverty.

In 2013, the average annual income before taxes for individuals earning between \$15,000 and \$19,999 a year was \$17,508, as shown in Table 6. This group of consumers spent \$1,116, or 6.4 percent of their annual income on electricity, as compared to consumers earning over \$70,000 whose mean income was \$131,945 and who spent \$1,774, or 1.3 percent of their income on electricity.<sup>4</sup>

	\$15,000 to \$19,999		\$40,000 to \$49,000		\$70,000 and more	
Average Income	\$17,508		\$44,576		\$131,945	
Expenditures	Average Spent	Percent of Income	Average Spent	Percent of Income	Average Spent	Percent of Income
Electricity	\$1,116	6.4%	\$1,436	3.2%	\$1,774	1.3%

Source: Consumer Expenditure Survey, US Bureau of Labor Statistics, 2013

Note: US poverty level for one person/household in 2013 was \$11,490 (Health and Human Services, 2014)

As Table 7 below points out, a move toward solar energy will place a very heavy burden on the poor, increasing their electricity costs by up to 23 percent, or 1.4 percentage points. The same move for those making more than \$70,000 a year will increase their electricity costs by up to 14 percent, or 0.2 percentage points. A move toward alternative energy is much more costly for this group of lower income earners. These estimates assume that prices stay constant at the ranges reported in Table 3.

	\$15,000 to \$19,999		\$40,000 to \$49,000		\$70,000 and more	
Average Income	\$17,508		\$44,576		\$131,945	
Expenditures	Average Spent	Percent of Income	Average Spent	Percent of Income	Average Spent	Percent of Income
Current Electricity Costs	\$1,116	6.4%	\$1,436	3.2%	\$1,774	1.3%
Electricity Costs With Coal Energy Moving To <u>Solar</u> Energy	\$1,370	7.8%	\$1,690	3.8%	\$2,028	1.5%
Electricity Costs With Coal Energy Moving To <u>Wind</u> Energy	\$1,158	6.6%	\$1,478	3.3%	\$1,816	1.4%

Source: EIA 2014 and Consumer Expenditure Survey, US Bureau of Labor Statistics 2013

Note: US poverty level for one person/household in 2013 was \$11,490 (US Department of Health and Human Services, 2014)

<sup>4</sup>“The Act increases the Weatherization Assistance Program by \$5 billion to help low income families save on their energy bills by making their homes more energy efficient.” (The White House 2014)

**The United States has attempted to make this switch to more expensive alternative energy easier on all consumers through billions of dollars in subsidies.**

The United States has attempted to make this switch to more expensive alternative energy easier on *all* consumers through billions of dollars in subsidies. In 2012, \$60 billion in total subsidies were used to fund solar and wind power. For instance, one large federal subsidy is a federal tax credit for residential energy property that allows a taxpayer to claim a credit of up to 30 percent of the expenditures for solar-electric systems, solar water heating systems, fuel cells, small wind-energy systems, and geothermal heat pumps (Lomborg 2014, DSIRE 2014).

Another tax incentive is the Residential Energy Conservation Subsidy Exclusion, which allows customers of public utilities to avoid any taxes on any electricity subsidies they may receive. Individual states also incentivize their residents to invest in alternative energy, like the California Energy Commission's partnership that funds solar systems in new homes and the New York Sun Initiative that provides up to \$13,000 in low-interest loans to residents who want to make alternative energy-efficient home improvements (DSIRE 2014).

While these subsidies are a luring incentive, those that are barely above the federal poverty level (those earning between \$15,000 and \$19,999 a year) have other costs on which to focus so are less likely than the rich to spend money updating their higher energy-consuming homes and appliances. These costs include food (average spent: \$4,082 annually, or 23.3 percent), shelter (average spent: \$5,888 annually, or 33.6 percent), and clothing (average spent: \$790 annually, or 4.5 percent). Meeting these basic needs will always take priority over installing solar energy systems or finding clean energy. In reality, a move toward an alternative energy economy is an over-reaching expectation for our lowest economic class.

## Conclusion

This study has examined the effect of a move toward alternative energy sources (away from coal) on household electricity prices. The study has found that the US dependency on alternative energy subsidies overshadows the real cost of these electricity sources. Government-provided subsidies mask the true costs of alternative energy, and once those subsidies are taken away, Americans will be left with soaring electricity costs - costs that will have the worst impact on the lowest economic classes and further contribute to US income inequality.

## References

- Bossong, Kenneth. "Renewable Energy Provides 37% of All New US Electrical Generating Capacity in 2013." January 27, 2014. Accessed November 8, 2014. <http://www.renewableenergyworld.com/rea/news/article/2014/01/renewable-energy-provides-37-of-all-new-us-electrical-generating-capacity-in-2013>.
- Bureau of Labor Statistics. "Income Before Taxes: Annual Expenditure Means, Shares, Standard Errors, and Coefficient of Variation, Consumer Expenditure Survey, 2013." 2013. Accessed October 3, 2014.
- Bryce, Robert. "The High Cost of Renewable-Electricity Mandates." *Energy Policy & the Environment Report* 10(2012): 1-32.
- DSIRE. "Financial Incentives for Renewable Energy." 2014. Accessed October 30, 2014. <http://www.dsireusa.org/summarytables/finre.cfm>.
- <sup>1</sup>Energy Information Administration. "Levelized Cost and Levelized Avoided Cost of New Generation Resources in the Annual Energy Outlook 2011." Accessed October 31, 2014. [http://www.eia.gov/forecasts/archive/aeo11/electricity\\_generation.cfm](http://www.eia.gov/forecasts/archive/aeo11/electricity_generation.cfm)
- <sup>2</sup>Energy Information Administration. "Levelized Cost and Levelized Avoided Cost of New Generation Resources in the Annual Energy Outlook 2014." Accessed October 31, 2014. [http://www.eia.gov/forecasts/aeo/electricity\\_generation.cfm](http://www.eia.gov/forecasts/aeo/electricity_generation.cfm)
- <sup>3</sup>Energy Information Administration. "Frequently Asked Questions." 2014. Accessed November 16, 2014. <http://www.eia.gov/tools/faqs/faq.cfm?id=427&t=3>.
- <sup>4</sup>Energy Information Administration. "Electric Power Monthly with Data for July 2014." September 2014. Accessed October 31, 2014. <http://www.eia.gov/electricity/monthly/>.
- Johnson, Brad. "Kerry-Boxer Clean Energy Jobs Act Strengthens American Power." September 30, 2009. Accessed October 3, 2014. <http://thinkprogress.org/climate/2009/09/30/174445/kerry-boxer-clean-energy-jobs/>.
- Lomborg, Bjorn. "The Poverty of Renewables." March 17, 2014. Accessed November 1, 2014. <http://www.project-syndicate.org/commentary/bj-rn-lomborg-says-that-the-prevailing-solution-to-global-warming-is-hurting-the-poor-more-than-the-problem-is>.
- Office of Energy Efficiency and Renewable Energy. "Offshore Wind Research and Development." 2015. Accessed February 6, 2015. <http://energy.gov/eere/wind/offshore-wind-research-and-development>.

The Shift Project. "Breakdown of Electricity Generation by Source." 2014. Accessed December 14, 2014. <http://www.tsp-data-portal.org/Breakdown-of-Electricity-Generation-by-Energy-Source#tspQvChart>.

"Solar Thermal." *dasolar*. 2014. Accessed December 1, 2014. <http://www.dasolar.com/solar-energy/solar-thermal>

<sup>1</sup>The White House. "Advancing American Energy." 2014. Accessed November 8, 2014. <http://www.whitehouse.gov/energy/securing-american-energy>.

<sup>2</sup>The White House. "Poverty." 2014. Accessed December 28, 2014. <http://www.whitehouse.gov/issues/poverty/>.