

**OHIO'S RENEWABLE PORTFOLIO STANDARDS:
OUTCOME EVALUATION**

Cathy Becker

PUBAFR 6080

Tricia Petras and Amy Elliot

August 5, 2015

In 2008 when the Ohio legislature passed SB 221 to establish standards for energy efficiency and advanced and renewable energy generation, both parties cited job creation as one of the major expected outcomes for the law. The law's clean energy strategy "will take us into the future and put dollars in the pockets of Ohio's work force by creating jobs," House Speaker Jon Husted said. "If we want to create Ohio jobs, we must pass a comprehensive energy bill," Ohio Gov. Ted Strickland said. For this reason, my outcome evaluation question was: How many jobs did Ohio's renewable energy standards create? I chose to focus on renewable energy standards because subsequent legislation under SB 310 froze these standards so they could be evaluated by a legislative study committee, which is set to report its findings next month. The legislature could reinstate the renewable energy standards, modify them, or repeal them entirely.

Since SB 310 was passed, several studies have looked at the number of alternative energy "green" jobs in Ohio. For example, in its July 2012 report "Employment in Ohio's Advanced Energy Industry," the Advanced Energy Economy Institute found that in 2010 Ohio had 25,410 jobs in more than 400 advanced energy companies. To reach this conclusion, AEEI used the Battelle-Brookings Clean Economy Database, which ties jobs to actual companies. However, the database is subject to selection bias because it counted only companies that identified themselves as part of the clean energy economy, as opposed to companies that didn't but might have some clean energy jobs, and it looked only at companies in certain metropolitan areas.

Another study, conducted by ICF International for the Ohio Development Services Agency, surveyed all private businesses listed in the Quarterly Census of Employment and Wages database to determine that by 2012 Ohio had a total of 31,222 alternative energy jobs at 845 establishments. However, this study was subject to the instrumentation threat, since it relied on self-reporting from the businesses surveyed, and to selection bias, since only about half the businesses that received surveys responded, so results for the rest had to be extrapolated. In addition, neither study addressed my outcome evaluation question, which sought the number of

jobs created from 2008 to 2012 as a result of SB 221. These studies were simply snapshots in time, with AEEI estimating all alternative energy jobs in Ohio in 2010 and ICF in 2012.

Two other studies did estimate the number of jobs created as a result of SB 221. First, a study conducted in 2013 by The Ohio State University Center for Resilience for Ohio Advanced Energy Economy found that SB 221 created more than 3,200 new jobs in Ohio from 2008 to 2012 and was projected to create more than 17,000 new jobs by 2025. To reach this conclusion, researchers used a model called Dynamic Energy-Economic Policy Simulation (DEEPS), which combines measures from economy, society, and energy and environment to explore the outcomes for different policy scenarios. Modeling simulations are inherently subject to instrumentation threat, however, since the results they produce are based solely on the inputs they receive.

Finally, based on investments by utilities in energy efficiency and renewable energy, a study by the Natural Resources Defense Council and Ohio Environmental Council estimated that SB 221 created 4,250 jobs between 2008 and 2012 and was projected to create 32,300 jobs by 2025. However, this study is subject to the history threat, since the authors did not examine any counterfactuals to explain why utilities were making these investments, and to instrumentation threat, as the amounts counted as investments can vary depending on how they are defined. In addition, while both studies zeroed in on the number of jobs created under SB 221, neither separated jobs created by the renewable energy standards from those created by energy efficiency standards. Therefore, they too did not specifically address my evaluation question.

One other problem with an outcome evaluation question on the number of renewable energy jobs created by SB 221 is a lack of publicly accessible databases. The Bureau of Labor Statistics began tracking the number of green jobs in 2010, and its data could be broken down by state and economic sector. “Energy from renewable sources” was one component of the BLS’s definition for what constitutes a green job. Unfortunately, the BLS green jobs database covers only two years, 2010 and 2011. It was discontinued as a result of federal spending cuts in 2013.

Because I was unable to find a publicly available database that could identify the number of jobs created by Ohio's renewable energy standards, I decided to take a different approach. While creating jobs was certainly a priority of the legislators who passed SB 221, another priority was to increase the amount of renewable energy generated in the state. Such increases were written into the law itself, as my process evaluation showed. Thus, my new outcome evaluation question became: Did SB 221 increase the amount of renewable energy generated in Ohio?

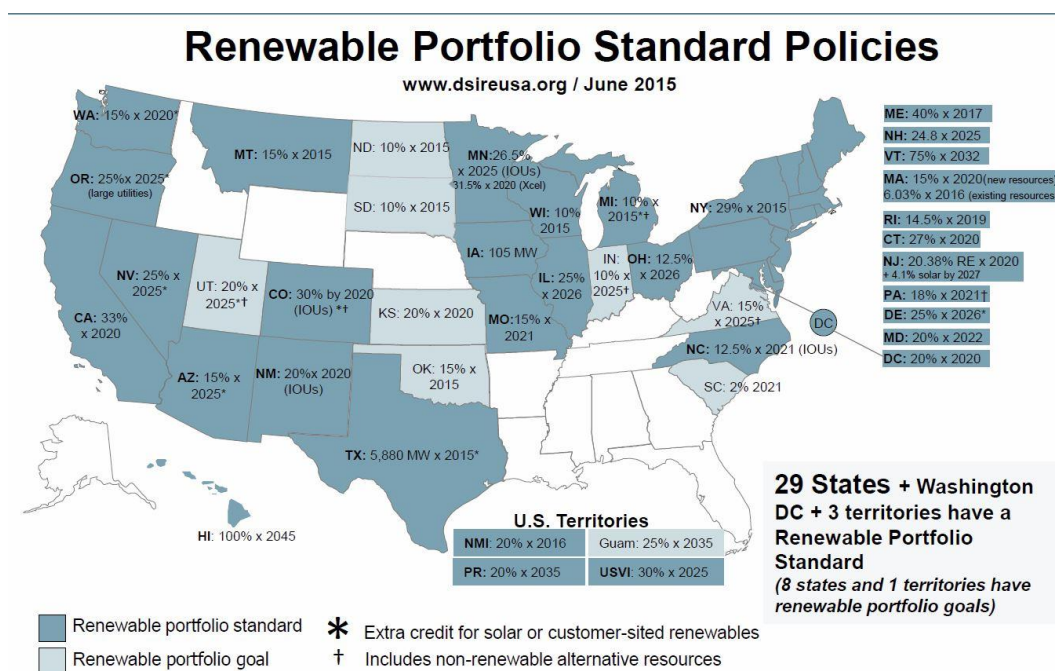
To answer this question, I turned to the U.S. Energy Information Administration, a division of the U.S. Energy Department that "collects, analyzes, and disseminates independent and impartial energy information to promote sound policymaking, efficient markets, and public understanding of energy and its interaction with the economy and the environment." Among the EIA's products is its Electricity Data Browser, an interactive tool that allows researchers to build tables and graphics using monthly, quarterly, and annual data on electricity generation and consumption. To answer my new outcome evaluation question, I had simply to select the appropriate variables, then ask the tool to produce the relevant data. These variables included:

- Sector: Electricity generation by utilities
- Fuel type: Renewable, including wind, solar, biomass, and geothermal
- State: Ohio compared to other states

To this end, my evaluation design is a time series with modified removed treatment and non-equivalent comparison groups. The design is a time series because it looks at renewable energy production in Ohio from before SB 221 was passed in 2008, through its years of being in effect up to and after 2014, when SB 310 froze renewable energy standards at 2.5 percent of total electricity produced in the state. The design is also what I call a modified removed treatment because SB 310 froze Ohio's renewable energy standards but did not repeal them. Finally the design includes two non-equivalent comparison groups – one state that also enacted renewable

energy standards and never froze or repealed them, and one state that never enacted such standards. The question then became how to choose the two states.

According to the National Conference of State Legislators, 29 states have enacted renewable portfolio standards. However, these states vary widely in what the requirements are, when the requirements begin and peak, and how the requirements can be met. While most states require around 20 to 25 percent renewable energy production by the mid-2020s, some have goals that are much lower (for example, South Carolina requires 2 percent by 2021) while others have goals that are much higher (for example, Hawaii requires 100 percent by 2045). In addition, states vary widely on when their standards went into effect and how long they take to peak. Iowa was the first to pass renewable portfolio standards in 1983, with South Carolina last in 2014. Compared to other states Ohio was a relative late-comer, establishing its renewable energy standards in 2008 with a relatively modest goal of 12.5 percent by 2025, as demonstrated in this graphic from the Database of State Incentives for Renewables and Efficiency (DSIRE), by the North Carolina Clean Energy Technology Center at North Carolina State University:



Of the states that have enacted renewable energy standards and did not freeze or repeal them, the state with requirements most closely matching Ohio's is North Carolina. Although North Carolina enacted its renewable energy standards a few years before Ohio – North Carolina's law was passed in 2007 and peaks in 2021, while Ohio's was passed in 2008 and peaked in 2025 before it was frozen – both states set a standard of 12.5 percent of electricity to come from renewable sources. Both states also include a small carve-out requirement for solar energy, although North Carolina also includes a small carve-out for biomass from swine and poultry waste. Of the states that do not have renewable energy standards, two – Kentucky and West Virginia -- share a border with Ohio. However, West Virginia did pass renewable energy standards in 2009 and became the only state to repeal these standards in 2015. Thus, the two non-equivalent comparison groups in my evaluation are North Carolina, which has renewable energy standards similar to Ohio's but never froze or repealed them, and Kentucky, which never enacted renewable portfolio standards at all. The notation for this evaluation is as follows:

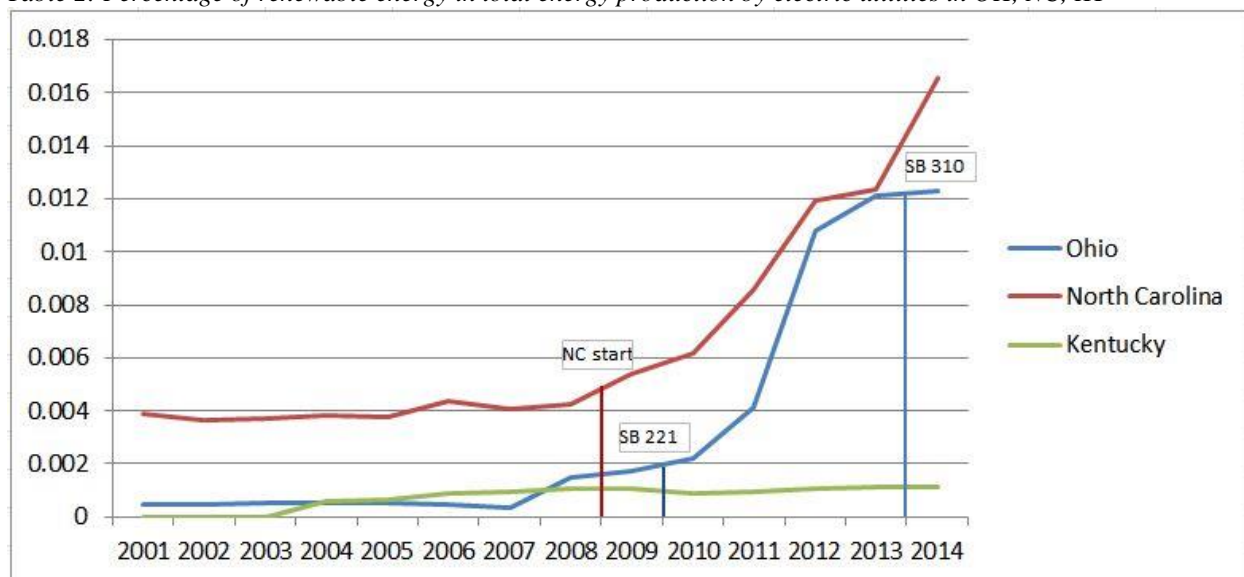
Table 1: Outcome evaluation design

		01	02	03	04	05	06	07	08	09	10	11	12	13	14
N	NC	O	O	O	O	O	O	X	O	O	O	O	O	O	O
N	OH	O	O	O	O	O	O	O	O	X	O	O	O	O	(X)
N	KY	O	O	O	O	O	O	O	O	O	O	O	O	O	O

This evaluation design has a number of strengths. First, even a single group time series is a strong design, with instrumentation being one of the few threats. However, in this case, the way the EIA has measured renewable energy has not changed over time, so the threat does not apply. Second, the two comparison groups provide evidence for counterfactuals, answering the question of what happens if renewable portfolio standards have never been enacted, as in Kentucky, or never been frozen, as in North Carolina. Counterfactuals guards against the history threat, because if a national cause were to have led to the results we see in Ohio, it probably would cause similar results in the other two states, yet the pattern of data is different.

Kentucky's percentage of renewable energy remains flat throughout the period measured, while North Carolina's percentage is flat until 2008 when its renewable energy standards went into effect, then the percentage rises steadily. Third, Ohio's freezing of the renewable energy standards provides a modified version of the removed treatment design. Here the strength is in the pattern of data: Ohio's percentage of renewable energy is flat until 2009 when its renewable energy standards went into effect under SB 221. Then the percentage rises until 2014 when renewable energy standards were frozen under SB 310; at that point the percentage flattens out. It is not likely that a history or some other threat would cause this pattern in the data.

Table 2: Percentage of renewable energy in total energy production by electric utilities in OH, NC, KY



The main weakness of this design is that freezing renewable energy standards is not the same as removing them; moreover, renewable energy requires investment and infrastructure such that removing treatment would likely not see a drop in production. Maturation could also be an issue, as the industry could simply get better at generating renewable energy over time. Still, the outcome evaluation pretty clearly shows that renewable energy standards do indeed work to produce more renewable energy in a state, and that renewable energy is not likely to be produced without them. Therefore, if the goal of state policymakers is to increase the percentage of electricity generated by renewable energy, renewable standards are a good way to go about it.

Appendix I: Data on renewable energy generation as a percentage of overall electricity generation by utilities in Ohio, North Carolina, and Kentucky

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Ohio														
Renewable generation (thousand MWh)	67	66	78	73	80	76	57	227	235	317	552	1387	1647	1641
Total generation (thousand MWh)	140995	146627	145591	147324	155896	154317	154252	152341	135187	142572	134452	128146	136228	133473
Percentage	0.000475	0.00045	0.000536	0.000496	0.000513	0.000492	0.00037	0.00149	0.001738	0.002223	0.004106	0.010824	0.01209	0.012295
North Carolina														
Renewable generation (thousand MWh)	443	442	460	473	477	536	518	522	628	777	995	1366	1519	2098
Total generation (thousand MWh)	113961	120784	123951	123234	126602	122467	127936	123105	116490	126454	116202	114257	122839	126554
Percentage	0.003887	0.003659	0.003711	0.003838	0.003768	0.004377	0.004049	0.00424	0.005391	0.006145	0.008563	0.011956	0.012366	0.016578
Kentucky														
Renewable generation (thousand MWh)	--	--	0	57	62	88	93	105	96	89	95	95	98	100
Total generation (thousand MWh)	95126	91530	91263	94018	97302	98266	96656	97328	90149	97644	97772	89481	89308	90166
Percentage	0	0	0	0.000606	0.000637	0.000896	0.000962	0.001079	0.001065	0.000911	0.000972	0.001062	0.001097	0.001109

Source: U.S. Energy Information Administration, Electricity Data Browser

References

- Advanced Energy Economy Institute. Employment in Ohio's Advanced Energy Industry. July 2012. Accessed at <http://ohioadvancedenergy.org/wp-content/uploads/2012/AEEOIJobsReport.pdf>
- Barbose, Galen. Renewables Portfolio Standards in the United States: A Status Update. Lawrence Berkeley National Laboratory. Presentation at the National Summit on RPS, Washington, D.C. November 6, 2013. Accessed at http://emp.lbl.gov/sites/all/files/rps_summit_nov_2013.pdf
- Bureau of Labor Statistics. BLS 2013 Sequestration Information. March 4, 2013. Accessed at http://www.bls.gov/bls/sequester_info.htm
- Bureau of Labor Statistics. Green Goods and Services Occupations. Accessed at <http://www.bls.gov/ggsocc/home.htm>
- Bureau of Labor Statistics. The BLS Green Jobs Definition. Accessed at http://www.bls.gov/green/green_definition.htm
- Database of State Incentives for Renewables and Efficiency (DSIRE). Renewable Portfolio Standard Policies. North Carolina Clean Energy Technology Center at North Carolina State University. June 2015. Accessed at <http://ncsolarcen-prod.s3.amazonaws.com/wp-content/uploads/2014/11/Renewable-Portfolio-Standards.pdf>
- Durkay, Jocelyn. State Renewable Portfolio Standards and Goals. National Conference of State Legislators. July 1, 2015. Accessed at <http://www.ncsl.org/research/energy/renewable-portfolio-standards.aspx>
- Fiksel, Joseph, Emrah Cimran, and Chien-Chen Huang. Assuring Ohio's Competitiveness in a Carbon-Constrained World. Center for Resilience, The Ohio State University, 2013. Accessed at http://ohioenergyresources.com/Docs/AssuringOhiosCompetitiveness_OUOSU_Ch9.pdf
- ICF International. Ohio Alternative Energy Job Survey Analysis. February 2013. Accessed at http://www.dispatch.com/content/downloads/2014/11/2-13_green_jobs_survey_report.pdf
- Laitner, John A. Energy Productivity: Efficiency Benefits to Power Ohio Jobs and the Economy. Natural Resources Defense Council and Ohio Environmental Council. NRDC Issue Brief, May 2012. Accessed at <http://www.nrdc.org/energy/files/Ohio-Energy-Productivity-Issue-Brief.pdf>
- Lee, Don. "Green jobs grow four times faster than others." *Los Angeles Times*, March 19, 2013. Accessed at <http://articles.latimes.com/2013/mar/19/business/la-fi-mo-green-jobs-20130319>
- Muro, Mark, and Jonathan Rothwell. Sizing the Clean Economy. Brookings Institute, July 13, 2013. Accessed at <http://www.brookings.edu/about/programs/metro/clean-economy>

- Ohio Advanced Energy Economy. Economic Analysis of Ohio's Renewable and Energy Efficiency Standards. September 2013. Accessed at http://media.cleveland.com/business_impact/other/FINAL-DEEPS-11.19.13-1.pdf
- U.S. Energy Information Administration. EIA now delivers monthly electricity data in interactive data browser. February 15, 2013. Accessed at <http://www.eia.gov/todayinenergy/detail.cfm?id=10011>
- Williams, Samantha. "Ohio Wraps Up its SB 310 'Energy Mandates' Committee." Natural Resources Defense Council, July 20, 2015. Accessed at http://switchboard.nrdc.org/blogs/swilliams/ohio_wraps_up_its_sb_310_energ.html
- Wilson, Paul, and Jim Siegel. "Steel mill no longer considering Ohio - Stalemate in House on electricity bill gets some blame." *The Columbus Dispatch*, February 22, 2008. Accessed at http://www.dispatch.com/content/stories/local/2008/02/22/nosteel.ART_ART_02-22-08_A1_419E6HQ.html
- Wiser, Ryan, Christopher Namovicz, Mark Gielecki, and Robert Smith. The Experience with Renewable Portfolio Standards in the United States. *The Electricity Journal*. Volume 20, Issue 4, May 2007, Pages 8-20.