Testimony of Ryan M. Yonk PHD, Utah State University
3565 Old Main Hill Logan Utah 84321
ryan.yonk@usu.edu

Background

One of the United States' defining cultural and political initiatives of the past thirty years has been the push for renewable electricity generation and the abandonment of generation from fossil fuels. Kansas in particular has been working toward renewable wind energy since as early as 1999, when Westar Energy (then known as Westar Resources) built the first utility-scale wind turbine production facility with the installation of two 600 kW Vestas wind turbines. An abundance of wind blows through the grasslands of the Midwest, making wind energy a desirable option for renewable energy advocates in that area. In fact, since 2008, at least one wind energy project has come online in Kansas every year. That timing correlates strongly with the implementation of the state's Renewable Portfolio Standard.[1]

Governor Kathleen Sebelius was the state's first real proponent for renewable energy and she laid the groundwork for the current RPS in Kansas. From 2007 to 2009, she instituted voluntary renewable energy standards, which encouraged the use of renewable energy but did not force energy companies to meet any mandates. In 2009, she began to push for mandatory renewable energy standards, feeling that her current voluntary policies were not doing enough to promote renewable energy.

Governor Mark Parkinson took up this mantle in May of 2009 when he signed H.B. 2369, the Renewable Energy Standards Act (RESA), creating legislation for a mandatory RPS in Kansas, thereafter known as Kansas' Renewable Energy Standards (RES). The mandate required the following: Renewable energy sources must provide at least 10 percent of Kansas' power generation between 2011 and 2015, 15 percent between 2016 and 2019, and 20 percent by 2020. Although many other states base renewable generation percentages on the share of total retail electric sales, Kansas' RPS mandate is based upon generation capacity.

The mandate also provided a list of available technologies that qualify as renewable energy. That list includes wind, solar, landfill gas, current hydropower, new hydropower that is less than 10 megawatts (MW), and a variety of types of biomass. The RES also stipulate that if utilities do not abide by the RPS, they will be assessed a penalty equal to double the value of the Renewable Energy Credits (RECs) that would have been required for that year. That penalty can be increased as a punitive measure or decreased when utilities demonstrate good-will attempts at compliance. RECs are tradable commodities awarded for the production of 1 megawatt-hour (MWh) from a qualified renewable energy resource. They are proof that a utility company has achieved required levels of renewable energy production, and can be traded or stockpiled in times of excess

[1] Polsinelli, & KEIN. (2014). *Annual economic impacts of Kansas wind energy 2014 report*. California: Alan Claus Anderson, Britton Gibson, Luke Hagedorn, Scott W. White. Retrieved from http://www.polsinelli.com/~/media/Articles%20by%20Attorneys/Anderson_Gibson_Hagedorn_Feb_2014

production (production above the mandated RPS levels for that year). RECs remain valid for two years after their date of production, after which they are officially retired.[2]

States have sometimes resorted to other means of inducing renewable electricity generation, including by using existing energy or environmental regulations as leverage in bargaining for an RPS. In 2009—before Kansas' RES went into effect—Sunflower Electric Company motioned their intent to build a coal-fired generating plant in Holcomb. They met resistance, however, from the Kansas Department of Health and Environment, which objected to the air pollution the plant would potentially create. Governor Parkinson, in his desire to establish an RPS in Kansas, reached an agreement with Sunflower Electric. The governor agreed to issue an air permit for the Holcomb plant, and in return Sunflower and the utility industry agreed to support expanded renewable energy initiatives.[3] Even though Kansas has now effectively implemented its RES, the Holcomb plant has yet to be built.

Since its inception, the RES has not been overwhelmingly popular in Kansas, and eight separate attempts have been made to repeal it.[4] Some of those attempts achieved greater acceptance in the state legislature, but ultimately each one failed. The most recent attempt was in May 2014 when a bill was introduced into the House which would end Kansas' RPS through a gradual reduction. The bill narrowly lost in a vote of 63-60.[5] Despite the failures, constituents continue to fight against the RPS, and many politicians are beginning to support phasing it out, including current Governor Sam Brownback.[6]

Results

Empirical Analysis: State Coincident Event Study

Using an event study for state coincident indices—a methodology first fashioned by the Federal Reserve Bank of Philadelphia we explore the impacts of RPS standards.[7] The event study indexes the economic conditions of all states across multiple points in time, and assigns as "point zero" each state's economic conditions on the dates of their respective RPS implementations. The study then compares said economic conditions over a span of 48 months before to 48 months after that enactment date. We then average the results across the different states, which, given that RPS have been implemented in states over a long period, should minimize the effects of anomalies such as recessions and the enactment of other energy-related laws. The indices of each state RPS policy, while

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[2] United States Department of Energy, 2014, *op. cit.*

[3] Kansas Electric Power Cooperative, Inc. (2009). *2009 annual report*. Retrieved from http://pbadupws.nrc.gov/docs/ML1012/ML101260216.pdf

[4] Barnett, D. (2014). Capital gains. *Climate + Energy Project*. Retrieved from http://climateandenergy.org/news.1050012.capital-gains

[5] Lowry, B. (2014a). Kansas House rejects repeal of renewable energy standards. *The Wichita Eagle*. Retrieved from http://www.kansas.com/news/politics-government/article1141897.html

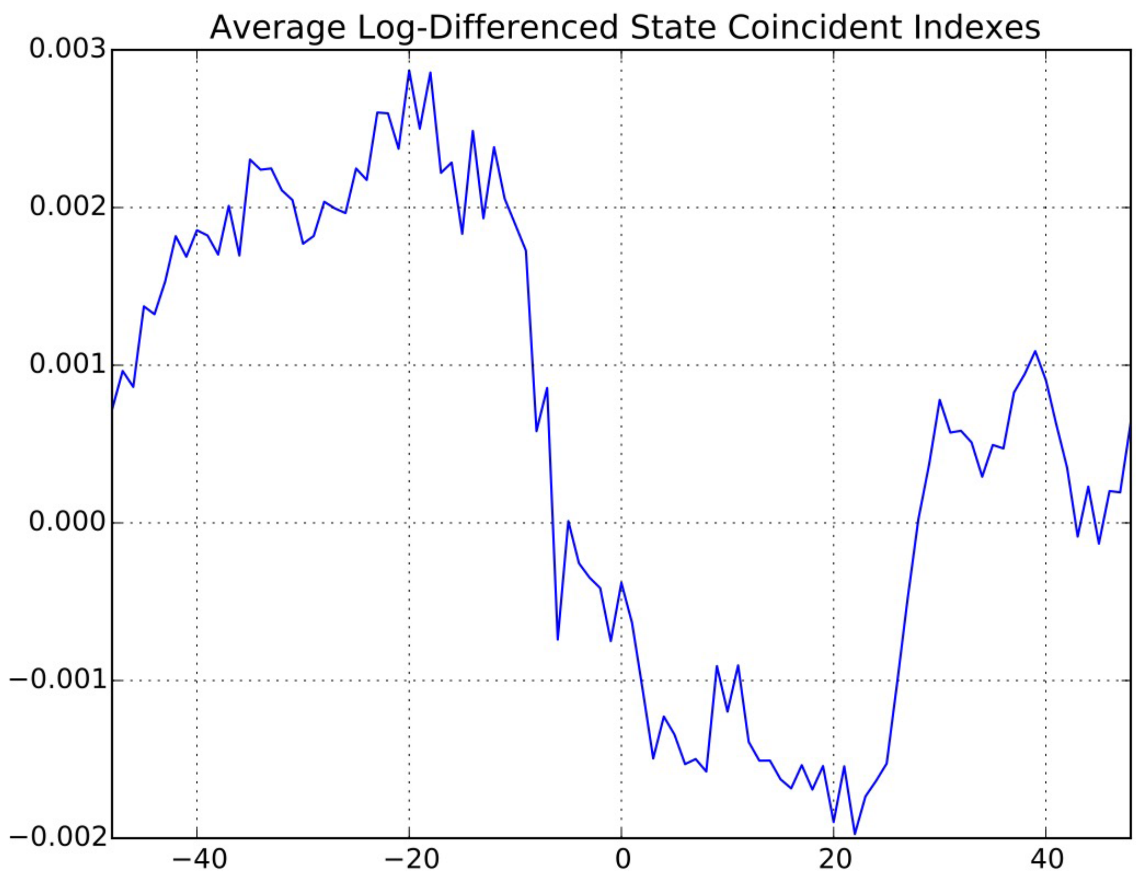
[6] Lowry, B. (2014b). Next legislative session could be end for Kansas' renewable energy standard. *The Wichita Eagle*. Retrieved from http://www.kansas.com/news/politics-government/article4202126.html

[7] Federal Reserve Bank of Philadelphia. (2015, January 29). State coincident indexes. Retrieved from http://www.philadelphiafed.org/research-and-data/regional-economy/indexes/coincident/

enacted in a different calendar month and year, can thus be lined up in this so-called "event time" and averaged. For these reasons, the event study has become a time-honored empirical methodology in finance and economics and a standard course of analysis for the Philadelphia Fed. It is a simple but powerful method for measuring the effect of an exogenous shock to an economic variable of interest. See Mackinlay for a more in-depth discussion of the event study methodology.[8] Table 3 presents the dates of 31 different states that have enacted an RPS policy.

The results of the event study are presented in Figure 1, wherein we see the response of the state coincident index to the enactment of RPS policies. The coincident index is a measure of the strength of a state economy.

FIGURE 1: THE RESPONSE OF THE STATE COINCIDENT INDEX TO THE ENACTMENT OF RPS POLICIES.



The horizontal axis shows months before and after point zero (RPS enactment). The vertical axis shows an indexed scale measuring the average reaction of states in terms of several economic indicators.

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[8] MacKinlay, A.C. (1997). Event studies in economics and finance. *Journal of Economic Literature, 35*(1), 13-39.

As can be seen in Figure 1, the average effect on the state coincident index is a precipitous drop surrounding the enactment of an RPS policy. This evidence is suggestive of a negative effect of an RPS policy on a state economy. While suggestive, the evidence from the event study warrants further exploration into the effects, since state economies also appear to decline several months prior to the enactment of an RPS. The next section presents the structural panel VAR-X model, which provides further evidence of the negative economic effects of an RPS.

The Structural Panel VAR-X Model

The VAR model takes into account the nature of the state macroeconomic variables that could provide unwanted feedback into the model, and considers their dynamic interactions. By including a panel dimension to the model we can include the data for multiple states in a single model. We include fixed effects to control for state-level heterogeneity. We impose a recursive causal ordering on the VAR-X model to allow for structural interpretation of dynamic multiplier analysis of the RPS policy variable. Table 4 presents the cumulative effects of an RPS on the state economy via structural policy simulations.

TABLE 4: THE LONG-RUN EFFECTS ON STATE MACROECONOMIC VARIABLES

State Economic Variable	Long-Run Effect
Electricity Sales	-13.7075%
Real Personal Income	-3.6369%
Non-farm Employment	-2.8416%
Manufacturing Employment	3.7454%
Unemployment Rate	9.6841%

The cumulative effect of the enactment of an RPS policy on state electricity sales is a staggering 13.7-percent decline. This is, perhaps, not surprising as the RPS increases the cost of electricity generation. Real personal income declines in the long run by 3.6369 percent, which figures to a loss of $4.85 billion in 2013, or $4,367 less per family.[9] Non-farm employment declines in the long run by 2.8 percent. Only one analyzed component of non-farm employment, manufacturing employment, does not experience a long-term suppression in response to an RPS policy, although as we see in the graphical analysis, it does still experience a sharp decline in the short term. Most significantly, the state unemployment rate increases by 9.6 percent. This means that, at the end of last year, Kansas had 5,500 fewer jobs than it would have had without the RPS.[10] There can be no doubt that the combined economic effect on an RPS enactment, as measured by the structural panel VAR-X model, is a severe decline in the Kansas economy. A graphical

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[9] Bureau of Economic Analysis. (n.d.). Regional Data, Annual State Personal Income and Employment. Retrieved from http://www.bea.gov/iTable/iTable.cfm?reqid=70&step=1&isuri=1&acrdn=1#reqid=70&step=1&isuri=1

[10] Bureau of Labor Statistics. (n.d.). Kansas. Retrieved from http://www.bls.gov/regions/mountain-plains/kansas.htm

representation of the analysis, showing the changes over time that lead to these results, can be found in Appendix C.

Conclusions from the Empirical Analysis

We demonstrate strong empirical evidence that a Renewable Portfolio Standard has a lasting negative effect on a state economy. We present this evidence from both an event study of the state coincident index as measured by the Federal Reserve Bank of Philadelphia, as well as from structural policy simulations from a panel VAR-X model. The long-run effect of an RPS on state industrial production, as measured by electricity sales, is greater than a 13-percent decline. Real personal income declines in the long run after an RPS by almost 4 percent. The cumulative effect of an RPS on non-farm employment is nearly 3 percent. While the effect of an RPS on manufacturing employment is not as severe in the long run, it too demonstrates initial sharp declines lasting for several years. Finally, the state unemployment rate increases in the long run in response to an RPS by nearly 10 percent. These are strong and lasting effects in 4 of the 5 variables measuring the state economy. The combined econometric evidence makes clear that an RPS policy has a severely negative economic effect on a state that enacts such.

Institutional Analysis

Our institutional analysis provides a detailed account of all the regulations that create barriers for the state, electricity generators, and utilities to comply with an RPS. We find several instances in the regulatory structure of Kansas' RPS that could be reasonably expected to hinder mere compliance with the law.

Kansas' Renewable Energy Standard (RES) mandates that 20 percent of peak demand capacity must be supplied from renewable sources by 2020. This approach is not typical, as most states base their RPS benchmarks on total electricity retail sales. Generation capacity, which is generally the "gross capacity owned or leased by a utility less the auxiliary power used to operate [their] facilities,"[11] is tedious to determine. Doing so requires a four-hour test of a generator, which must be free of "[limitations] on performance due to ambient conditions, equipment, or operating or regulatory restrictions."[12] If the facility is not tested for the entire duration under these conditions, the test results are still used anyway. They are simply considered, by extrapolation, to represent an accurate test under correct conditions. The same is true for multi-unit facilities, such as wind farms, except now the capacity of 10 percent of the wind turbines will be considered representative of all turbines in the same farm. Additionally, if the testing of a particular generator is impractical, then the "nameplate" capacity, as purported by the manufacturer, will be used as a stand-in. The tested capacity of a generator is unlikely ever to exceed the capacity purported by the manufacturer—which is inherently disposed to convey an inflated number—and since the generator's

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[11] DSIRE. (2014, December 31). Renewable Energy Standards. Retrieved from http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=KS07R&re=0&ee=0

[12] Electric Utility Renewable Energy Standard, 2014 Supplement to the Kansas Administrative Regulations 82-16-1. (2014, January). Retrieved from http://www.sos.ks.gov/pubs/KAR/2014/2014_KAR_Supplement_Book_1.pdf

compliance benchmarks will be based thereon, this could cause power providers to overproduce.[13]

Such extrapolation could be problematic for utilities precisely because compliance benchmarks are based on generation capacity. If compliance were based on total electricity retail sales, then a utility would know exactly how many renewable facilities, and of what capacity, to build in order to satisfy their requirements. A faulty test of a particular generator, however, could handicap a utility by tricking it into building too much or too little generation capacity and/or creating a perpetual shortage or excess of power.

RES-eligible sources include wind, solar thermal, solar photovoltaic, dedicated crops grown for energy production, cellulosic agricultural residues, plant residues, methane from landfills or wastewater treatment, clean and untreated wood products, existing hydropower, new hydropower of no more than 10 MW, fuel cells using hydrogen, and other sources of energy that become available. Kansas' RES also allows for net metering.

Generators and utilities can still buy and sell Renewable Energy Certificates (RECs) in the state of Kansas, but the amount of electrical production the REC conveys must be converted, using a complex formula, so that it can comport with the generating capacity of the buyer. This will prevent a buyer from purchasing an REC from another generator with a disproportionately high capacity, so as to escape its own obligations. If a buyer does not have a facility of the same resource as the original seller, then the capacity of the buyer's overall renewable energy generation is used, and if that number is unavailable, a default capacity factor of 34 percent is the used. RECs in Kansas are valid for only two years after generation—an unusually short period, compared with other states.

Unlike other states, older renewable technologies can be eligible to generate RECs for complying with the RES, but Kansas does significantly favor newly installed technologies over old ones. Each MW of eligible capacity installed in Kansas after January 1, 2000, counts as 1.1 MW for the purpose of compliance, amounting to a 10-percent reward for generators who have newer facilities.

Failing to meet the renewable energy standard results in a fine that is equal to twice the market value of the RECs that would have been required to meet that year's requirement. Penalties may be increased or decreased upon evaluation. Utilities are exempt from administrative penalties if the retail rate impact is one percent or more.

Even in judging an RPS on its own terms, and assuming that all potential economic and environmental ramifications are acceptable, the legal and regulatory structure behind RPS makes compliance itself a difficult task; this fact does not change even in spite of the good-faith efforts made by utilities. Proponents of RPS often gloss over these considerations and assume that the mere presence of a law is solely required to effect their desired outcome. Our analysis clearly demonstrates that reality is more complicated.

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[13] *Ibid.*

Conclusion

The evidence from these studies paints a clear picture about the effects of RPS. Our empirical analysis shows an estimated drop in industrial electricity sales in RPS states by almost 14 percent, real personal income by almost 4 percent, non-farm employment by nearly 3 percent, and an increase of 10 percent in the unemployment rate, which for Kansas means the state had 5,500 fewer jobs at the end of 2014 than they would have had without the RPS. While individual conditions in Kansas may allow for some variability in these actual figures, the overall finding is that long-run economic conditions in states with implemented RPS programs experience significant negative impacts. Our institutional analysis further describes the barriers that make it difficult for utilities to comply and for bureaucracies to enforce the RPS, finding that Kansas' generation capacity scheme of compliance benchmarking produces manifest difficulties in compliance and enforcement.