Policy Reverberation and Electricity Prices in the United States

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1 Introduction

Rising electricity costs in developed nations has become the political topic du jour across OECD jurisdictions. The cost of electricity matters: the impact of rising electricity costs is felt most acutely by low-income individuals, who see a greater proportion of their pay checks directed towards their electricity bills. Given the economic difficulties caused by rising electricity prices, this is an ongoing topic of importance for academics and politicians alike.

Much of the blame for rising electricity prices has been levied against government renewable energy policies [see Ferguson, 2016a,b, Svaldi, 2016]. This perspective claims that the requirement that electricity generation is made up of more expensive renewable energy production will lead to higher costs. Indeed, as the U.S. Energy Information Administrative (EIA) claims that generation is responsible for 65% of average electricity prices, distribution accounts for 25% of average electricity prices, and transmission accounts for 9% of electricity prices [EIA, 2015], a rise in the cost of generating electricity may lead to increased prices. Indeed, Hongbo Wang [Wang, 2016] has found a relationship between the first enactment of particular renewable energy policies and rising energy costs.

The question that is left unanswered here is why there is a divergence between states that have implemented renewable energy policies (knowing that it may lead to increased electricity cost) and those that have not. In part, this gap in the literature is because much research has been limited to the impact of state level policies on electricity prices, either through process-tracing extreme case studies [see Mulder and Scholtens, 2013] or by analyzing the relationship between cost and policy at the state level [see Wang, 2016]. These research efforts are invaluable; they provide an understanding of how outliers have implemented renewable energy policies, and of general trends assuming monolithic political contexts. However, this paper will attempt to answer the question of what happens to renewable energy policy, and subsequently electricity costs, when political environments change. To address this question, this paper will conduct a textual analysis of federal energy court rulings. Specifically, it will analyze whether changes in the environmental language used in the rulings of the federal energy courts is correlated with an increased electricity costs at the state level. The United States is the case study in this analysis because federal judicial rulings effects multiple different contexts. This "most different systems design" enables us to analyze whether changes in judicial opinion lead to changes in renewable energy policies and in electricity prices.

2 Literature Review: Two-Level Games, Renewable Energy Policies, and Electricity Prices

2.1 Theoretical Framework: Two-Level Games

The literature that concentrates solely on the link between state renewable energy policies and cost ignores any impact that federal body positions on renewable energy would have on state-level policy. This assumption follows the realist trajectory. Traditional realist scholars argue that there is no connection between judicial court rhetoric and state-level action because the rhetoric is epiphenomenal [Measheimer, 1994] and governments enact renewable energy policies when it suits their best interests [George W. Downs, 1996]. Thus, the realist academic scholarship emphasizes that federal court-level rhetoric has no concrete impact on the renewable

policies of states. Further, a realist would argue that if a state?s policies are in line with federal rulings, it is primarily due to the self-interest of the state [Waltz]. As such, even in a situation where a state did adhere to the policies of a treaty, the fact that a state did so is not because of any relevant federal rhetoric.

On the other side of the ideological spectrum, constructivists argue that states do try to adhere to ideological rhetoric. Constructivists would argue that pressure from NGOs and politicians can alter the way that states approach renewable policy [**?**]. Finally, a third perspective would argue that the reason why states implement renewable energy policy is because of local pressure and local support for specific policies. In this understanding, political institutions, interest groups, and state actors determine whether a government implements renewable energy policy [Emilie Hafner-Burton, 2005]. Thus, whether states actually comply depends on a more localized mobilization.

Clearly these three mainstream arguments point in different directions. One maintains that federal court rhetoric has no effect on a states renewable energy, while the other argues that the socialization that can result from federal court decisions can result in a states changed renewable energy policies. The third maintains that the federal court is irrelevant, and that the renewable energy policies of states governments result from local pressure. However, all three of these perspectives have an incomplete focus. The way the three theories arrive at their arguments is centred on a state-centric response to specific pressures. Both constructivist and realist theories overlook the impact of domestic civil society in either the deterioration or amelioration of a states renewable energy policies [Emilie Hafner-Burton, 2005]. The third perspective, however, cannot explain why states implement renewable energy policies in the absence of domestic mobilization. As such, all three theories overlook a pertinent arena (whether state-centric or federal) that impacts the implementation of renewable energy policies in specific states.

Due to the limitations of these perspectives, this paper will follow a theoretical framework that emphasizes the necessity of considering both federal and state-centered influences on a states domestic policies. This theoretical framework comes from Robert Putnam [Putnam, 1988]s concept of a two-level game. Putnam argues that politicians consider both international and domestic dynamics in the formulation of international agreements. Putnams focus intentionally deviates from state-centric theories, which he argues are an uncertain foundation for theorizing how domestic and international politics interact [Putnam, 1988, p.433]. He further theorizes a concept of reverberation. Putnam argues that *international pressures can reverberate within domestic politics* subsequently altering the position of domestic civic society groups [Putnam, 1988, p.454]. Building on the significance of reverberation, Putnam argues that if the two spheres are linked synergistically then they cannot be modeled separately [Putnam, 1988, p.456]. Thus, the incompleteness of the aforementioned theories is because they are attempting to model the influence of one sphere in absence of a discussion of the impact of the other sphere. We will use a modified version of this theory to model how the federal and state spheres interact in the United States. Putnams theory illustrates how the impact of federal court decisions can reverberate, and potentially influence, the attitudes of the state legislature

2.2 The Formulation of Energy Policy in the United States

There are two court systems that ensure that electricity companies comply with either the federal or government policies. The first court system is the Federal Energy Regulatory Commission (FERC). FERC is an independent regulatory agency within the United States Department of Energy. Specifically, FERC regulates the transmission of electricity in interstate commerce, and licenses non-federal hydropower projects. Their

jurisdiction also includes overseeing the transmission and wholesale sales of electricity in interstate commerce, reviewing the siting applications for electric transmission projects, reviewing mergers and acquisitions by electricity companies, licenses and inspects private, municipal, and state hydroelectric projects, and overseeing environmental matters related to natural gas and hydroelectricity projects [FERC, 2016]. In contrast, the state-level adjudicative bodies are responsible for the public utilities in the separate states. State-level bodies are primarily concerned with regulating retail electricity sales to customers, overseeing the construction of oil pipelines, and regulation of activities of the municipal power systems and most rural electric cooperatives [FERC, 2016].

These courts are guided by policies made at the state and federal level regarding electricity generation and distribution. Energy policy in the United States is formulated at both the federal and the state level. Federal level policies tend to be more financially based, and rely primarily on Tax Credits and Cost Recovery Systems. In contrast, state level policies can take a wide variety of forms including feed-in-tariffs, and renewable energy requirements [FERC, 2016]. Hence, it is at the state level that there is significant divergence in policy as all states are subject to the overarching policies made at the federal level (and, in tandem, all rulings that are made by FERC).

2.2.1 Renewable Energy Policies, and Associated Costs

Non-hydro renewable electricity production accounts for 2% of total electricity production in the United States; fossil fuels used for electricity generation account for 40% of all carbon dioxide emissions resulting from human activity in the United States [EIA, 2015]. The overwhelming amount of carbon dioxide produced by electricity production has prompted multiple states to encourage the increase of renewable energy production feeding into the electricity grid through renewable energy promotion policies [Wang, 2016].

Renewable energy promotion policies are separated in the literature into two broad policies realms: market-pull policies and technological-push policies. Market-pull policies aim at *increasing renewable energy use by creating demand for Renewable Energy Targets (RETs)* [EIA, 2015, p. 16]. These policies include carbon taxation strategies, technology and performance standards, and investment promotion. Technology-push policies include public R&D spending, tax credits, and support for education and training. This paper will focus specifically on market-pull policies that incentivize the generation of renewable energy. There are two types of policies that incentivize the use of renewable energy generation in the electricity grid. The first is a market-based construction of generation incentives, and the second is generation promotion policies. These policies are summarized in the following table.

Policy	Price.Driven	Quantity.Driven
Generation Incentives	Feed-in tariffs	Tendering systems for long term contracts Energy
	Premium feed-in tariffs	Portfolio standards (quotas)
Generation Promotion	Green Tariffs	

2.2.2 Energy Portfolio standards (quotas)

In the United States, 29 states have implemented mandatory Renewable Portfolio Standards (RPS), and a further 8 states have adopted non-binding goals for renewable energy standards [Wang, 2016]. These states

place an obligation on electricity supply companies to produce a specific faction of their electricity from renewable sources. Though it has been argued that RPS policies increase the amount of renewable energy generation in a state [Carley, 2009] critics argue that RPS increases retail electricity prices because of the required extra investment or costs involved with a switch to using renewable energy [**?**].

Previous studies of RPS policy effects have focused on evaluating whether the implementation of policies leads to forecasted changes in electricity costs either at the national level or the state level [see Karen Palmer, 2005, Kydes, 2007, Wang, 2016]. Notably, Hongbo Wang (2016) uses a differences-in-differences model to compare the electricity prices of those states that have not implemented RPS to the electricity prices of those states that have implemented RPS, and found that implementation increases electricity prices when the RPS policy first becomes binding. Her argument is persuasive, both in terms of the evidence and methodology used. We want to expand on this argument by asking why particular states have chosen to implement renewable energy policies if they had the understanding that it may increase costs. We will link the implementation of renewable energy policy to the reverberation effects of particular voting patterns, and to the rhetoric used by federal energy courts.

2.2.3 Feed-in Tariffs, Tendering systems and Green Tariffs

Despite the wide international use of FITS, the utilization of feed-in tariffs have not been popular in the United States at the state level. Currently, there are five states that have mandated FITs by law or regulation, and a handful of states have voluntary FIT programs [EIA, 2013]. Given the lack of variation at the state level for this policy in the United States, this policy will not be the main policy of investigation.

In the United States, the use of tendering systems for long-term contracts and green tariffs are not an independent policy measure in and of themselves. Rather, companies can choose to engage in long-term contracts or green tariffs in order to ensure that they meet the requirements set out by other policies [**?**].

3 Methodology

The most different systems design evaluates whether states that are different in as many factors as possible have a similar dependent variable of interest because of a change in the dependent variable. For our analysis, the dependent variable is electricity pricing and the implementation of RPS policies at the state level. We wonder if changes in judicial rhetoric at the federal level impacts these two variables.

However, our states are different in many ways. Thus, we must control for several variables to ensure that we are not overemphasizing the impact of judicial rhetoric on electricity prices and RPS policy. For example, variables such as political leanings, or whether the state votes democrat or republican, may be correlated with different odds of implementing RPS policies. Further, weather patterns, such as particularly hot summers, may make electricity more expensive because of increased demand. Finally, electricity market deregulation may impact electricity prices regardless of whether the state has engaged in RPS policies. These variables and their data sources are specified in the following table:

3.1 Variable Snapshot

X	Prices	RPS	Deregulation	Freq..of.Order	Freq..of.Renewable	Context..Renewable	Temper
Mean	10.73	0.43	0.33	1.52	0.15	0.11	91.97
Median	10.16	0	0	1.41	0.08	0.08	89.5
Min	4.95	0	0	0.11	0.01	0	2
Max	23.08	1	1	2.51	0.42	0.31	185
Unit	USD	-	-	% point	% point	% point	
Source	EIA	Wang (2016)	electricchoice.com	FERC (PDFs)	FERC (PDFs)	FERC (PDFs)	NOAA

This paper relies on the assumption that reverberation of FERC decisions results from three intertwined variables. The first is frequency. We argue that the more frequently FERC uses particular terms, the more likely the court decisions are to reverberate in the state context. This is because the more a federal court makes statements about a topic, the more likely this topic will arguably stay in the mind of a state politician or state advocates. Repetition, here, is key for getting into the long-term memory of particular individuals.

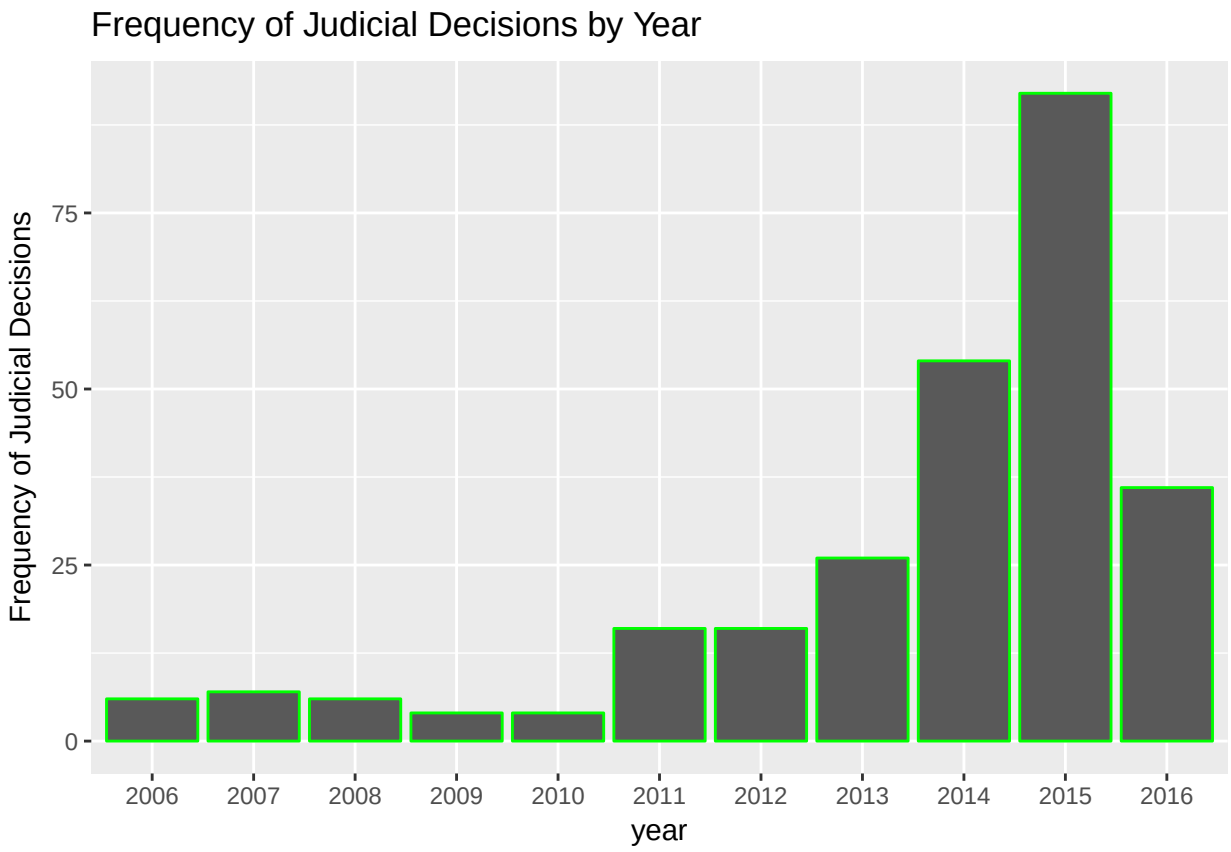
The second variable is that of renewable terminology. We argue that the court can choose to use particular words in order to make a ruling. The choice of some terms are more likely to encourage a positive association with the use of renewable energy policies. Hence, the terms that will be searched for as representative of renewable terminology are green, renewable, hydro, sustainable, sustain, and environment. These terms carry positive connotations with regards to renewable energy. The third variable is that of action terminology. Here, words that indicate that the court is ordering a particular corporation or person to take action are correlated with situations where the individual does not have a choice as to whether they will adhere to the ruling. The action terms that will be searched for are order, revoke, and comply.

3.2 Web-Scrapping

Each of the relevant variables was obtained using web scrapping. The variables were then matched based on year, month, and state in question. For variables that did not change over the course of a year, or between years, such as the proportion of the popular vote that went to each party in the relevant elections, the same numbers were applied to all observations until they changed. Hence, the votes for political parties from 2000 were counted as the same for all months in 2000, 2001, 2002, and 2003. Those from 2004 were counted for all months in 2004, 2005, 2006, and 2007, and so on.

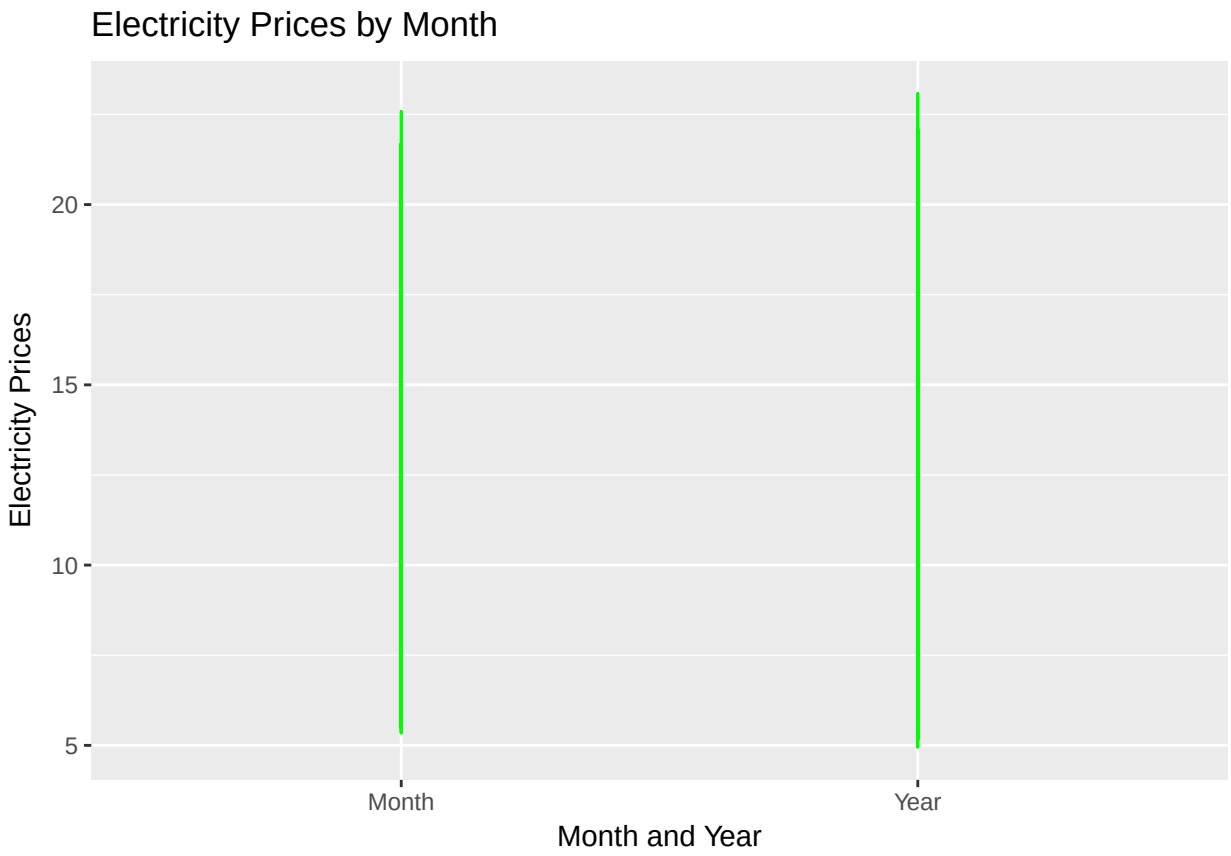
3.3 Textual Analysis

The text obtained from the FERC online commissioners was analyzed using a program called lemmatize. Lemmatize works through cleaning the text in three distinct ways. 1. All punctuation and numbers are removed. 2. All commonly used linking terms such as *and* , *or*, *but* are removed. 3. All terms are reduced to their root form. For example, all terms such as compliance, comply, and complying would become to be comply. This change enabled us to search only for the term comply without being concerned that we were missing particular conjugations of the word comply in our search.



These electricity prices can also be broken down by month, where it is revealed that they tend to be lowest in the summer, and highest in the summer.

```
## Warning: Removed 2 rows containing missing values (geom_pointrange).
```



3.4 Terminology Regression

The terminology regression was conducted using a Fixed Effects regression. The reason why the model relies on a fixed effects estimator is because fixed effects controls for heterogeneity between cases over time. We regressed the impact of terminology on prices in three ways.

First, we evaluated whether there was a correlation between the frequency of order terminology and pricing. Second, we evaluated whether there was a correlation between the frequency of renewable terminology and pricing.

However, these analyses do not account for whether there is a connection between the use of order terms and renewable terms. Specifically, the word *order* could be used 50 times in a document, but that does not mean that it will impact the price of electricity unless it is correlated with the use or production of renewable energy policy. Hence, we created a third variable called context to measure the impact of the two words occurring together on electricity prices. The context variable counts the incidence of times that the order words and renewable words are used together. So, for example, if the judge uses an order word and uses a renewable word that within 30 words of the order word, this would count as one instance for our third variable. The reason why we used 30 words as the window of distance between the terms is because the average sentence length if 15-25 words, and often does not exceed 35 words. Thus, if the order and renewable words are within 30 words of each other, either they are in the same sentence, or they are in adjacent sentences. This proximity increases the likelihood that they are used to relay the same judicial idea.

4 Results

4.1 Terminology Regression

The following chart presents the results of our analyses for the impact of order, renewables and context terminology on electricity pricing. It also includes the impact of RPS policies on electricity prices. It should be noted that for each regression, we have controlled for the other noted variables, as well as political affiliation, deregulation, and weather.

The first regression, the bars on the left hand side, contain the results for the base fixed effects regression. It should be noted that there is a positive effect for all the variables. This implies that the increased frequency (terminology) or enactment of RPS policies is correlated with an increased price of electricity, when unobserved heterogeneity is controlled for. These results, and in particular the result that RPS policy is correlated with higher electricity prices, is expected based on the theoretical framework and literature review.

However, as illustrated above, the prices of electricity tend to shift with weather patterns that occur within a year. Hence, we include a second regression that regresses based on month and year fixed effects. Curiously, this regression has notable effects on the impacts of the terminology and RPS variables. Specifically, both context and renewable variables drop to a negative effect. The frequency of these variables is now correlated with a decrease in the price of electricity. This means that as the word renewable or the appearance of both order and renewable words within 30 words of each other increases in frequency, the correlated cost of electricity goes down. This result was not predicted by our models, and is suggests that there must be some unspecified bridging variables between the implementation of renewable energy policies and increased electricity costs. These bridging variables could include companies buying into long-term contracts that lock-them in to more expensive renewable energy production. However, this is subject for future research.

In contrast, order remains positively correlated with electricity prices (though it is just above the 0.00 coefficient). RPS policies are also correlated with increased electricity prices, but the impact is much less than the effects that have been noted in past studies.

```
final <- import("Output/processed data/mergeddata.csv")
ggplot(subset(final, Judicial %in% c("order.ave", "renewable.ave", "context_30")),
    aes(x = judicial, y = price,  colour = interaction(Judicial, Prices))) + facet_wrap( ~ judicial) + s
    geom_point(alpha = 0.3, position = "jitter") +
    geom_boxplot(alpha = 0, colour = "black")+
ggtitle ("Judicial Rulings and Price")
```

4.2 Two Step

5 Conclusion and Avenues for Further Research

The main finding of our analysis is that there is a pricing contradiction when evaluating state policies and federal rulings. This finding runs against the arguments in the mainstream literature that suggest that RPS policies increase electricity prices because the generation of electricity is more expensive if done through

renewable forms. However, if federal rulings that contain terminology around ordering companies take specific action with regards to renewable energy are correlated with reduced electricity prices, it may not all be about the costs of electricity generation. Hence, further research would do well to expand on this contradiction by utilizing process-tracing analysis of the link between RPS and increased electricity costs in select states. Specifically, what about RPS is driving prices upwards? If it is not the cost of generating electricity, what is the economic impact of implementing RPS?

Finally, our main judicial link here was federal court rulings. In short, this variable was chosen in part to evaluate reverberation effects, but also because of the relative ease of scrapping the data from the FERC website (in comparison to from the websites of 50 state judicial commissions). What remains to be seen, however, is whether increased federal court focus on renewable energy is correlated with increased state-level court focus on renewable energy. Further studies would do well to evaluate the terminology used by courts at the state-level, in order to analyze if there is a reverberation of federal court rhetoric at the state level as well.

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