Evaluation of the Stringency and Design of RPSs

Hosted by
Warren Leon, Executive Director, CESA

October 18, 2018
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RPS Collaborative

- With funding from the Energy Foundation and the U.S. Department of Energy, CESA facilitates the Collaborative.
- Includes state RPS administrators, federal agency representatives, and other stakeholders.
- Advances dialogue and learning about RPS programs by examining the challenges and potential solutions for successful implementation of state RPS programs, including identification of best practices.
- To sign up for the Collaborative listserv to get the monthly newsletter and announcements of upcoming events, see: www.cesa.org/projects/renewable-portfolio-standards
Webinar Speakers

**Sanya Carley**
Associate Professor, School of Public and Environmental Affairs, Indiana University Bloomington

**Nikos Zirogiannis**
Assistant Scientist, School of Public and Environmental Affairs, Indiana University Bloomington

**Warren Leon**
Executive Director, Clean Energy States Alliance (moderator)
Evaluation of the stringency and design of renewable portfolio standards

Sanya Carley and Nikos Zirogiannis
School of Public and Environmental Affairs
Indiana University

Co-authors: Lincoln Davies, David Spence
Renewable Portfolio Standard Policies

www.dsireusa.org / February 2017

[Map of the United States showing various states with renewable portfolio standards]

29 States + Washington DC + 3 territories have a
Renewable Portfolio Standard
(8 states and 1 territories have renewable portfolio goals)

How Effective is the RPS?

Mixed Results (Adelaja 2010; Alagappan, Orans, and Woo 2011; Butler and Neuhoff 2008; Carley 2009; Carley et al., 2017; Delmas and Montes-Sancho 2011; Dong 2012; Haas 2011)

Why?

– Methodological approaches able to tell a causal story?
– Enough time to realize results?
– What about states that set mandates equal to the renewables that they already have?
– How well can they account for alternative compliance with the policy?
Pathways through which Utilities can Comply with State RPSs

(1) Deploy renewable energy
(2) Purchase credits
(3) Pay an alternative payment or penalty
(4) Be excused from compliance because of a cost cap
(5) Take advantage of a “multiplier”
(6) Some combination thereof
Are We Asking the Right Question?

Utility-Reported RPS Compliance, 2000-2015

Data are publicly available through the National Renewable Energy Laboratory
Is the Way that We Operationalize the RPS Policy Accurate?
Is the Way that We Operationalize the RPS Policy Accurate?

POLICY DESIGN SHOULD MATTER
Research Question

It is time to stop asking the question, “Are RPS policies effective?”

Instead, we must ask: “Which specific RPS design features make these policies more or less effective, and how do those different designs shape in-state renewable energy markets in different ways?”
A BRIEF HISTORY OF RPS DESIGN
Policy Stringency

\[ S_t = \frac{M_T - M_I}{Z_T - Z_I} \times L_t \]

- \( S_t \): stringency score in time \( t \)
- \( M \): percentage mandate
- \( Z \): year
- \( T \): terminal year value
- \( I \): value at first year of the policy
- \( L \): percentage of state’s electricity load that is regulated by the policy
RPS as a “Technology-Neutral” Policy?

Carve-outs and Multipliers

Renewable Portfolio Standards (RPS) with Solar or Distributed Generation Provisions

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VT: 1% DG X 2017 + 3/5ths of 1%/year until 10% X 2032
NH: 0.3% (E) x 2014
MA: 400 MW PV x 2020
NY: 0.59% customer - sited x 2014
PA: 0.5% PV x 2021
NJ: 4.1% (E) x 2026
DC: 2.5% (E) x 2023
DE: 3.5% PV x 2026
NC: 0.2% for PV (M)
MD: 2.5% (E) x 2020

22 States + DC have an RPS with solar or DG provisions

Delaware allows certain fuel cell systems to qualify for the PV carve-out
Solar water heating counts toward solar/DG provision

Renewable Portfolio Standard with solar/distributed generation (DG) provision
Renewable Portfolio Goal with solar/DG provision

(E): Solar Electric
PV: Solar Photovoltaic
DG: Distributed Generation
(M): Multipliers
(CST): Customer - Sited
Alternative Eligible Resources

Coal Bed Methane

Nuclear

Integrated Gasification Combined Cycle

Energy Efficiency

Renewable Energy Credits/Certificates (REC)

A REC represents 1 MWh of renewable generation

Unrestricted RECs?
- Least-cost option
- But who recovers the economic development benefits of the policy?
- Import RECs and export $$

Restrictions on RECs?
- Cost implications
- Dormant Commerce Clause complications?

Cost Mechanisms

• **Cost-based escape clause**

• **Cost caps**: set as threshold percentage of rates or revenues above which obligated entities no longer need to comply

• **Cost recovery**: allows utilities to recover a percentage of RPS compliance costs

• **Alternative compliance payments (ACPs)**: a fee that utilities can pay in lieu of acquiring eligible renewable power
  – Function as a cost cap
Planning

As new renewables were put online, a growing importance of capacity and infrastructure planning

RESEARCH DESIGN
Mixed Methods Approach

• **Statistical analysis** using secondary data from 1992-2014
  – Detailed policy design data, compiled through careful analysis of legislation (and inter-coder reliability)

• **Semi-structured interviews** conducted with RPS experts across the country
Interviews

• Respondents from 37 states
• Conducted over the phone: November 2013 - September 2015
• 30-80 minutes interviews conducted over the phone

<table>
<thead>
<tr>
<th>Respondent Type</th>
<th>Number</th>
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<tbody>
<tr>
<td>Government</td>
<td>22</td>
</tr>
<tr>
<td>Utility</td>
<td>16</td>
</tr>
<tr>
<td>Renewable Energy Producer</td>
<td>4</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>42</strong></td>
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Methodological Approach: Regression Analysis

\[ Y_{it} = \alpha_0 + \beta_1 P_{it-1} + \gamma_1 X_{it-1} + \delta_{t-1} + \theta_i + \varepsilon_{it} \]

\( Y \): renewable energy market measures in state \( i \) and year \( t \)
\( P \): a vector of policy design features
\( X \): a vector of state-level control variables
\( \delta_t \): year fixed effects
\( \theta_i \): state-level fixed effects
\( \varepsilon \): the error term
Data

**Dependent Variables (all logged):**
- % renewable energy production
- Solar generation (in MWh)
- Wind generation (in MWh)
- Renewable capacity (in MW)

**Primary Independent Variable:** Policy stringency

\[ S_t = \frac{M_T - M_I}{Z_T - Z_I} \times L_t \]

$S$: stringency score in time $t$
$M$: percentage mandate
$Z$: year
$T$: terminal year value
$I$: value at first year of the policy
$L$: percentage of state’s electricity load that is regulated by the policy
Data

Other policy design features:
– Energy efficiency allowed
– Credit multipliers
– Non-renewables allowed
– Penalty
– Mandate amount
– Mandatory policy
– Number of years of policy experience
– Cost recovery
– Planning activities
– Geographic limits on compliance
– REC markets

Other variables:
– Economic and political variables
RESULTS
Results

1. **Strong mandates** are very important for solar and renewable energy in general
2. The **longer a state has an RPS**, the more it deploys solar
3. Strong **economic conditions** are especially important for high rates of wind deployment
4. Having **cost recovery** mechanisms lead to higher rates of renewables
5. Holding regular **planning activities** is associated with wind and other renewables
6. Tighter **geographic restrictions** are associated with more in-state wind generation, although this relationship may go in both directions
INTERVIEWS
ARE RPS EFFECTIVE?

- Yes: 74%
- No: 8%
- Maybe: 18%
Interviews: Design Matters

Setting Mandates
Should be well above current/readily attainable levels of renewable energy, so as to not artificially constrain market development
Mandates should be ambitious but attainable

Ensure Flexibility
Introduce mechanisms such as REC banking and borrowing

Full Transparency
Ensure a dependable and transparent REC trading system with prices that are not too low

Avoid Constraining Markets
Penalties, alternative compliance payments, or cost caps that are set high enough so as not to supplant new renewable energy development
Interviews: Trade-offs

• REC markets: to restrict or not to restrict?
• Policy modifications vs. regulatory stability
  – It is important to modify a policy to adapt to current circumstances and improve upon past performance
  – But not at the cost of increasing perceptions of regulatory uncertainty
Concluding Thoughts

• Policy design is important
• So too are other factors such as economic conditions for wind
• Trade-offs are inevitable
References

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Link to the paper: https://rdcu.be/7aqo
EXTRA SLIDES
## Important Assumptions and Robustness Checks

<table>
<thead>
<tr>
<th>Important Assumption</th>
<th>Approach or Robustness Check</th>
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<tbody>
<tr>
<td>No omitted variable bias</td>
<td>Fixed effects and extensive set of controls</td>
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<tr>
<td>Measurement error</td>
<td>Alternative measure of policy design using dynamic factor analysis</td>
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<tr>
<td>Outliers do not drive results</td>
<td>Run models without Texas</td>
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<tr>
<td>Parallel trends assumption &amp; exogeneity of policy variables</td>
<td>• Mixed methods approach with interview results</td>
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<tr>
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<td>• Lagged independent variables</td>
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<td>• Granger-type causality tests</td>
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<td>• Balancing tests</td>
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<tr>
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<td>• Run models with just RPS states</td>
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<td>• Include an interaction term between renewable energy potential and a linear time trend</td>
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Robustness Checks

• Use a dynamic factor index instead of stringency score
• Remove Texas
• Granger-type causality tests to detect anticipatory policy effects
• Balancing tests: control and treatment groups do not vary in systematic, observable ways
  – Exception: not balanced on electricity price; states with higher prices have stronger standards
• Time trend * renewable energy potential categories: states with different levels of renewable potential are not more likely to develop renewable energy absent RPS policies
• Just the RPS adopting states
Thank you for attending our webinar

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Visit our website to learn more about the RPS Collaborative and to sign up for our e-newsletter:
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Upcoming Webinar

Energy Storage in the Clean Peak Standard

*Thursday, November 8, 1-2pm ET*

Clean Peak Standards (CPS) are being implemented or considered by several states as a way to focus renewable generation at peak demand hours. Energy storage is expected to play a major role in these efforts. Navigant's Lon Huber will present.

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