RPS Collaborative Webinar

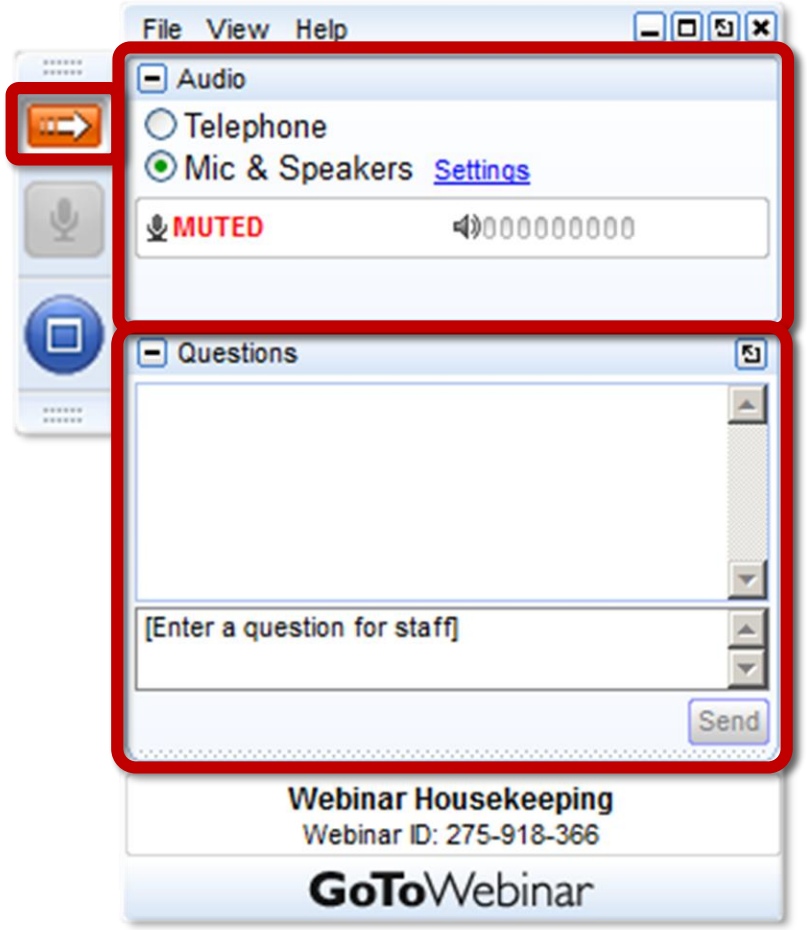
Evaluation of the Stringency and Design of RPSs

Hosted by
Warren Leon, Executive Director, CESA

October 18, 2018

CleanEnergy States Alliance

Housekeeping



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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

ENERGY FOUNDATION
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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)

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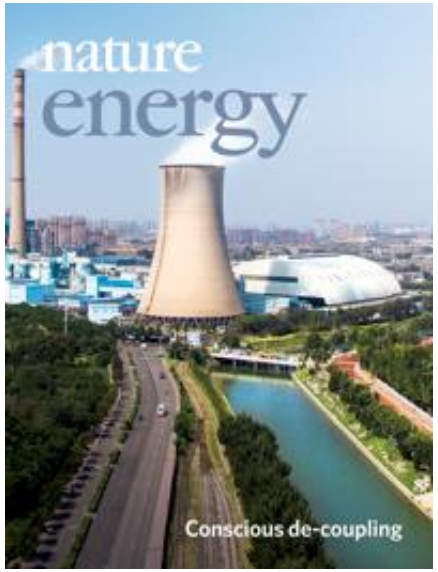
Evaluation of the stringency and design of renewable portfolio standards

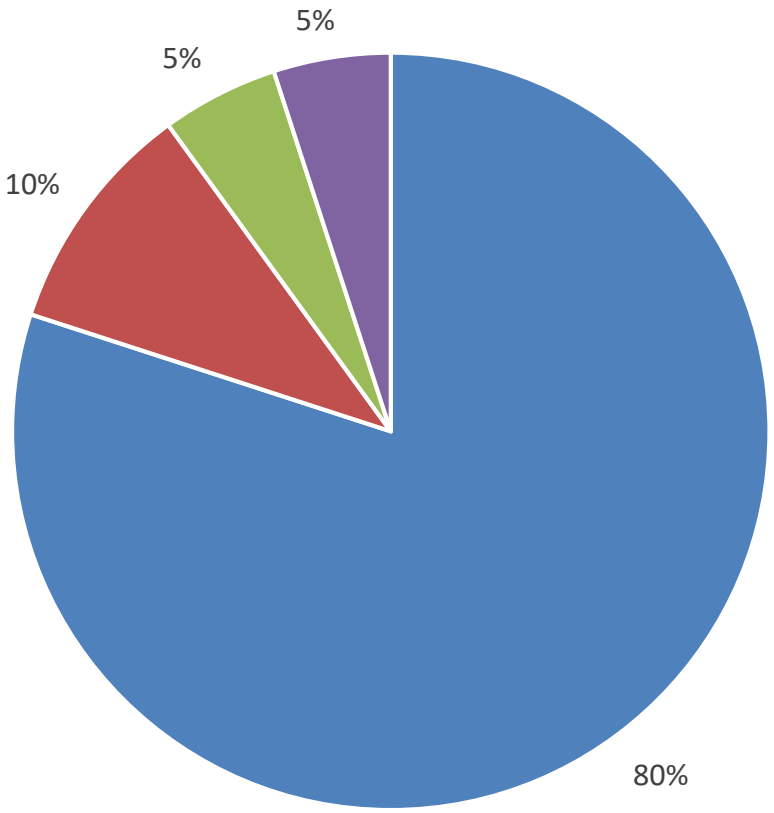


Source: https://www.nature.com/nenergy/volumes/3

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

Co-authors: Lincoln Davies, David Spence

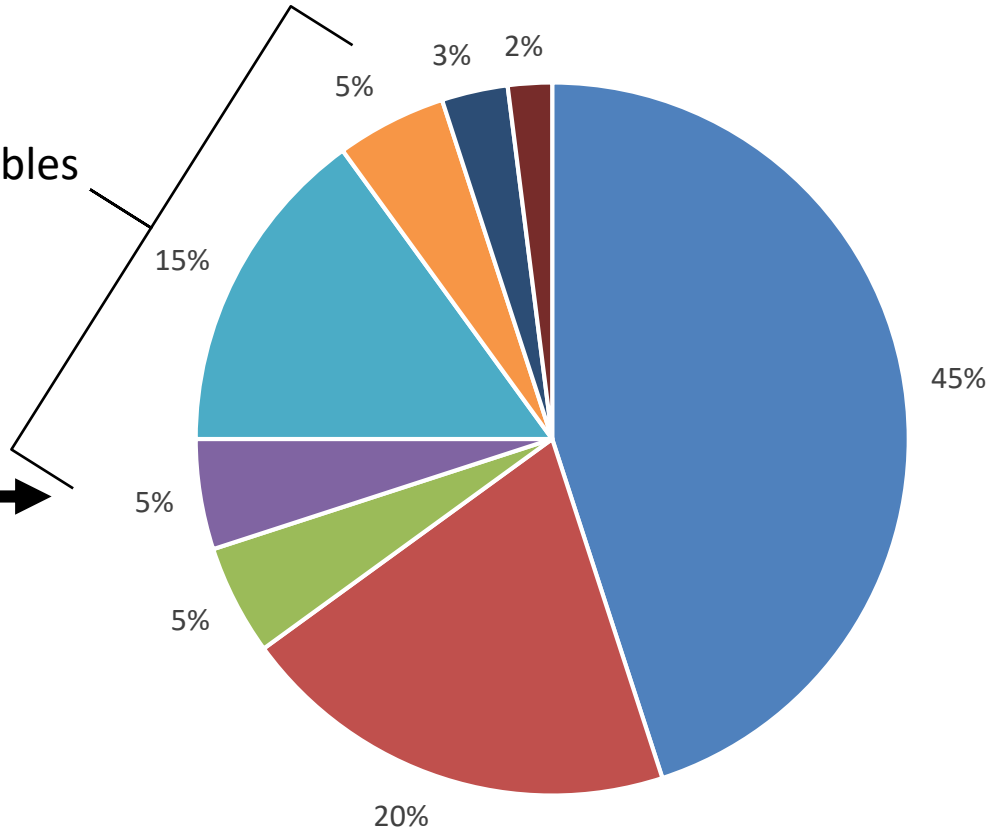
Share of Energy Resources, 2010



Coal Natural Gas Hydroelectricity Nuclear

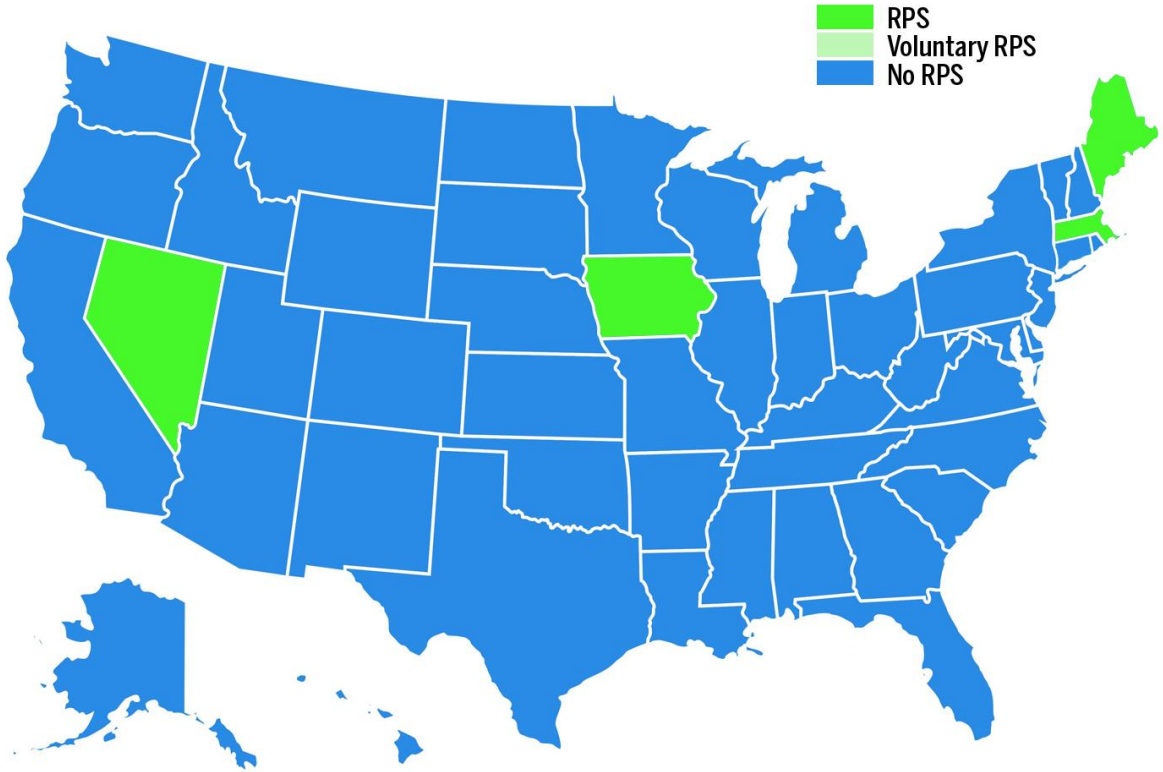
30% Renewables

Share of Energy Resources, 2025

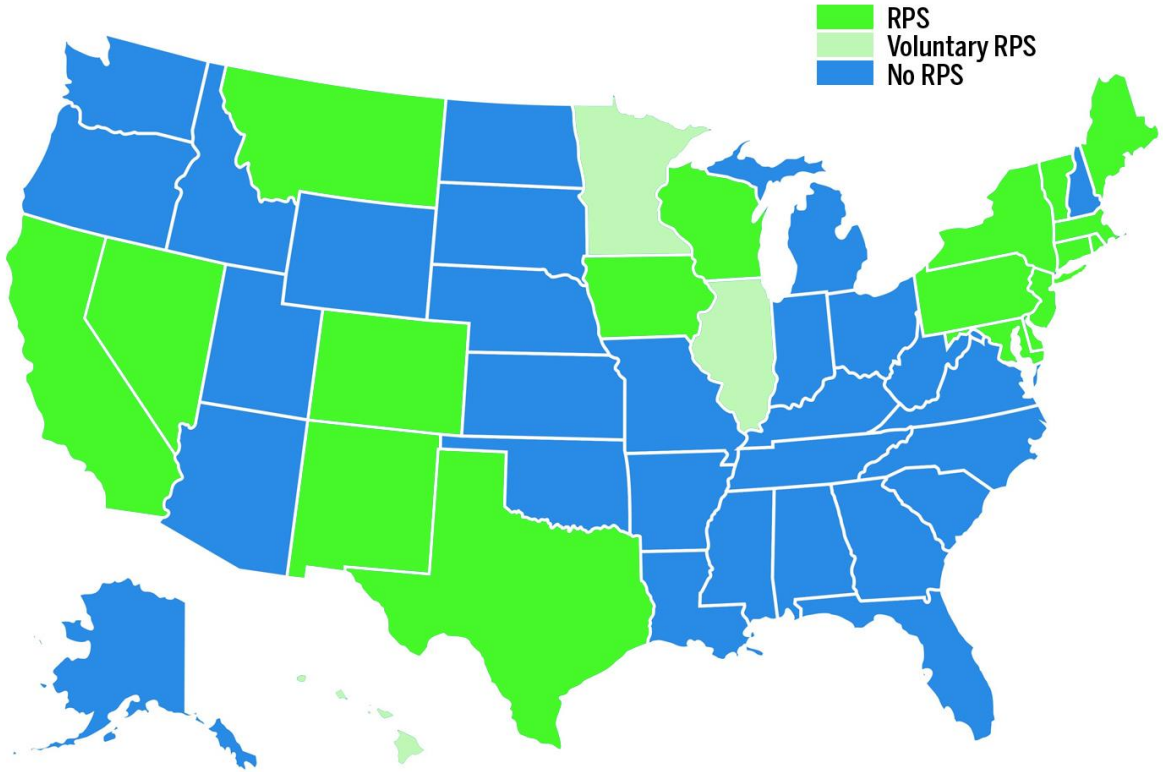


Coal Natural Gas Nuclear Hydroelectricity
Wind Solar Geothermal Biomass

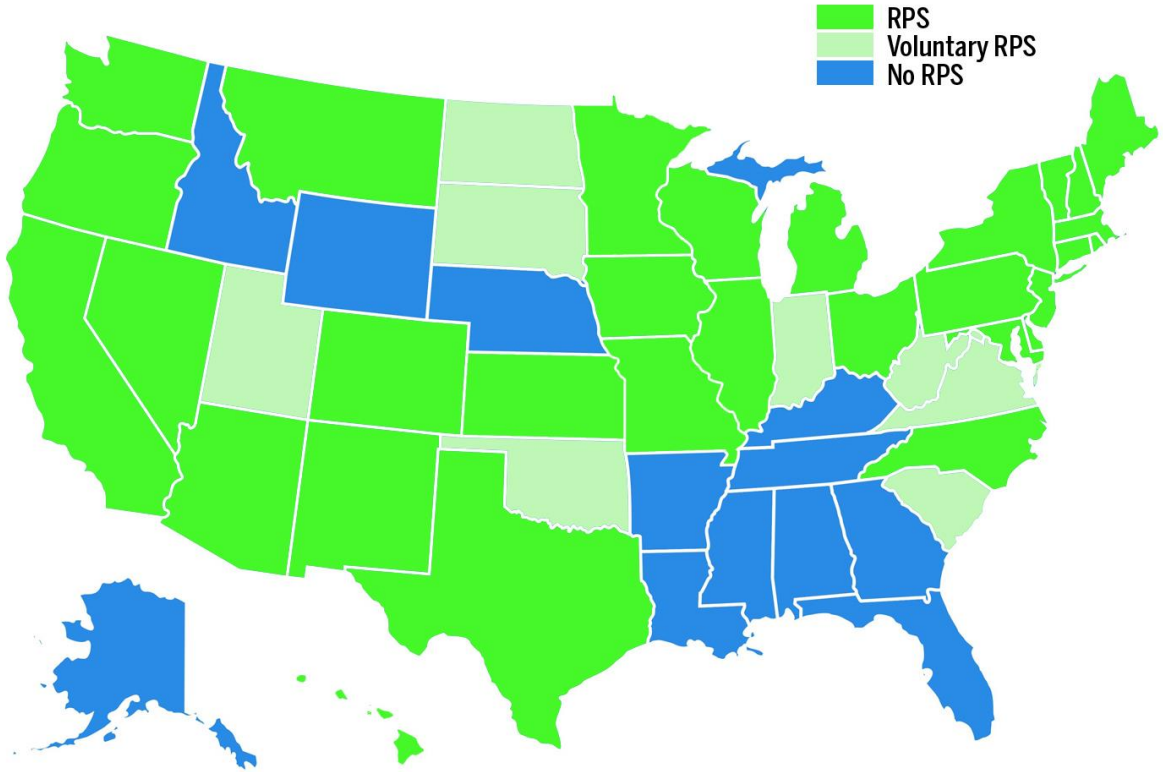
1997



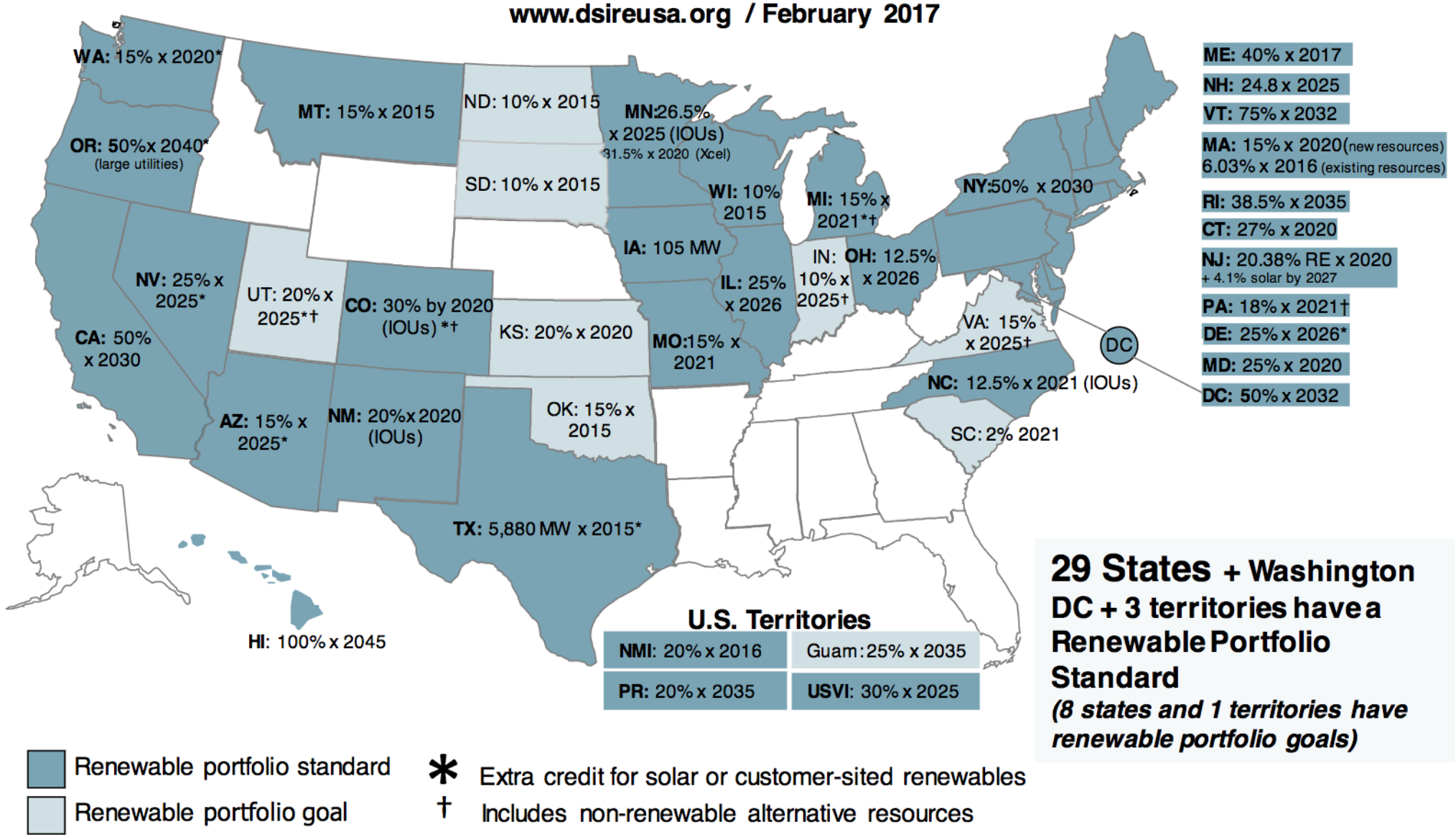
2005



2014



Renewable Portfolio Standard Policies



Source: http://ncsolarcen-prod.s3.amazonaws.com/wp-content/uploads/2017/03/Renewable-Portfolio-Standards.pdf

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

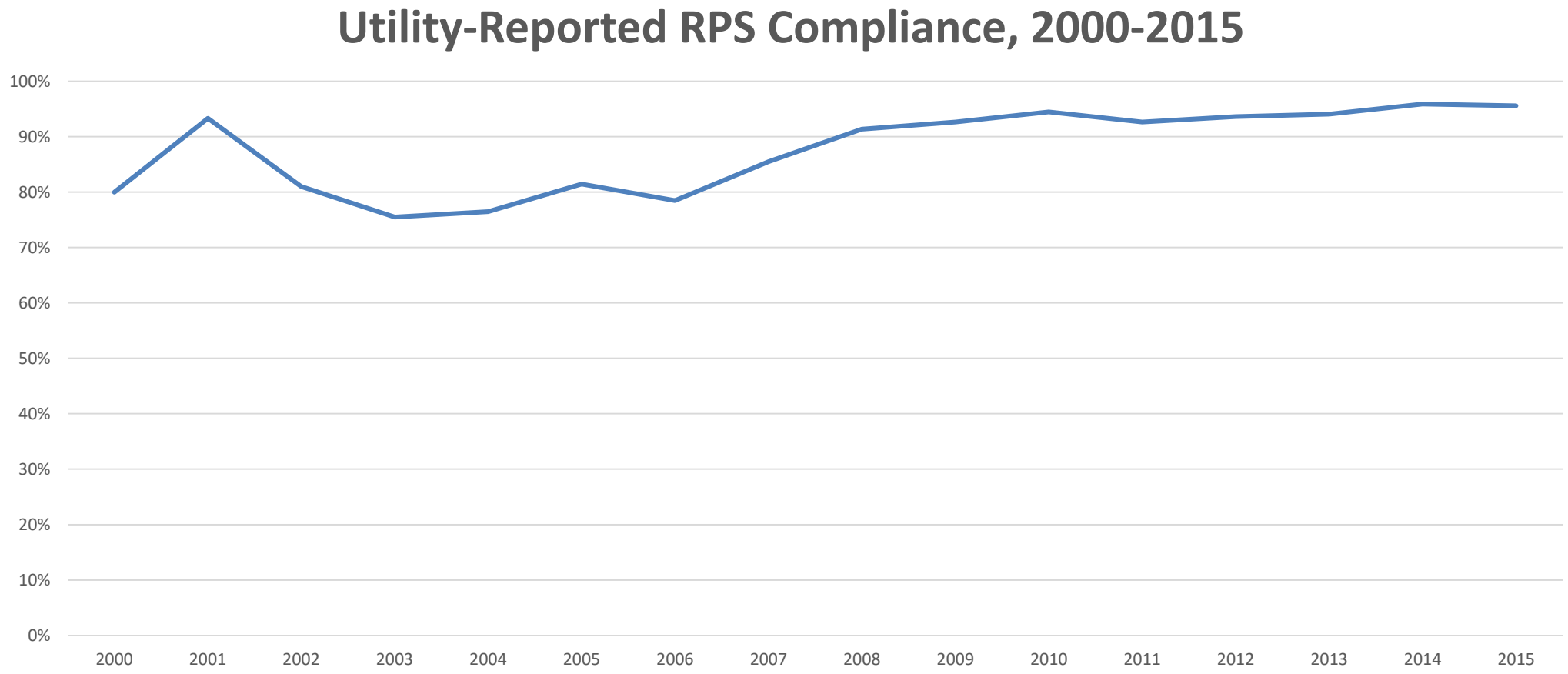
(3) Pay an alternative payment or penalty

(4) Be excused from compliance because of a cost cap

(5) Take advantage of a “multiplier”

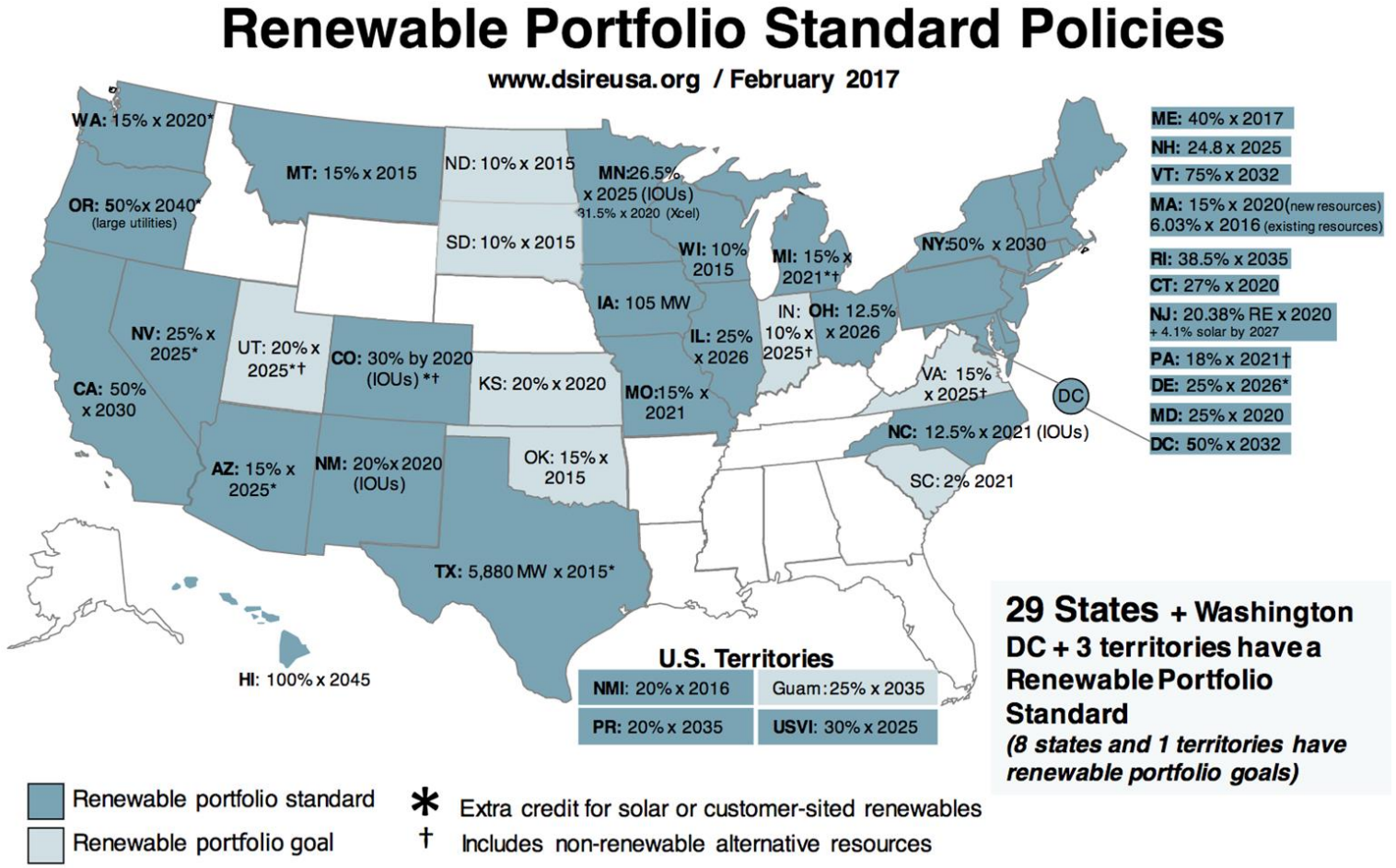
(6) Some combination thereof

Are We Asking the Right Question?



Data are publicly available through the National Renewable Energy Laboratory

Is the Way that We Operationalize the RPS Policy Accurate?



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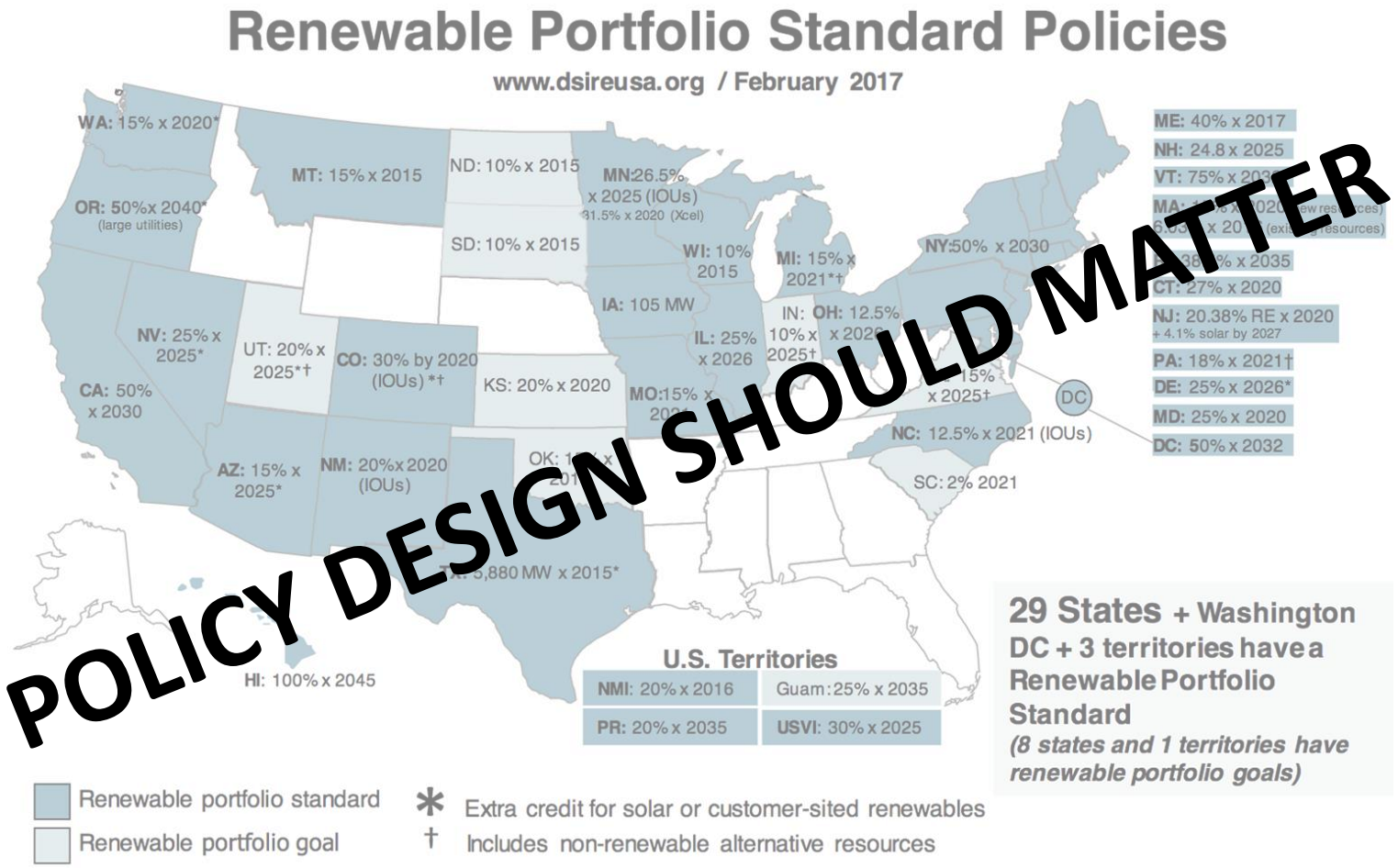


POLICY DESIGN SHOULD MATTER

Research Question

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

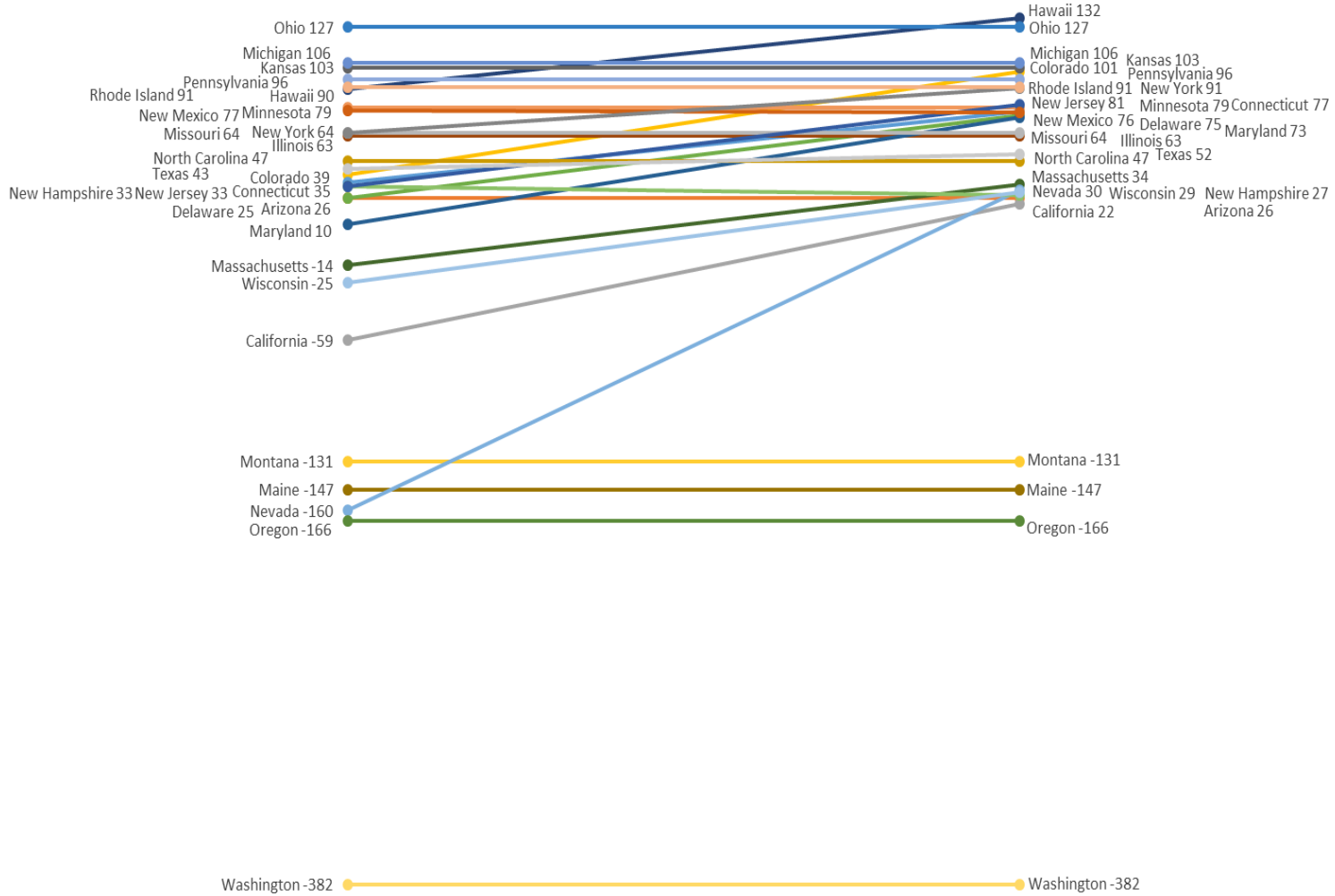
Instead, we must ask: “Which specific RPS design features make these policies more or less effective, and how do those different designs shape in-state renewable energy markets in different ways?”

A BRIEF HISTORY OF RPS DESIGN

Policy Stringency

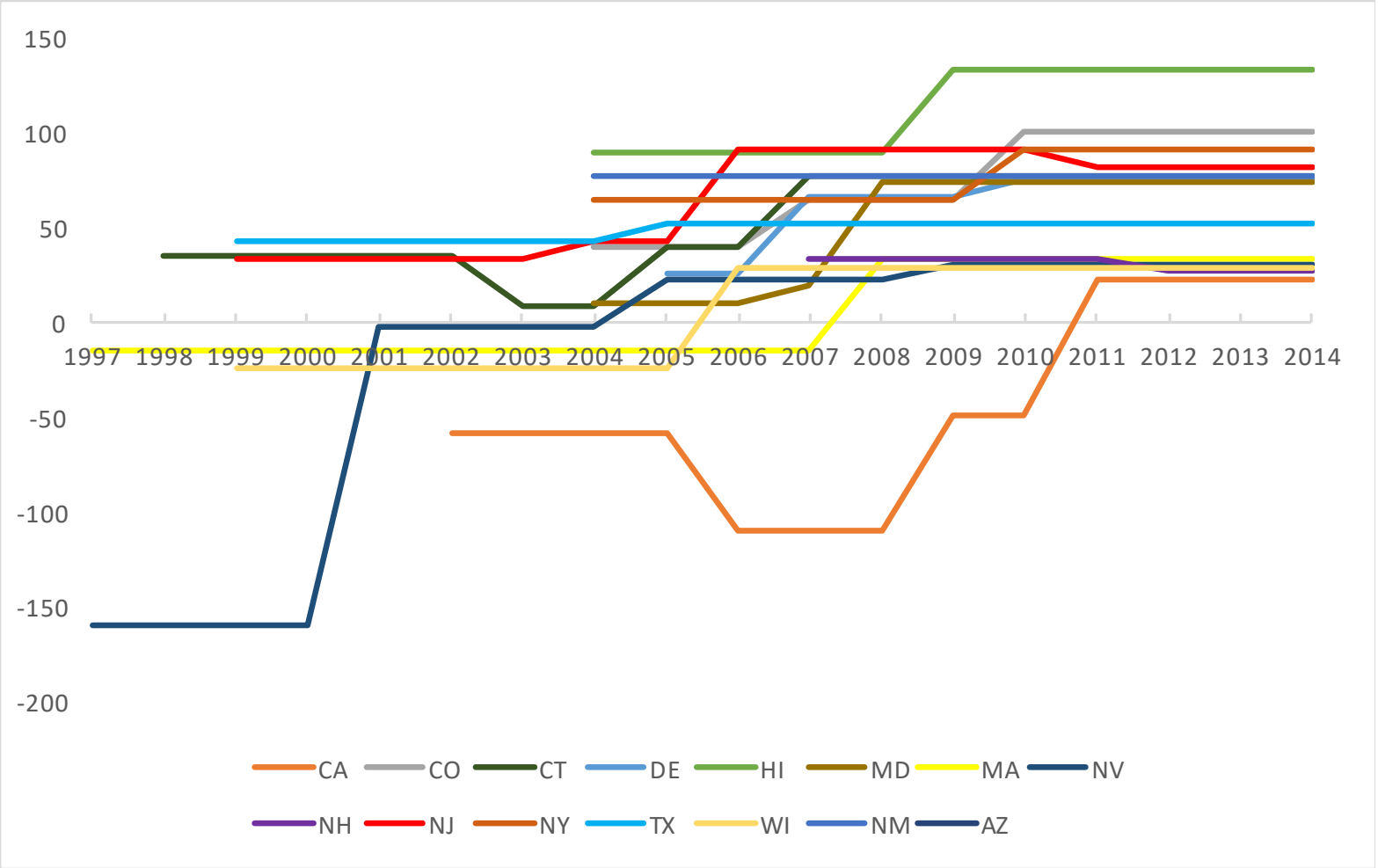
$$S_t = \frac{M_T - M_I}{Z_T - Z_I} \times L_t$$

S: 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 Stringency Score in Year of Inception (Left Axis) and in 2014 (Right Axis)

Stringency


150
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1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014
CA
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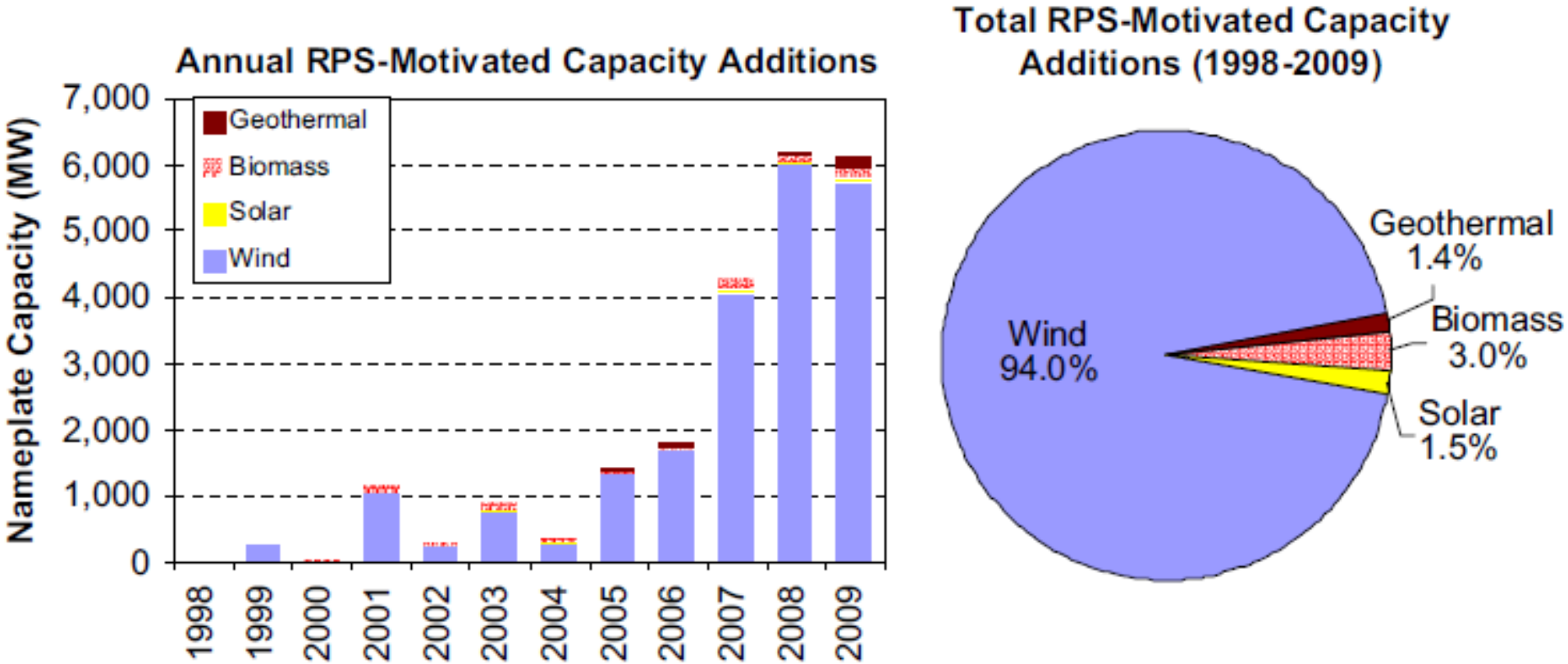
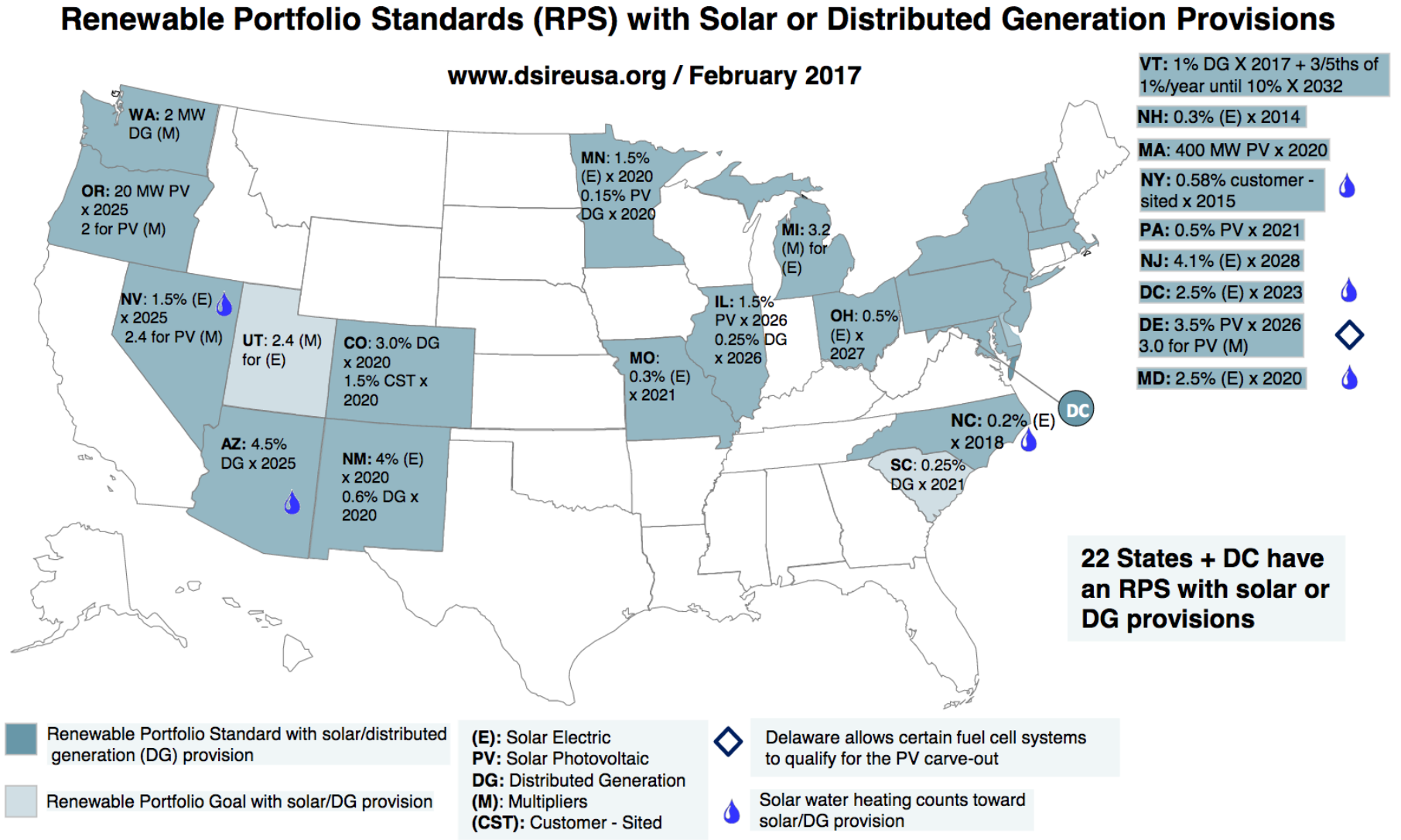
AZ

RPS as a “Technology-Neutral” Policy?



Source of Image: Wiser et al. 2011.

Carve-outs and Multipliers



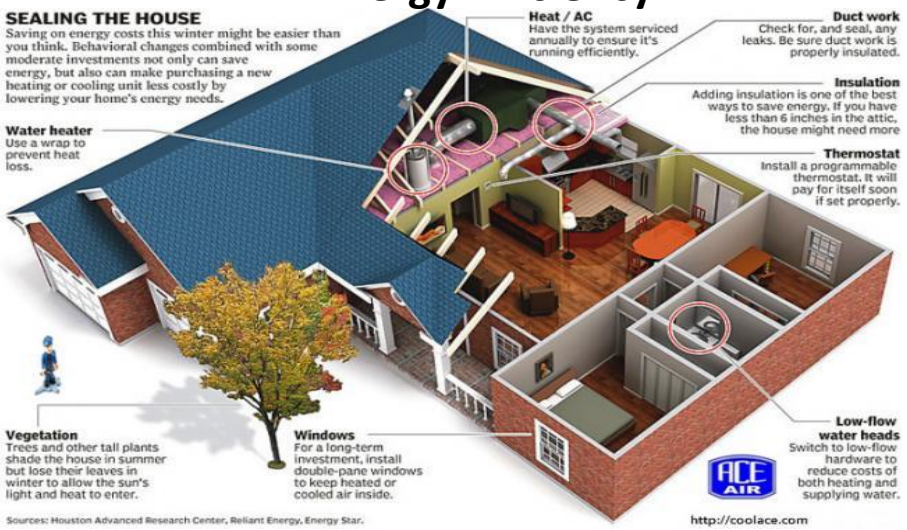
Coal Bed Methane

Integrated Gasification Combined Cycle

Alternative Eligible Resources

Nuclear

Energy Efficiency



Source: http://www.energyjustice.net/naturalgas/cbm, http://www.timesnews.net/News/2015/05/26/The-road-ahead-for-clean-coal, https://www.foreignaffairs.com/articles/2011-10-17/why-we-still-need-nuclear-power, http://www.ecoproach.com/news/2016/01/05/infographic-cost-effective-home-energy-upgrades

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?

Source: http://archive.news.indiana.edu/releases/iu/2014/04/spea-energy-credits.shtml

Cost Mechanisms

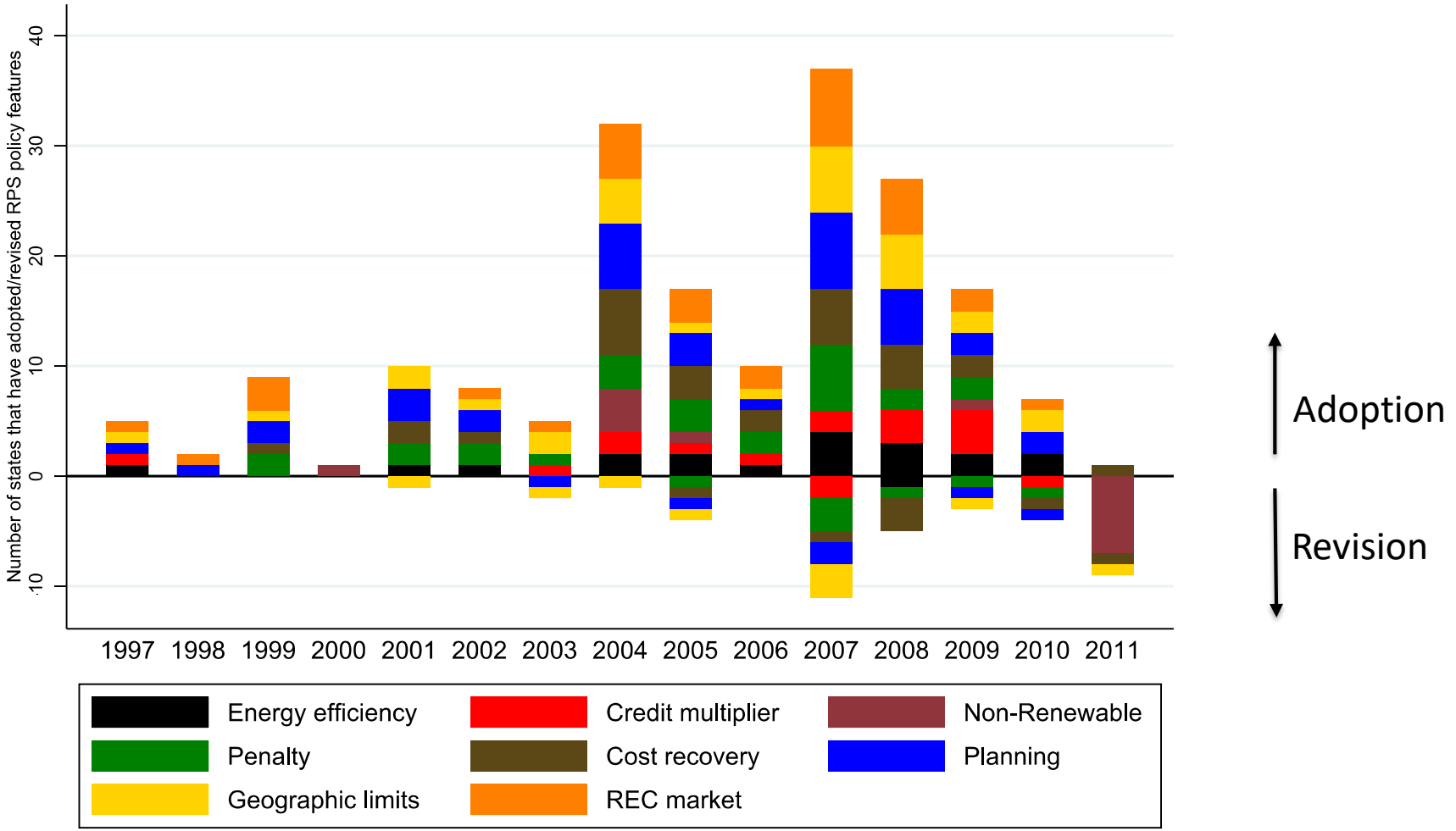
- **Cost-based escape clause**
- **Cost caps**: set as threshold percentage of rates or revenues above which obligated entities no longer need to comply
- **Cost recovery**: allows utilities to recover a percentage of RPS compliance costs
- **Alternative compliance payments (ACPs):** a fee that utilities 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

Source: https://www.ucsusa.org/clean-energy/how-electricity-grid-works#.WnDMfK6nGUk and http://www.tdworld.com/smart-grid/pjm-implements-advanced-control-center

RPS Policy Design Changes Over Time



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

Respondent Type	Number
Government	22
Utility	16
Renewable Energy Producer	4
Total	**42**

Methodological Approach: Regression Analysis

$$Y_{it} = \alpha_0 + \beta_1 P_{it-1} + \gamma_1 X_{it-1} + \delta_{t-1} + \vartheta_i + \varepsilon_{it}$$

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

δ_t: year fixed effects

ϑ_i: state-level fixed effects

ε: 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

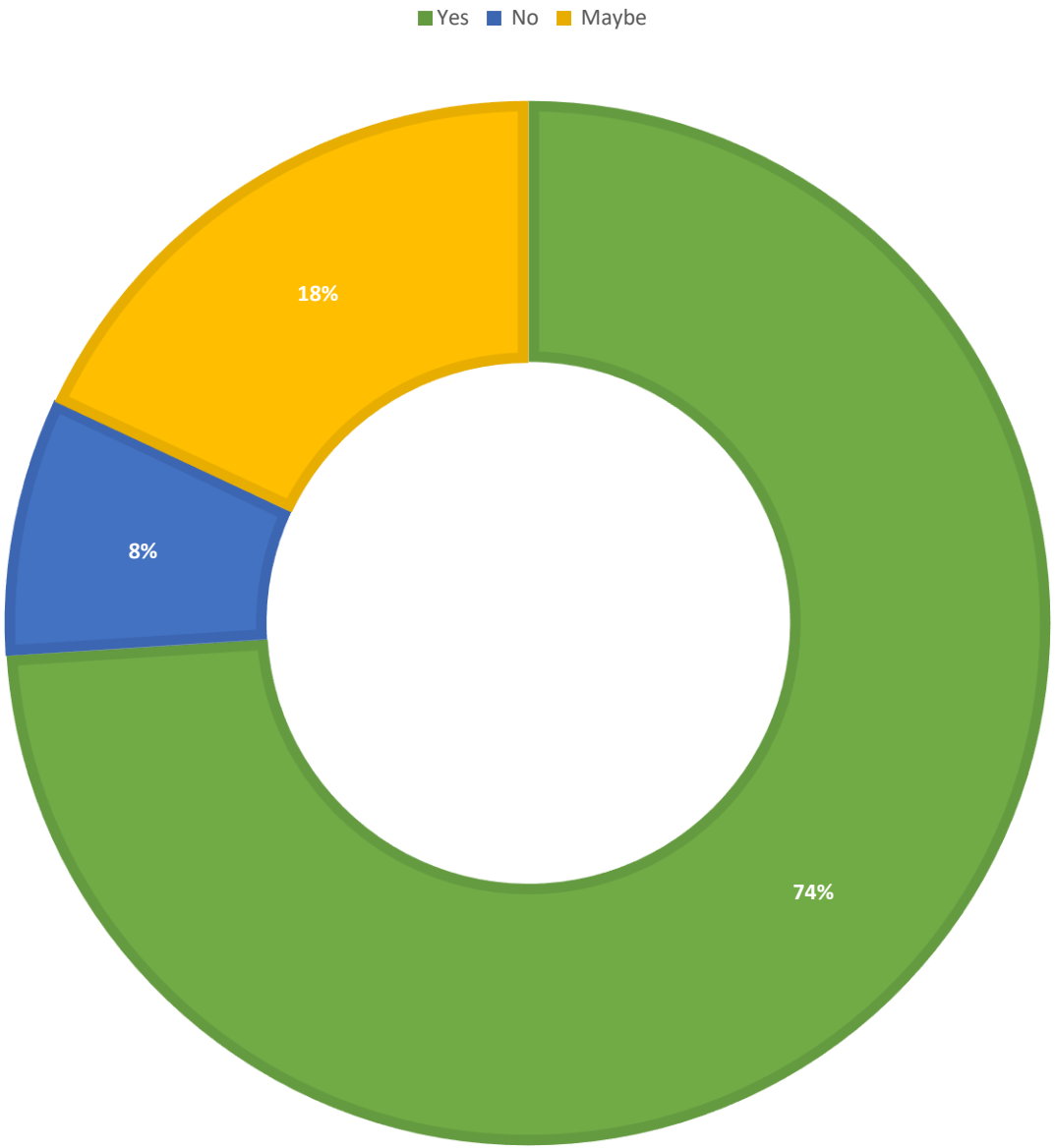
RESULTS

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?



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

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Contact Information:
Sanya Carley
scarley@indiana.edu

Link to the paper: https://rdcu.be/7aqo

EXTRA SLIDES

Important Assumptions and Robustness Checks

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

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

Warren Leon
RPS Project Director, CESA Executive Director
wleon@cleanegroup.org

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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.

Read more and register at www.cesa.org/webinars