

State of the States 2009: Renewable Energy Development and the Role of Policy



**Technical Assistance
Program (TAP) Webinar**

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November 18, 2009

State and Local Analysis Team

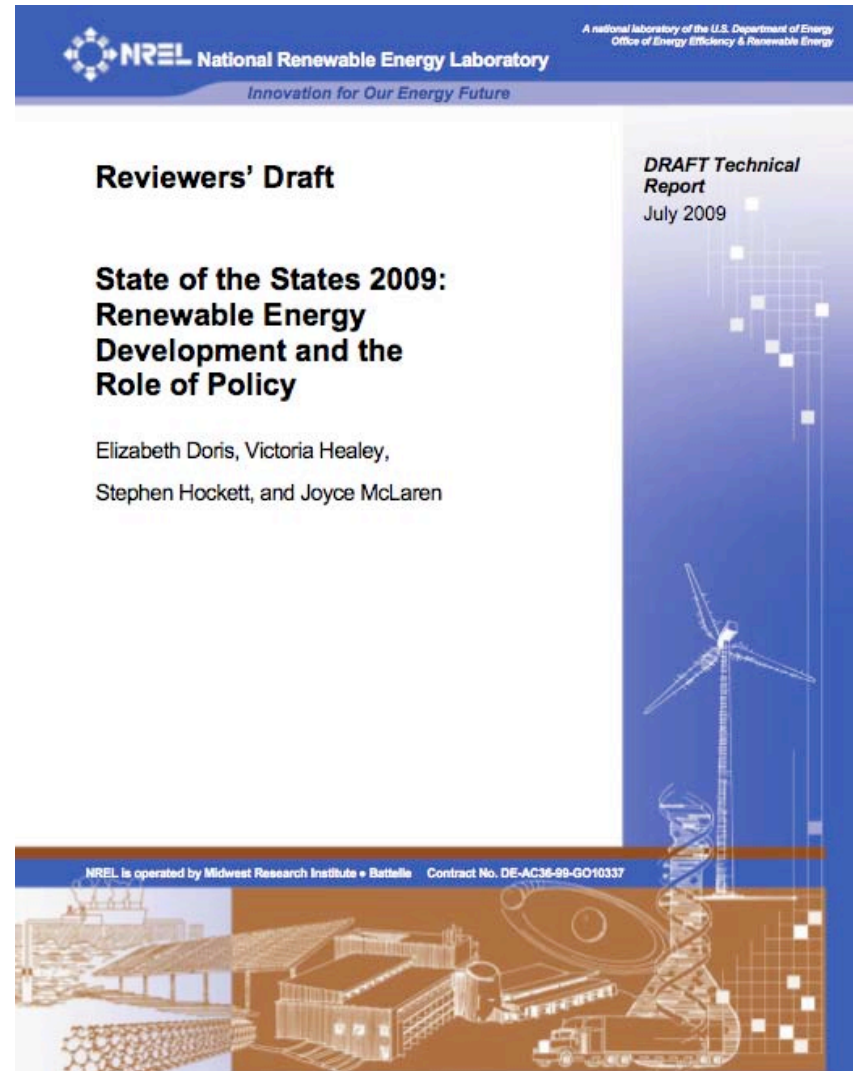


- Technical Assistance (Policy Analysis)
 - Direct requests
 - Projects to help states accomplish clean energy goals
- Multi-year analyses
 - Impact of policy on economic development, environment, etc. (State Clean Energy Policies Analysis)
 - Connecting policy with generation (State of the States)

State of the States 2009

Aim

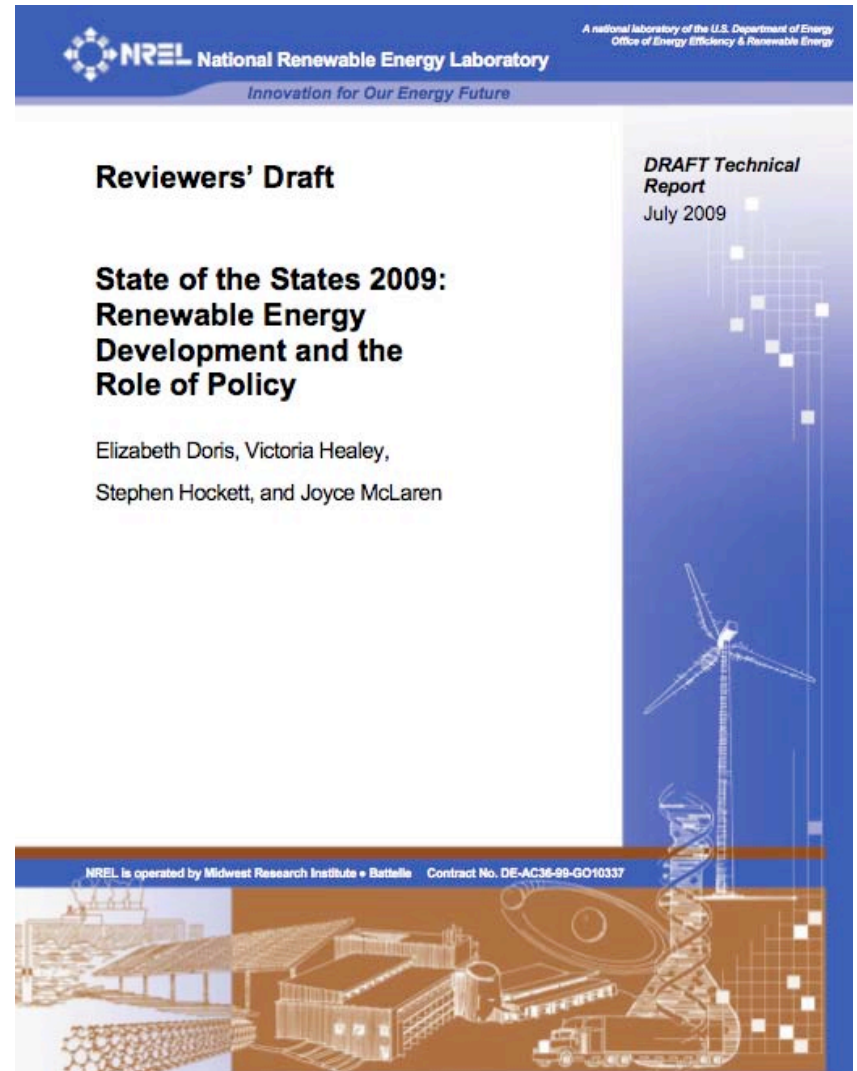
Supplement the existing *qualitative* policy analyses and individual case studies with *quantitative* policy analysis that explores the link between policy implementation and actual development.



State of the States 2009

Contents

1. Development Trends
2. State Policies and Best Practices
3. Quantitative Policy Evaluation
(Policy-Development Link)
4. Contextual Factors



Part 1: Development Trends

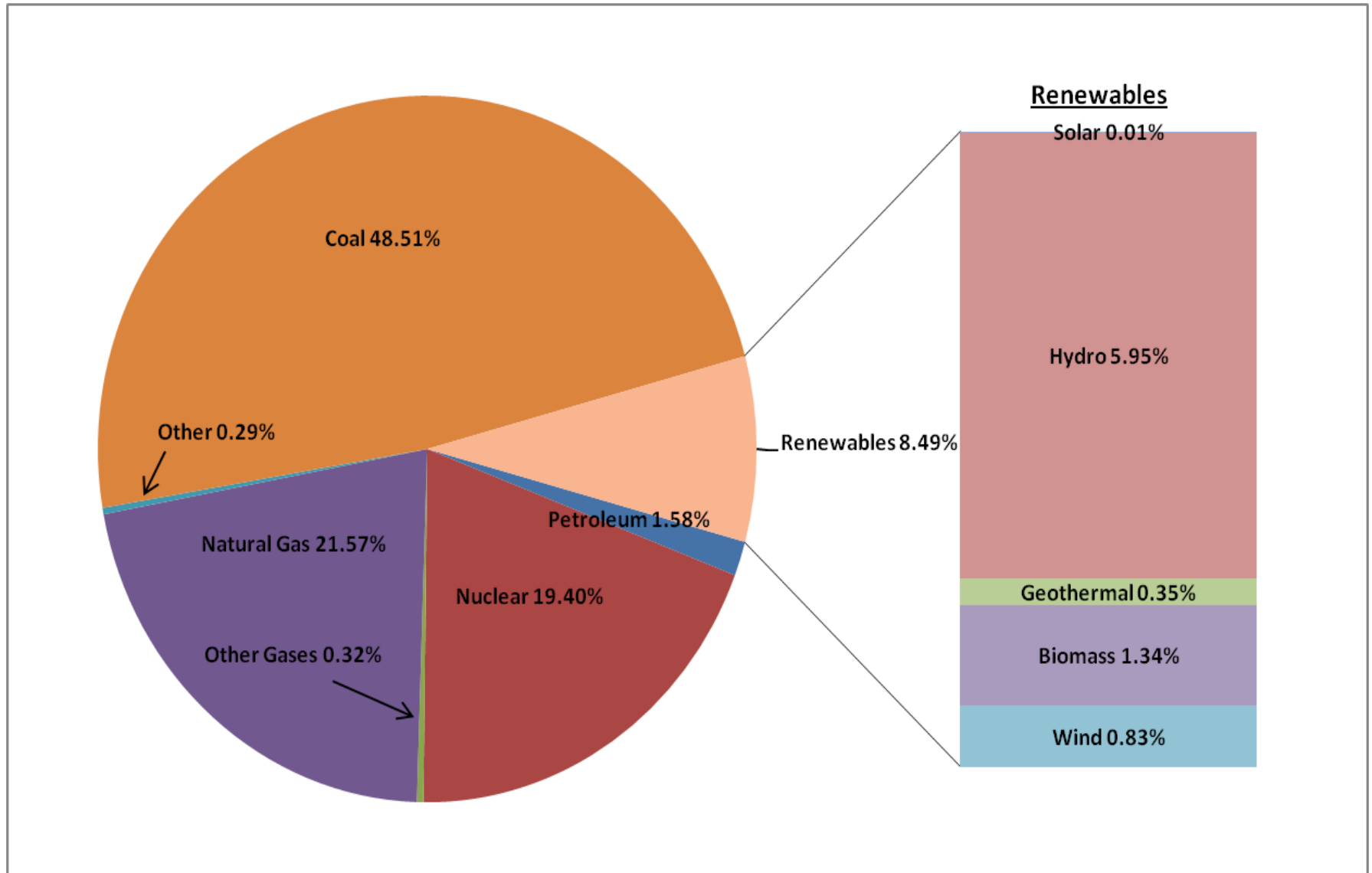
Metrics

How much
renewable energy
is being generated?

- National data
- State by State data
- Individual technologies

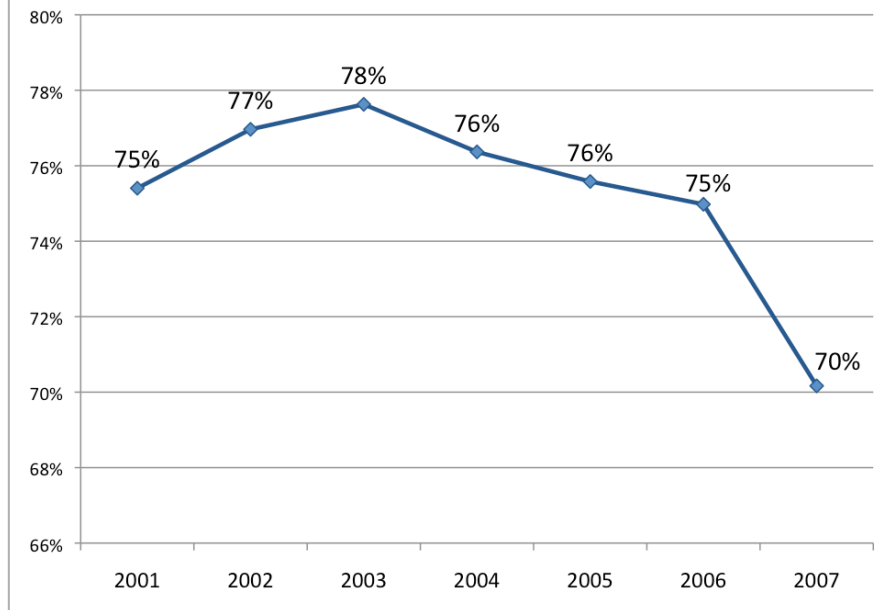
- Total capacity/generation
- Hydro vs. Non-hydro RE
- % of Total Generation
- Per Capita
- Per GSP
- % Change (most improved)

US Electricity Generation by Source (2007)

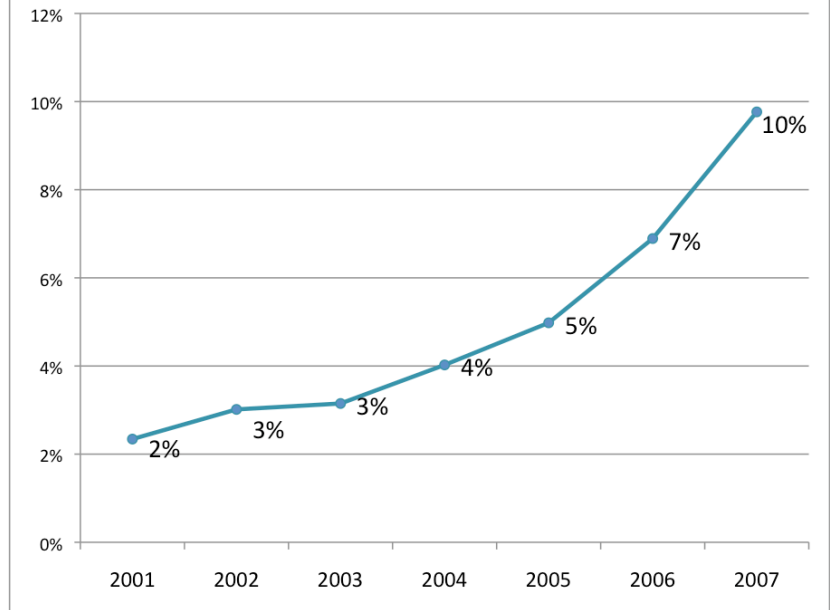


Hydro and Wind Generation as a % of Total Renewable Energy

U.S. Hydroelectric Generation as a Percent of Total Renewable Generation (2001-2007)

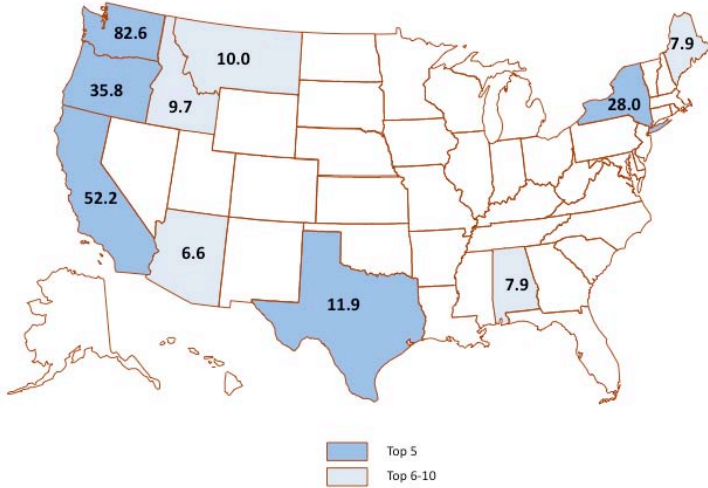


U.S. Wind Generation as a Percent of Total Renewable Generation (2001-2007)



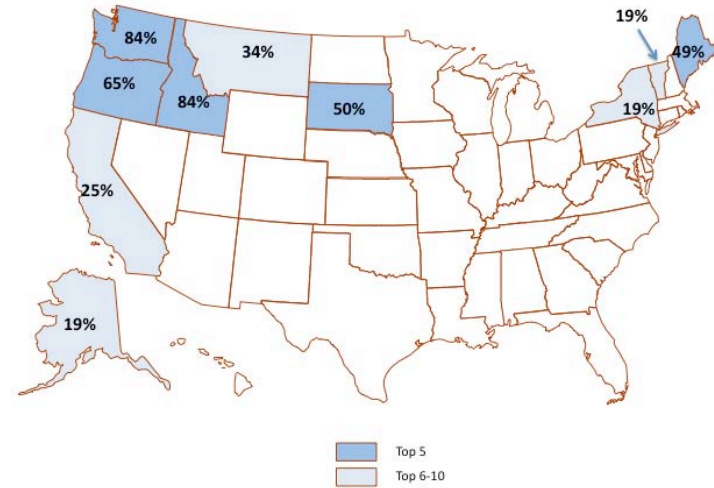
Total Renewable Energy Generation Leaders (2007)

Total Renewable Energy Generation (TWh)



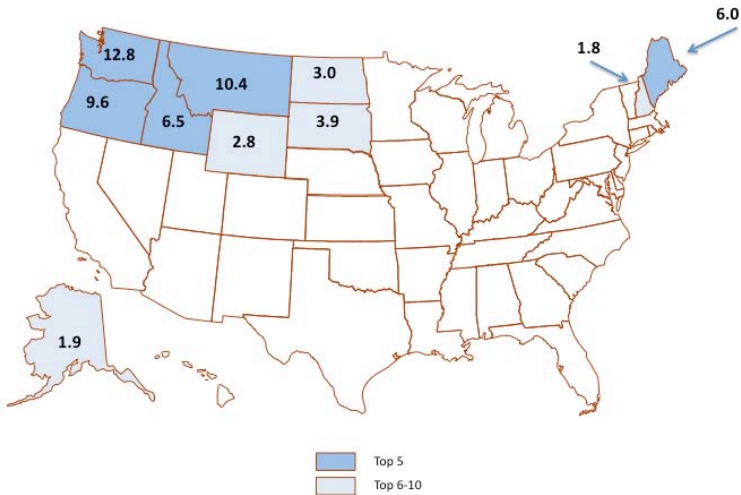
Source: State of the States 2009

Renewable Energy Generation as a % of Total State Electricity Generation



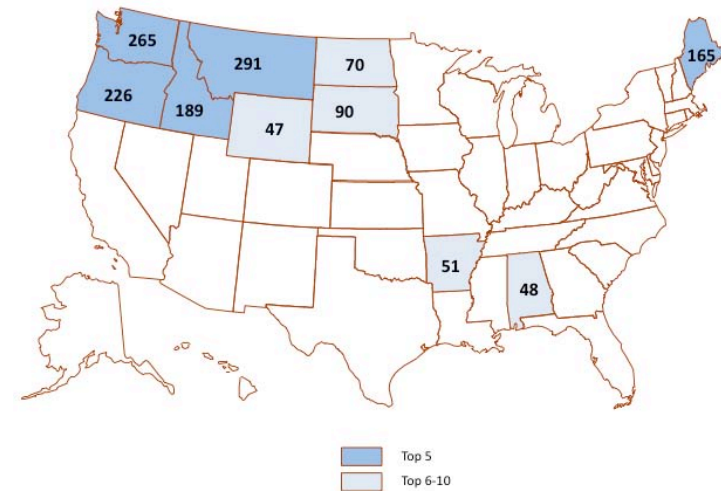
Source: State of the States 2009

Renewable Energy Generation per Capita (MWh/Capita)



Source: State of the States 2009

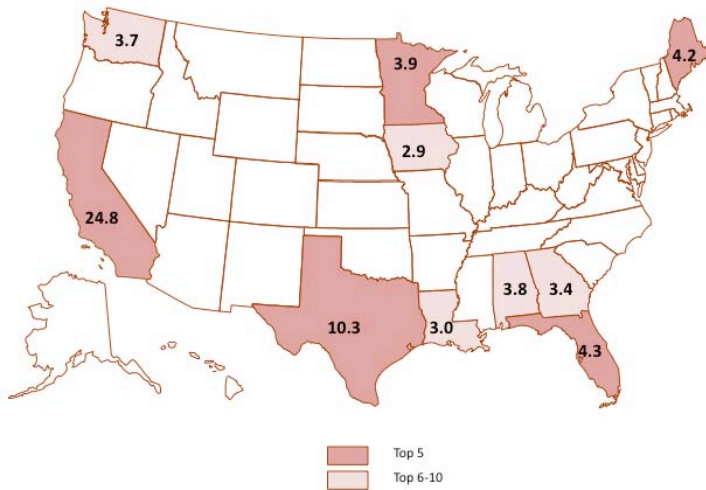
Renewable Energy Generation per Gross State Product (MWh/GSP2007)



Source: State of the States 2009

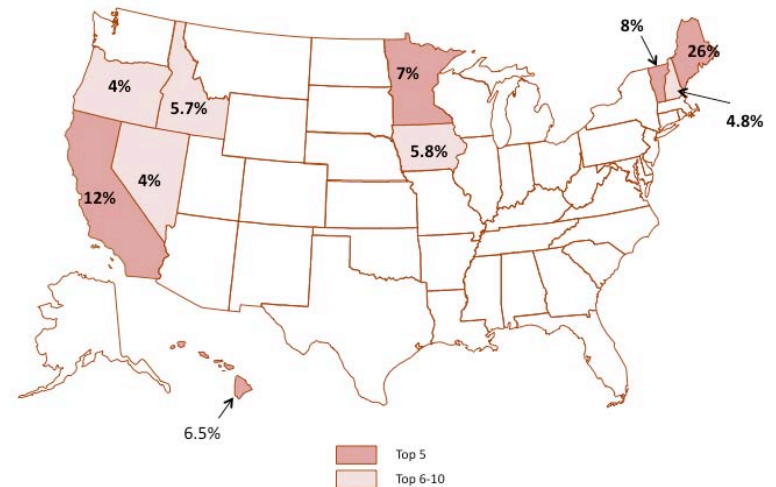
Non-hydro Renewable Generation Leaders (2007)

Non-Hydro Renewable Electricity Generation (TWh)



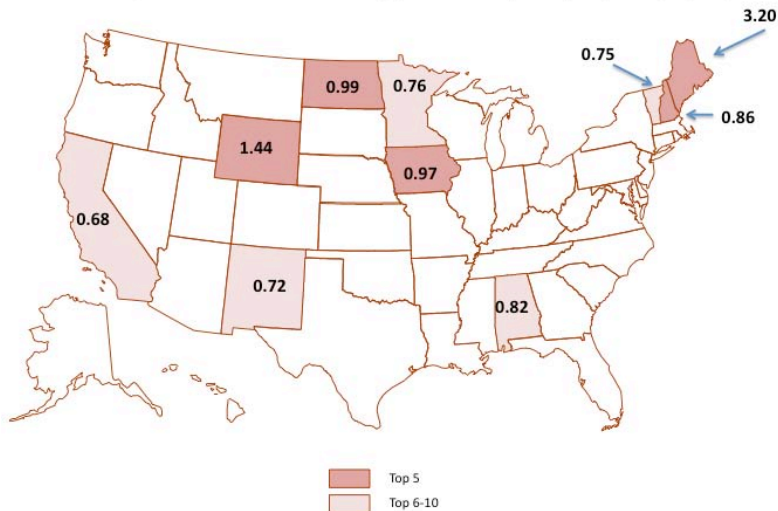
Source: State of the States 2009

Non-Hydroelectric Renewable Energy as a % of Total State Generation



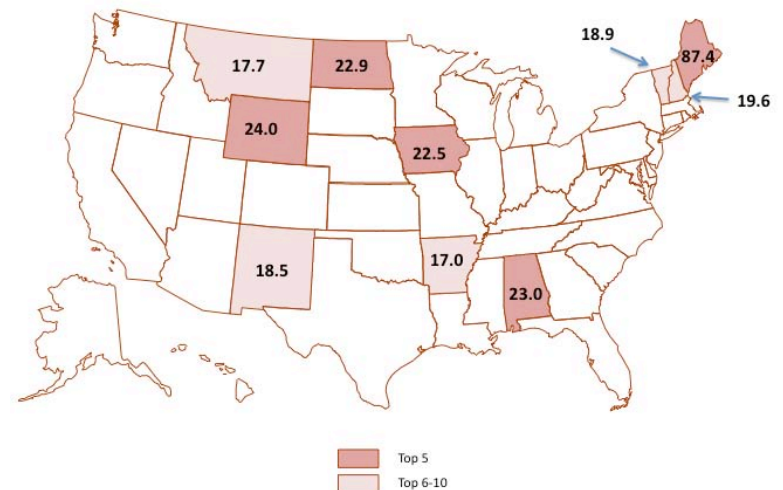
Source: State of the States 2009

Non-Hydroelectric Renewable Energy Generation per Capita (MWh/Capita)



Source: State of the States 2009

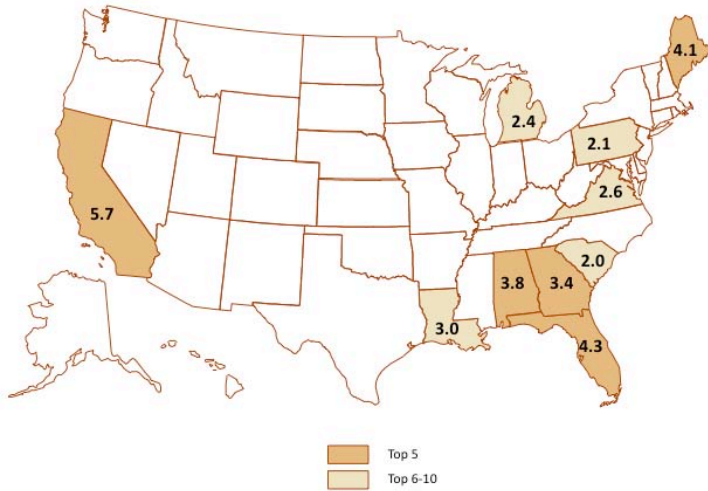
Non-Hydroelectric Renewable Energy Generation per GSP (MWh/M\$ 2007GSP)



Source: State of the States 2009

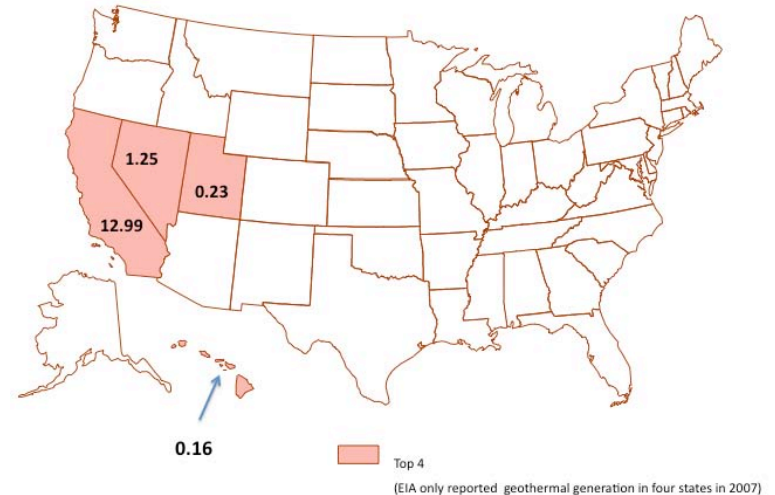
Renewable Energy Leaders by Resource (2007)

Biomass Generation – TWh (2007)



Source: State of the States 2009

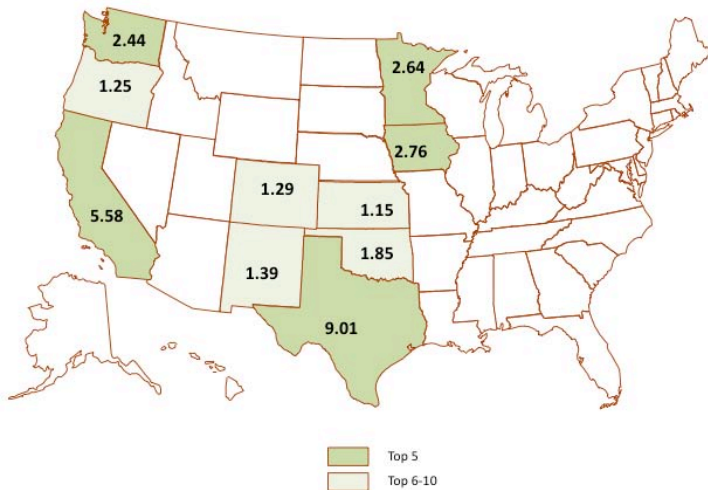
Geothermal Generation – TWh (2007)



Source: State of the States 2009

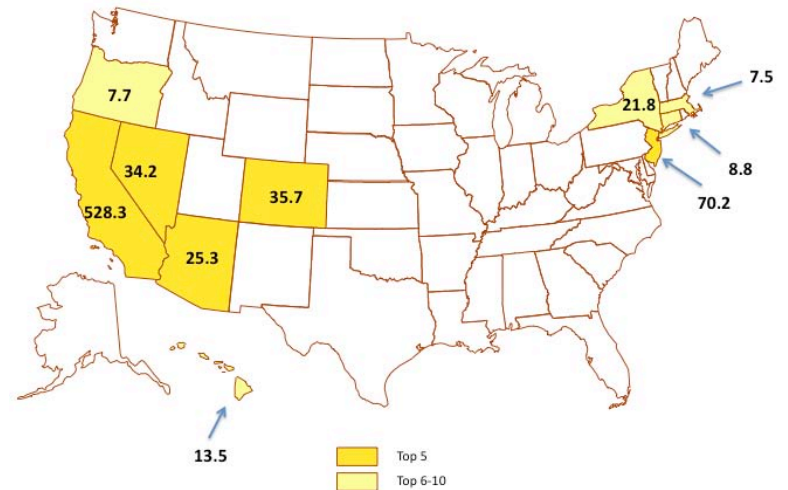
(EIA only reported geothermal generation in four states in 2007)

Wind Generation – TWh (2007)



Source: State of the States 2009

Grid-Connected Solar Capacity – MWdc (2008)



Source: State of the States 2009

Questions?

Part 2: Renewable Energy Policies

Policy Definitions

What policies are being used to support renewables?

Policy Implementation

Which states have implemented the policies?

Policy Design Best Practices

How can I design an effective policy?

What policies are being used to support renewables?

- Renewable Portfolio Standards
- Tax Incentives
- Public Benefit Funds
- Required Generation Disclosure
- Required Green Power Programs
- Contractor Licensing
- Equipment certification
- Interconnection standards
- Line extension analysis
- Rebates

Which states have implemented the policies?

States

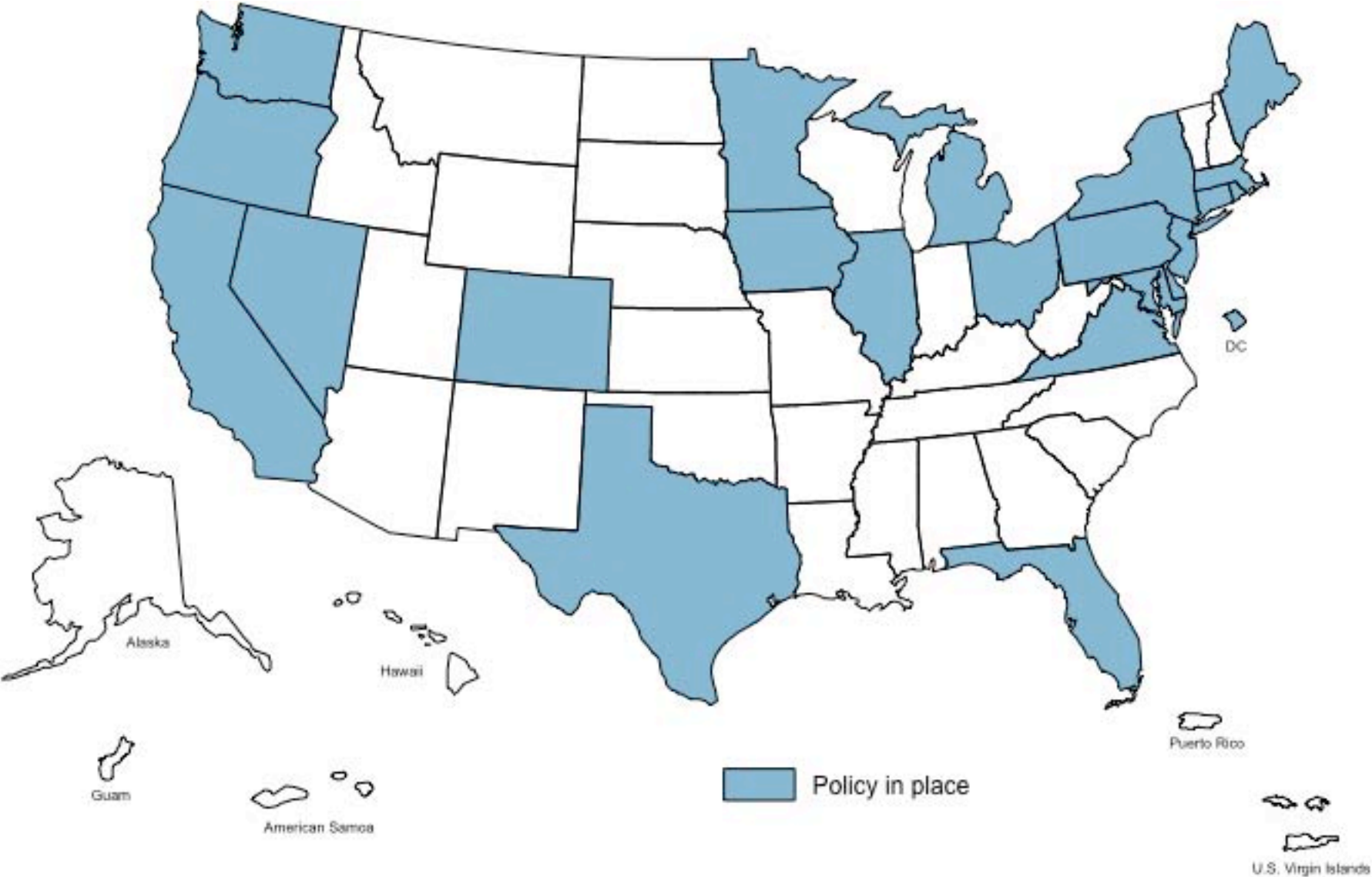


Summary of State Renewable Energy Development Policies																						
State	Bonds	Contractor Licensing	Corporate Tax Incentives	Equipment Certification	Generation Disclosure	Grants	Green Power Purchasing	Industry Support	Interconnection Standards	Line Extension Analysis	Loans	Net-Metering	Public Benefit Funds	Personal Tax Incentives	Property Tax Incentives	RE Access Laws	RE Production Incentives	Rebates	Required Green Power	RPS	Sales Tax Incentives	
AL						*					*			*								
AK						*					*			NA		*						NA
Am. Sam.												*										
AZ		*	*	*					*	*		*		*	*	*					*	*
AR									*	*		*										
CA		*			*	*			*	*	*	*	*		*	*	*	*	*	*	*	*
CO					*			*	*	*	*	*			*	*			*	*	*	*
CT		*			*	*	*	*	*	*	*	*	*		*	*		*	*	*	*	*
D.C.					*				*	*	*	*	*					*	*	*	*	*
DE					*	*			*	*	*	*	*					*	*	*	*	NA
FL		*	*	*	*	*			*	*	*	*		NA	*	*		*	*	*	*	*
GA			*						*	*	*	*	*	*	*	*		*	*	*	*	*
GU												*	*	*	*	*				*	*	*
HI		*	*					*	*	*	*	*	*	*	*	*		*	*	*	*	*
ID	*												*	*	*	*				*	*	*
IL					*	*	*		*	*	*	*	*	*	*	*		*	*	*	*	*
IN						*	*		*	*	*	*	*	*	*	*		*	*	*	*	*
IA			*		*	*			*	*	*	*	*	*	*	*		*	*	*	*	*
KS											*	*	*	*	*	*		*	*	*	*	*
KY			*						*	*	*	*	*	*	*	*		*	*	*	*	*
LA			*						*	*	*	*	*	*	*	*		*	*	*	*	*
ME					*	*	*		*	*	*	*	*	*	*	*		*	*	*	*	*
MD			*		*	*	*		*	*	*	*	*	*	*	*		*	*	*	*	*
MA			*		*	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*	*
MI		*			*	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*	*
MN				*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
MS											*	*	*	*	*	*		*	*	*	*	*
MO			*						*	*	*	*	*	*	*	*		*	*	*	*	*
MT			*					*	*	*	*	*	*	*	*	*		*	*	*	*	NA
NE									*	*	*	*	*	*	*	*		*	*	*	*	*



Policies

States with Required Generation Disclosure



Questions?

Part 3: Quantitative Policy Evaluation

Is there a quantifiable relationship between policy implementation and renewable energy development?

Explores the effects of....

- Individual policies
- Policy portfolios
- Policy age
- Policy best practice design features
- Contextual factors

...on renewables development.

Quantitative Policy Evaluation: Methodology

Two-tailed t-tests *or* Correlation analyses

Independent variables: State policies (2005)

- » RPS
- » Tax Incentives
- » Net metering
- » Generation Disclosure
- » Interconnection Standards
- » Etc.

Dependent variables: Generation metrics (2007)

- » Total RE generation
- » RE as % of total generation
- » RE as % of GSP
- » RE per capita
- » Individual technologies
- » Etc.

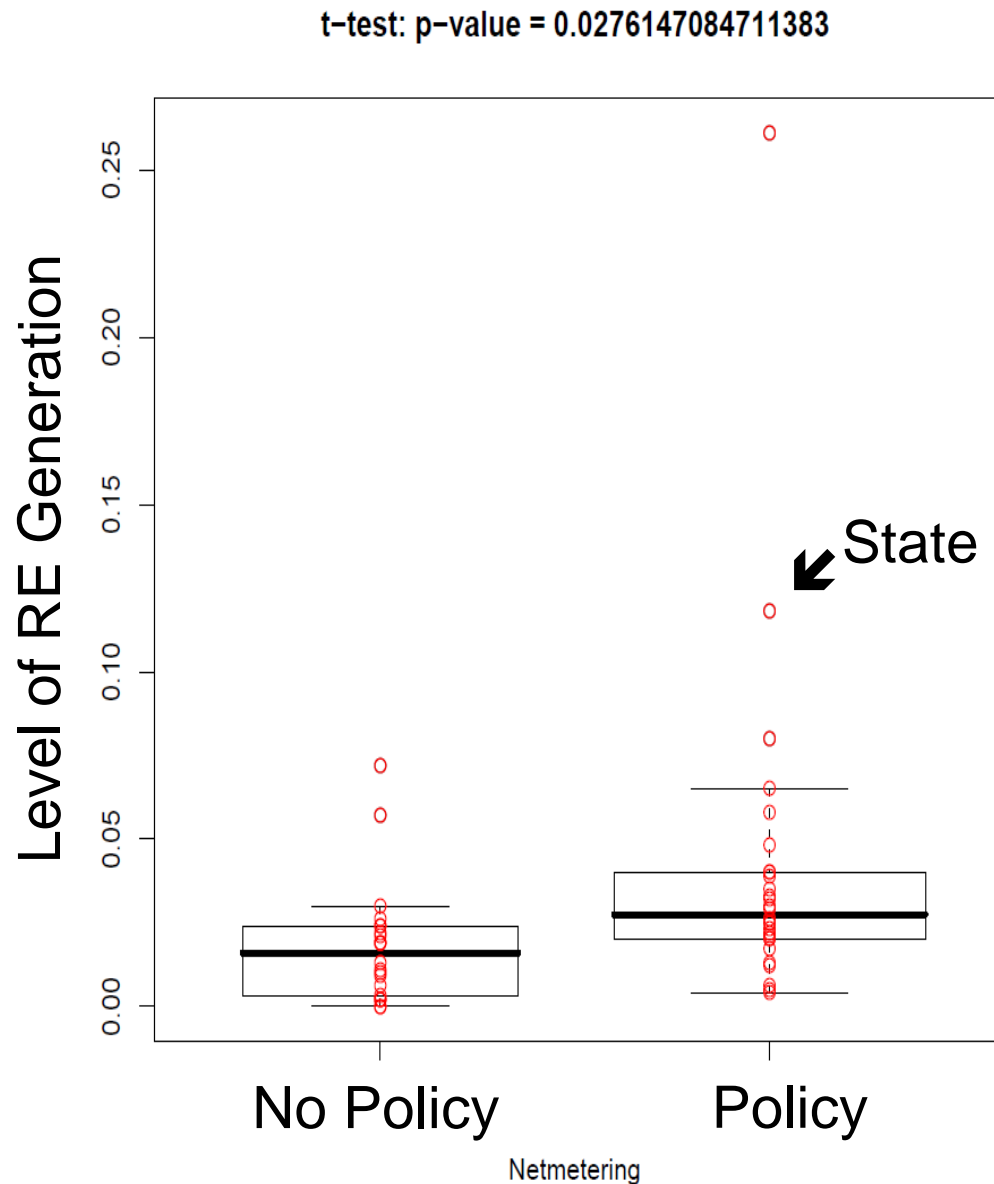
Quantitative Policy Evaluation: Methodology

Step 1:

Identify significant relationships through t-tests/correlations.

Step 2:

For each significant relationship the data is visualized.



Quantitative Policy Evaluation: Results

States with Net Metering Policy in 2005 had significantly more renewable energy generation in 2007 than those without the policy.

Quantitative Policy Evaluation: Results

States with Net Metering Policy in 2005 had significantly more renewable energy generation in 2007 than those without the policy.

2007 Generation Metric	States without Net metering Policy in 2005 (Mean Value)	States with Net metering Policy in 2005 (Mean Value)
Non-hydro renewable generation as a % of total state generation**	1.80%	4.10%
Non-hydro renewable generation per capita**	0.26 MWh/person	0.59 MWh/person
Non-hydro renewable generation per GSP**	6.7 MWh/M\$GSP	13.6 MWh/M\$GSP

**t-test significant to the 0.05 level

Policy Evaluation: Results

States that have implemented
both
Generation Disclosure and
Required Green Power Program policies
have significantly more
renewable energy generation.

Policy Evaluation: Results

*There is a correlation between the age of an **RPS** policy and increased **wind capacity**.*

Policy Evaluation: Results

*Some **RPS best practice features** are related to increased generation.*

(However no successful model for combining features was identified.)

Quantitative Policy Evaluation: Results

Caveat:

We can not assume causality!

We can say:

It is unlikely that these relationships
are due to chance.

Quantitative Policy Evaluation: Results

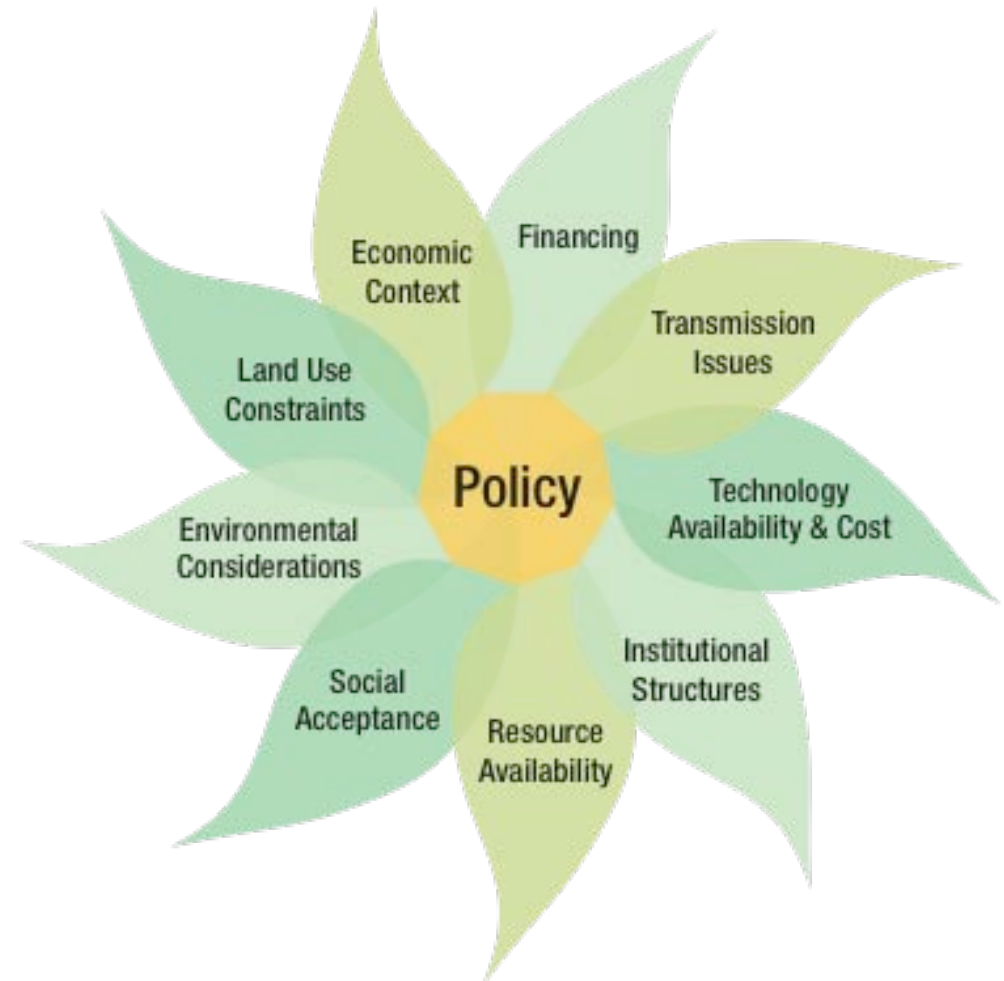
Removing the highest and lowest performing states reduces the number of relationships seen.

*Thus,
contextual factors other than policy may be
stronger indicators of development.*

Part 4: Contextual Factors

What other factors affect development?

Factors Affecting Renewable Energy Markets



Take Home Message 1

Consider Policy Portfolios

Which policies will support each other to create a whole that is greater than the sum of the parts?

Example:

Required Generation Disclosure + Green Power Programs
= Renewable Energy

Take Home Message 2

Consider contextual factors when choosing policy

One size does not fit all.

What are the specific characteristics of your region?

How can you use them to your benefit?

What special challenges do you face?

Which policies address those characteristics best?

Questions?

Next Steps

- Look for multi-year results
- Investigate effects of different time-lags
- Include contextual factors into analyses
- Strengthen statistical methods
- Conduct in-depth investigation of individual results
- Correlate results with qualitative analyses

For More Information

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State Policy

State of the States 2009: Renewable Energy Development and the Role of Policy

The State of the States project is a series of annual policy analyses that summarizes renewable energy generation and policy implementation at the U.S. state and territory level. This analysis investigates the role of policy in renewable energy development and also considers other contextual factors.

This Web site provides a summary of the results of the second version of the report. You can learn more about the efforts that your state is taking to develop renewable energy technologies through the links below, or by accessing the full report: "**State of the States 2009: Renewable Energy Development and the Role of Policy.**" ([PDF 4.2 MB](#)) [Download Adobe Reader](#).

In this section of the site, you will find project information, results, and current activity summaries, including:

- [Purpose and Background](#)
- [Summary of Trends](#)
- [State Policy Implementation](#)
- [State Policy Impact on Renewable Energy Development](#)
- [Other Factors Affecting Renewable Energy Development](#)
- [Conclusions](#)

The State of the States project was developed by the U.S. Department of Energy, The National Renewable Energy Laboratory (NREL), and the American Council for an Energy-Efficient Economy (ACEEE). It is funded by the Department of Energy (DOE) Weatherization and Intergovernmental Program (WIP) in the office of Energy Efficiency and Renewable Energy (EERE).

The project is part of the DOE-funded State Clean Energy Policies Analysis (SCEPA) project. More information can be found on the [SCEPA Web site](#). The project teams appreciate input and participation by stakeholders.

State of the States: Renewable Energy Development and the Role of Policy

The [State of the States](#) 2009 analysis project summarizes clean energy use and examines the role of policy in clean energy development in the U.S. states and territories. For more information on the project, overall results, and current activity summaries, visit the [State of the States](#).

Acknowledgements

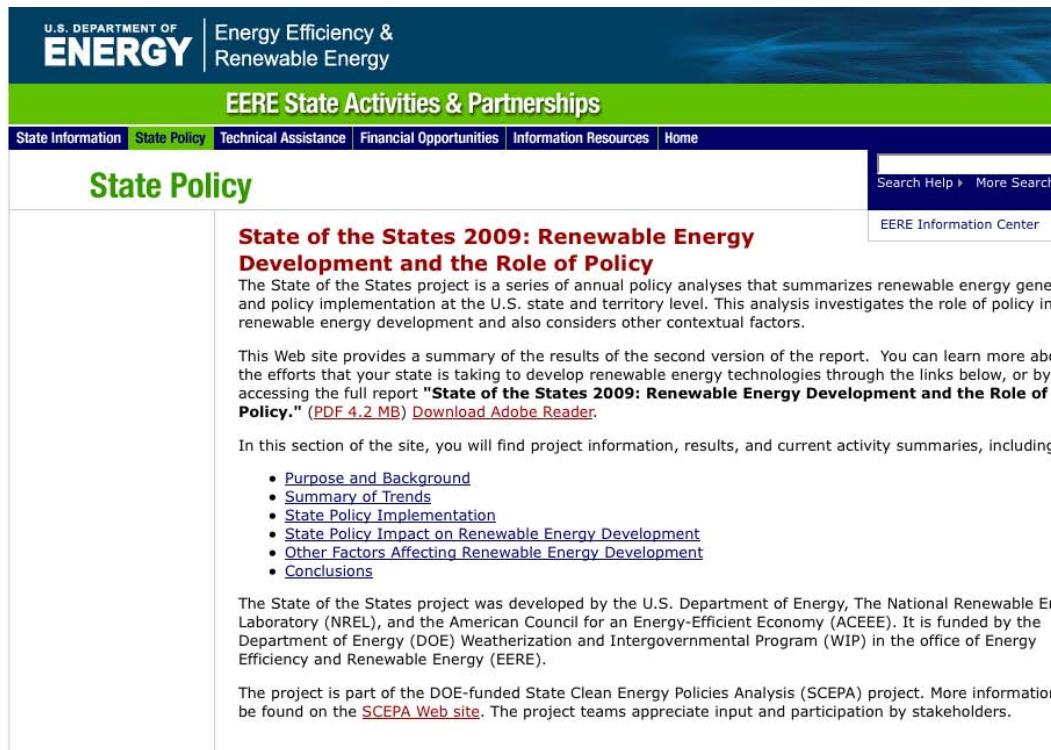
This work is funded by the U.S. Department of Energy's Weatherization and Intergovernmental Program (WIP) in the Office of Energy Efficiency and Renewable Energy (EERE)

NREL's State of the States '09 Team:

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Joyce McLaren
Steven Hockett
Victoria Healey**

Questions?

<http://eere.energy.gov/states>



The screenshot shows the EERE State Policy page. At the top, there is a header for the U.S. Department of Energy, Energy Efficiency & Renewable Energy. Below that is a green banner for "EERE State Activities & Partnerships". A navigation bar includes links for State Information, State Policy (which is highlighted), Technical Assistance, Financial Opportunities, Information Resources, and Home. The main content area is titled "State Policy" and features a search bar and a link to the "EERE Information Center". The primary article is titled "State of the States 2009: Renewable Energy Development and the Role of Policy". The text describes the project as a series of annual policy analyses summarizing renewable energy generation and policy implementation at the state and territory level. It provides a summary of the second version of the report and offers links to the full report (PDF 4.2 MB) and Adobe Reader. A list of links is provided for further exploration: Purpose and Background, Summary of Trends, State Policy Implementation, State Policy Impact on Renewable Energy Development, Other Factors Affecting Renewable Energy Development, and Conclusions. The page also includes information about the project's development by the U.S. Department of Energy, NREL, and ACEEE, and its funding by the DOE Weatherization and Intergovernmental Program (WIP). Finally, it mentions the project's participation in the DOE-funded State Clean Energy Policies Analysis (SCEPA) project.

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