Renewables Portfolio Standards in the United States:

A Status Report with Data Through 2007

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- Report Summary -

April 2008

Presentation Outline

- Introduction to *inaugural* report on the status of RPS policies in the U.S.
- Overview of state RPS policies: where they have been developed, when, and with what design features
- Early impacts on renewable energy project development, and possible future impacts
- Implications of solar-specific RPS designs
- Annual compliance information, use of alternative compliance payments, and enforcement actions
- Status of renewable energy certificate markets
- Impact of RPS policies on retail electric rates, and use of cost containment mechanisms
- States' policies to proactively combat transmission barriers to achieving RPS targets
- Overview of Federal RPS developments

Renewables Portfolio Standards in the US: A Status Report with Data Through 2007

Report Purpose:

- Provides an overview of the design, early experience, and impacts of renewables portfolio standards (RPS) in the United States
- Emphasizes factual information on state-level mandatory RPS policies, with little focus on “lessons learned”; briefly discusses Federal RPS developments, and state-level non-binding renewable energy goals

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What Is a Renewables Portfolio Standard?

Renewables Portfolio Standard (RPS):

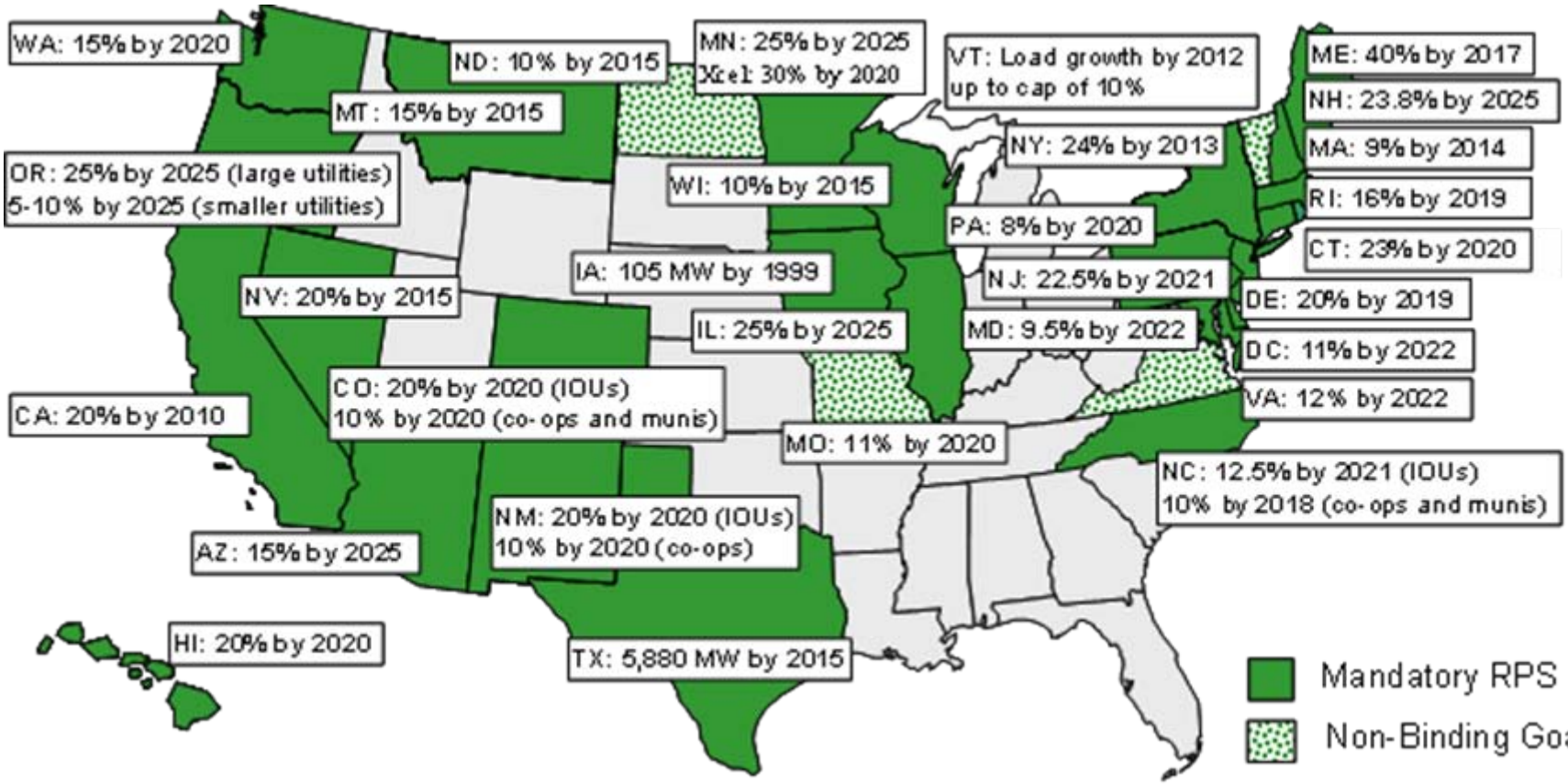
- A requirement on retail electric suppliers…
- to supply a minimum percentage or amount of their retail load…
- with eligible sources of renewable energy.

Typically backed with penalties of some form

Often accompanied by a tradable renewable energy certificate (REC) program, to facilitate compliance

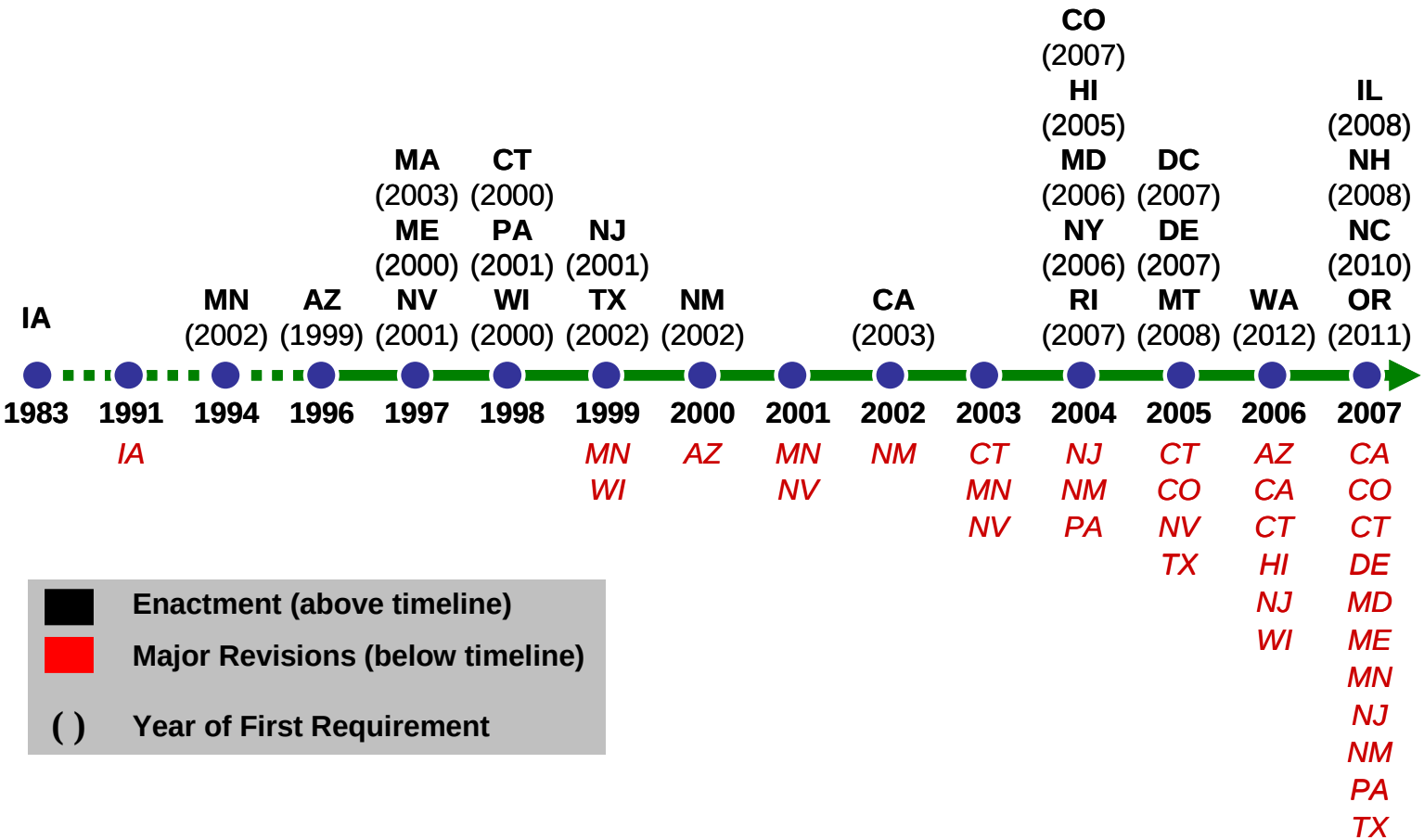
Never designed the same in any two states

State RPS Policies Exist in 25 States and D.C.; Four States Have Non-Binding Goals



Most policies established through state legislation, but some through regulatory action (NY, AZ) or voter-approved initiatives (CO, WA)

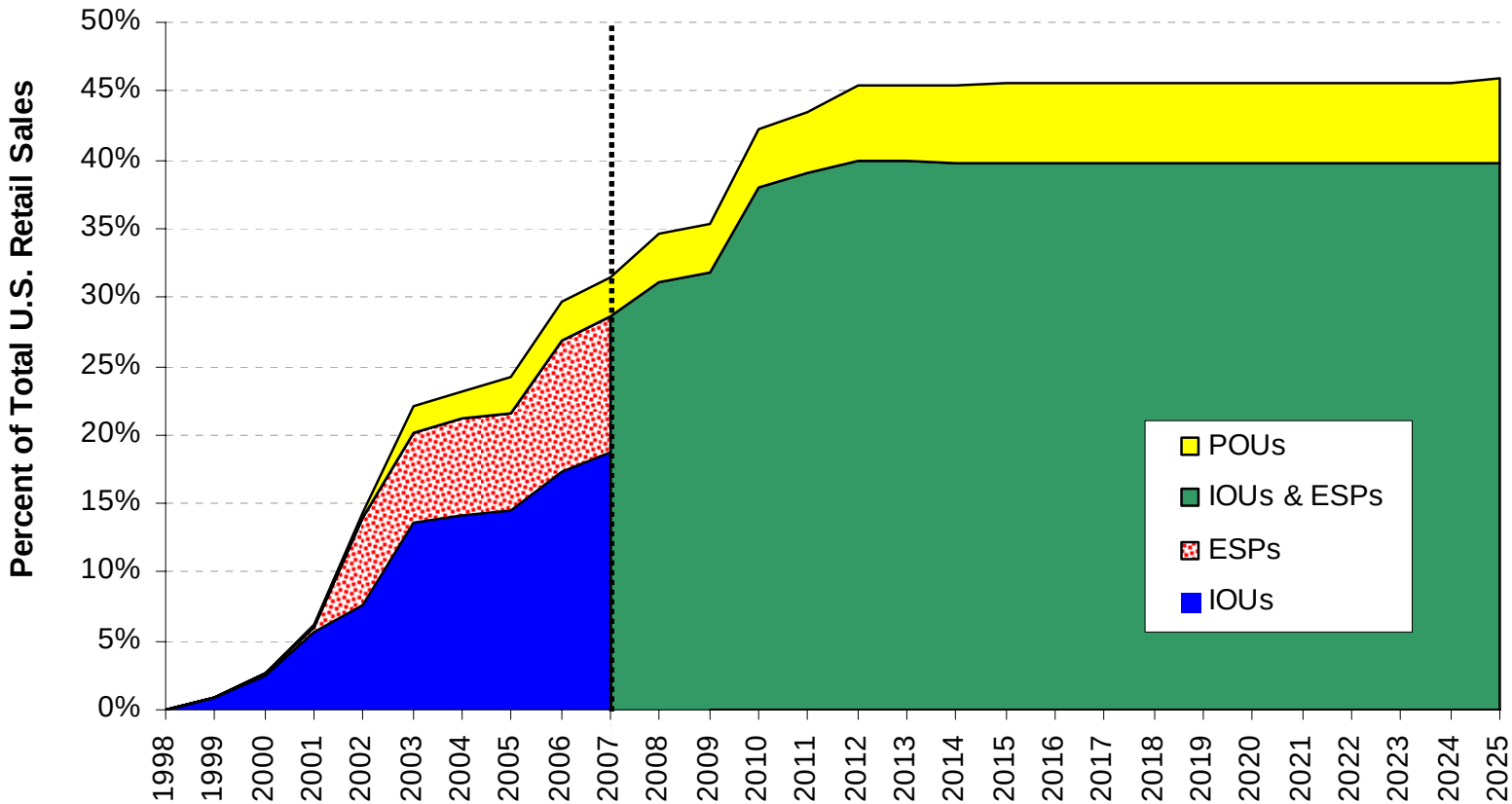
Four New RPS Policies Established in '07; 11 States Revised Existing RPS Programs



- Popularity of mandatory RPS policies has grown in recent years
- Half of the RPS policies have been created since the beginning of 2004

Existing RPS' Applied to 31% of US Load in 2007 (Will Apply to 46% Once Fully Implemented)

U.S. Electrical Load with Active State RPS Obligations
(Historic and Projected)



The Design of State RPS Policies Continues to Differ Widely

- Renewable purchase targets/timeframes
- Eligibility of different renewable technologies
- Whether existing renewable projects qualify
- Whether technology set-asides or vintage tiers are used
- Use of credit multipliers for favored technologies
- Entities obligated to meet RPS, and use of exemptions
- Treatment of out-of-state generators
- Methods to enforce non-compliance
- Existence and design of cost caps
- Allowance for RECs, and REC definitions
- Compliance flexibility rules
- Waivers from compliance requirements
- Contracting requirements
- Role of state funding mechanisms

State	First Compliance Year	Current Ultimate Target	Existing Plants Eligible[1]	Set-Asides, Tiers, or Minimums	Credit Multipliers
Mandatory RPS Obligations					
Arizona	2001	15% (2025)	No	Distributed Generation	None[2]
California	2003	20% (2010)	Yes	None	None
Colorado	2007	20% (2020): IOUs 10% (2020): POUs	Yes	Solar	In-State, Solar, Community-Ownership
Connecticut	2000	23% (2020)	Yes	Class I/II Technologies	None
Delaware	2007	20% (2019)	Yes	Solar, New/Existing	Solar, Fuel Cells, Wind
Hawaii	2005	20% (2020)	Yes	Energy Efficiency	None
Illinois	2008	25% (2025)	Yes	Wind	None
Iowa	1999	105 MW (1999)	Yes	None	None
Maine	2000	40% (2017)	Yes	New/Existing	None
Maryland	2006	9.5% (2022)	Yes	Solar, Class I/II Technologies	Wind, Methane
Massachusetts	2003	9% (2014)	No	None	None
Minnesota	2002	25% (2025) 30% (2020): Xcel	Yes	Wind for Xcel; Goal for Community-Based Renewables	None
Montana	2008	15% (2015)	No	Community Wind	None
Nevada	2003	20% (2015)	Yes	Solar, Energy Efficiency	PV, DG, Eff., Waste Tire
New Hampshire	2008	23.8% (2025)	Yes	Solar, New, Existing Biomass/ Methane, Existing Hydro	None
New Jersey	2001	22.5% (2021)	Yes	Solar, Class I/II Technologies	None
New Mexico	2006	20% (2020): IOUs 10% (2020): Co-ops	Yes	Solar, Wind, Geothermal or Biomass, Distributed Generation	None[2]
New York	2006	24% (2013)	Yes	Distributed Generation	None
North Carolina	2010	12.5% (2021): IOUs 10% (2018): POUs	Yes	Solar, Swine Waste, Poultry Waste, Energy Efficiency	None
Oregon	2011	25% (2025): Large 5-10% (2025): Small	No[3]	Goal for Community-Based and Small-Scale Renewables	None
Pennsylvania	2001	8% (2020)	Yes	Solar	None
Rhode Island	2007	16% (2019)	Yes	New/Existing	None
Texas	2002	5,880 MW (2015)	Yes	Goal for Non-Wind	All Non-Wind
Washington	2012	15% (2020)	No	None	Distributed Generation
Washington, DC	2007	11% (2022)	Yes	Solar, Class I/II Technologies	Wind, Solar, Methane
Wisconsin	2000	10% (2015)[4]	Yes	None	None
Non-Binding Renewable Energy Goals[6]					
Missouri	2012	11% (2020)	Yes	None	PSC Authorized To Do So
North Dakota	2015	10% (2015)	Yes	None	None
Vermont	2006	Up To 10% (2012)[5]	No	None	None
Virginia	2010	12% (2022)	Yes	None	Wind, Solar

Two Key Structural Design Differences Stand Out

Tiered Targets

– Different targets for different resource types or vintages

Compliance Models

– In states with retail electric competition, suppliers are typically given broad latitude to comply with requirements as they see fit

– In states with still-regulated utility monopolies, electricity regulators oversee utility procurement and contracting

– In New York and Illinois a state agency/instrumentality has direct responsibility to conduct procurements

RPS Policies Frequently Offer Exemptions for Certain LSEs and/or Customers

- Publicly owned utilities (POUs) are often exempted, or given more lenient requirements than other load-serving entities (LSEs)
- Various customer exemptions have also been offered in a number of states
- Result is that percentage of load eventually covered by state RPS policies varies from 56% to 100%, depending on the state
- These exemptions are accounted for in the previous figure

State	% of State Sales Covered	Treatment of POUs		Other LSE Exemptions	Customer Exemptions
		Munis	Coops		
AZ	59%	○	●	Political subdivisions; utilities with >50% of out-of-state customers	None
CA	98%	◉	◉	POUs obligated to develop own RPS	None
CO	94%	●	●	Munis with < 40,000 customers	None
CT	100%	◉	na	Munis obligated to develop own RPS	None
DE	75%	○	○	POUs have requested/received exemptions	Industrial customers > 1.5 MW load
HI	100%	na	●	None	None
IA	75%	○	○	Applies only to MidAmerican and IPL	None
IL	56%	○	○	IOUs with < 100,000 customers; all competitive ESPs	IOU retail supply customers not with fixed-price service
MA	86%	○	na	None	None
MD	98%	●	●	Coops served by existing purchase agreement	Industrial process load > 300 GWh/yr; resid. load in area subject to rate freeze
ME	93%	○	○	None	Sales to certain businesses, until 2010
MN	100%	●	●	None	None
MT	63%	◉	◉	Coops and existing munis with >5,000 customers must develop own RPS; other coops exempt; ESPs and new munis that serve large customers exempt	None
NC	100%	●	●	None	None
NH	100%	●	●	None	None
NJ	97%	○	○	None	None
NM	88%	○	●	None	None
NV	88%	○	○	None	None
NY	73%	○	○	LIPA, NYPA, munis encouraged to establish RPS	None
OR	100%	●	●	Multiple clauses offer possible exemptions to certain suppliers (esp. POUs) in certain years	None
PA	97%	○	○	None	Load in area subject to rate freeze
RI	99%	○	na	None	None
TX	75%	○	○	Utilities under a rate freeze	Certain large customers upon petition
WA	83%	●	●	All utilities with < 25,000 customers	None
D.C.	100%	na	na	None	None
WI	100%	●	●	None	None

Notes: The percent of state sales figures represent the fraction of statewide load ultimately obligated by existing RPS policies. The percentage totals include POUs required to meet an RPS of their own design and LSEs temporarily (but not permanently) exempted from the RPS. In addition to the specific exemptions listed here, Federal power marketing agencies and state-owned electric utilities are assumed to be exempt in all cases.

● Must generally meet RPS (in some cases, specific percentage targets are lower, or specific exemptions apply)
◉ Munis or coops must meet an RPS of their own design
○ Fully exempt from obligatory RPS
na No entities of that type exist in the state

Geographic Eligibility and Electricity Delivery Rules Vary Considerably

Rules for geographic eligibility and electricity delivery vary by state

Variation reflects differing:

- state interests in supporting in-state or in-region renewables development
- interpretations of the requirements imposed by the Interstate Commerce Clause
- wholesale market structure and geography

Geographic Eligibility and Delivery Requirements	States	Notes
In-state generation requirement	HI, IA	IA: also allows location in broader utility service area
In-region generation requirement	MN, OR, PA	MN: RECs originating within M-RETS; OR: WECC for unbundled RECs, U.S. portion of WECC and delivered to LSE for renewable electricity; PA: PJM projects for all LSEs, MISO projects for some LSEs
Electricity delivery required to state or to LSE		
Direct transmission inter-tie between generators and state	NV, TX	NV: allows limited sharing of transmission inter-tie with other generators; TX disallows such sharing
Broader delivery requirements to state or to LSE	AZ, CA, MT, NM, NY, WI	CA: relaxed scheduling allows shaped/firmed products; NY: strict hourly scheduling to state and strong preference for in-state resources in solicitation process; WI: projects must be owned by or under contract to LSE
Electricity delivery required to broader region		
Generators anywhere outside region must deliver electricity to region	DE, ME, NJ, WA	DE: also provides credit multipliers for in-state wind installed before 2013; NJ: resources outside PJM must be "new"; WA: if outside Pacific Northwest, requires delivery to state
Generators in limited areas outside region must deliver electricity to region	CT, DC, MA, MD, NH, RI	All: renewable facilities must be located in control areas adjacent to state's ISO; DC & MD: LSEs may also purchase unbundled RECs (without electricity delivery) from states that are adjacent to PJM
In-state generation encouragement		
In-state multipliers	CO	No restriction on location of RECs creation, but credit multiplier for in-state projects (DE also provides in-state encouragement through multipliers)
Cost-effectiveness test	IL	In-state unless insufficient cost-effective resources, then from adjoining states, then from other regions; after 2011, equal preference to in-state and adjoining states
Limit on RECs from out-of-state generators	NC	Up to 25% compliance can be met with unbundled RECs from outside state (no limit for one LSE, Dominion); remainder must be in-state or delivered to LSE

Trends Among Recently Established or Revised RPS Programs

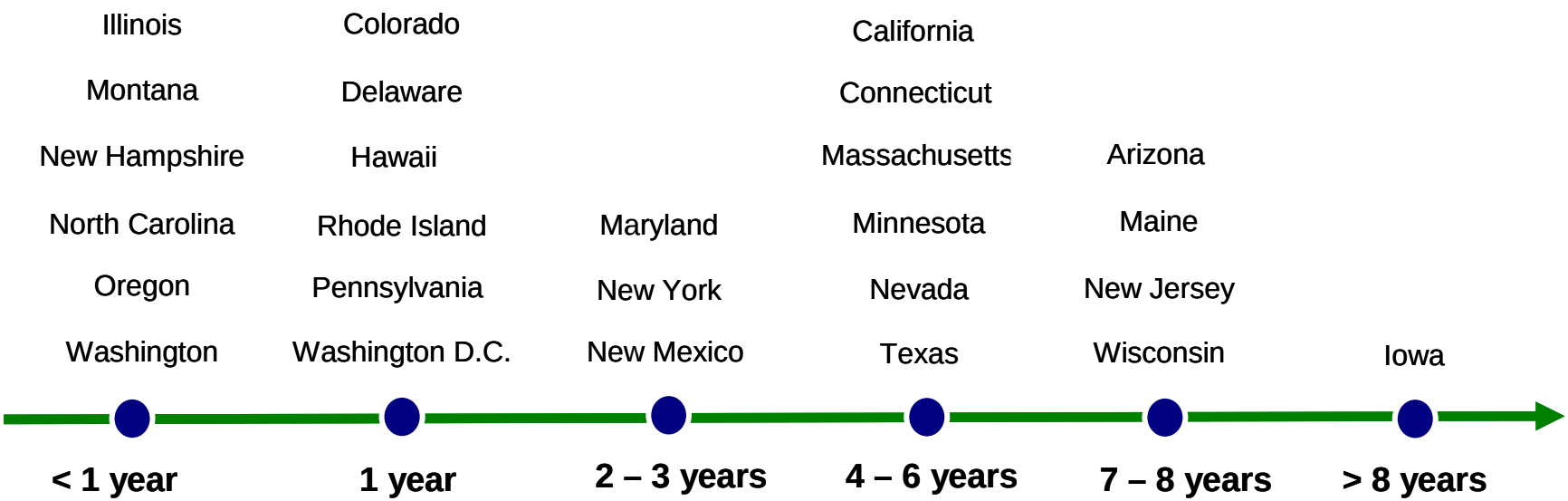
- Increased stringency of RPS targets
- Expanded use of resource-specific set-aides, especially for solar
- Expanded applicability of RPS policies to publicly owned utilities
- Greater leniency often given to publicly owned utilities in RPS targets and obligations

Use of Energy Efficiency in State RPS Programs Remains Limited

- Three states allow energy efficiency to qualify for a portion of the RPS
  - Hawaii (up to 50%)
  - Nevada (up to 25%)
  - North Carolina (up to 25-40% for IOUs; unlimited for POUs)
- Natural-gas fuels cells, fossil CHP, waste heat sometimes eligible
- A number of other states have or are developing separate energy efficiency portfolio standards
  - Colorado, Connecticut, Illinois, Minnesota, New Jersey, New Mexico, Pennsylvania, and Texas

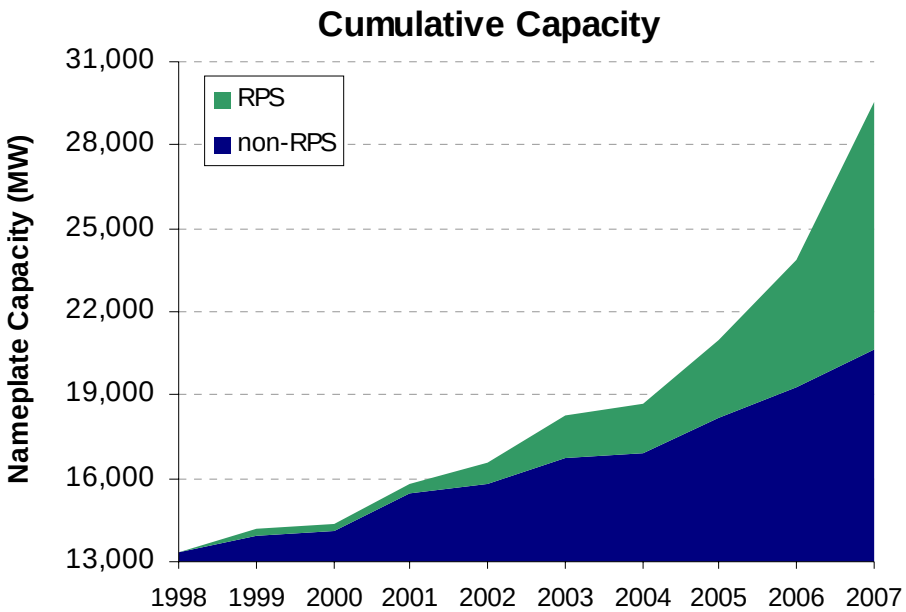
Operational Experience with State RPS Policies Remains Limited

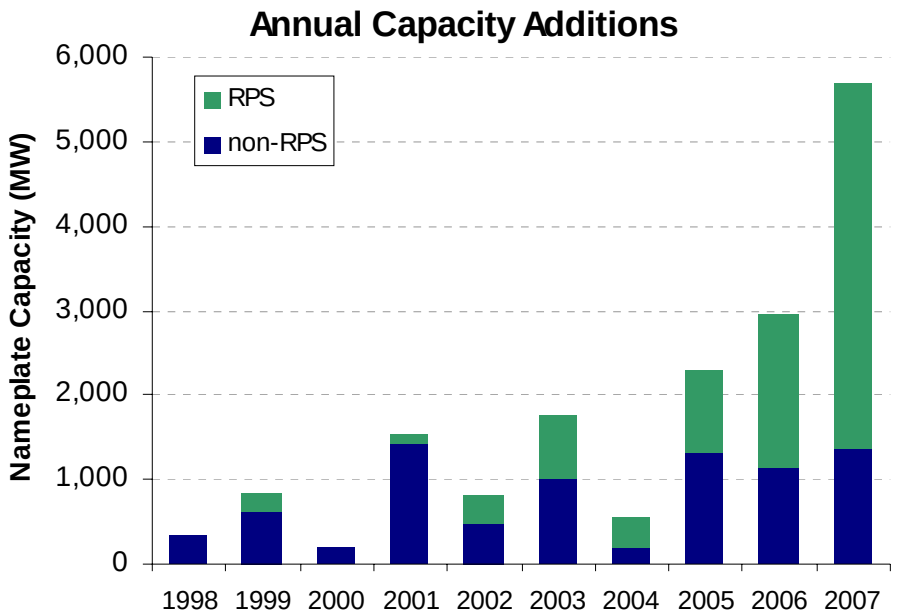
Operational Experience with State RPS Policies
(years since first major compliance period)



State RPS' Are Increasingly Motivating Renewable Energy Development

Cumulative and Annual Non-Hydro Renewable Energy Capacity in RPS and Non-RPS States

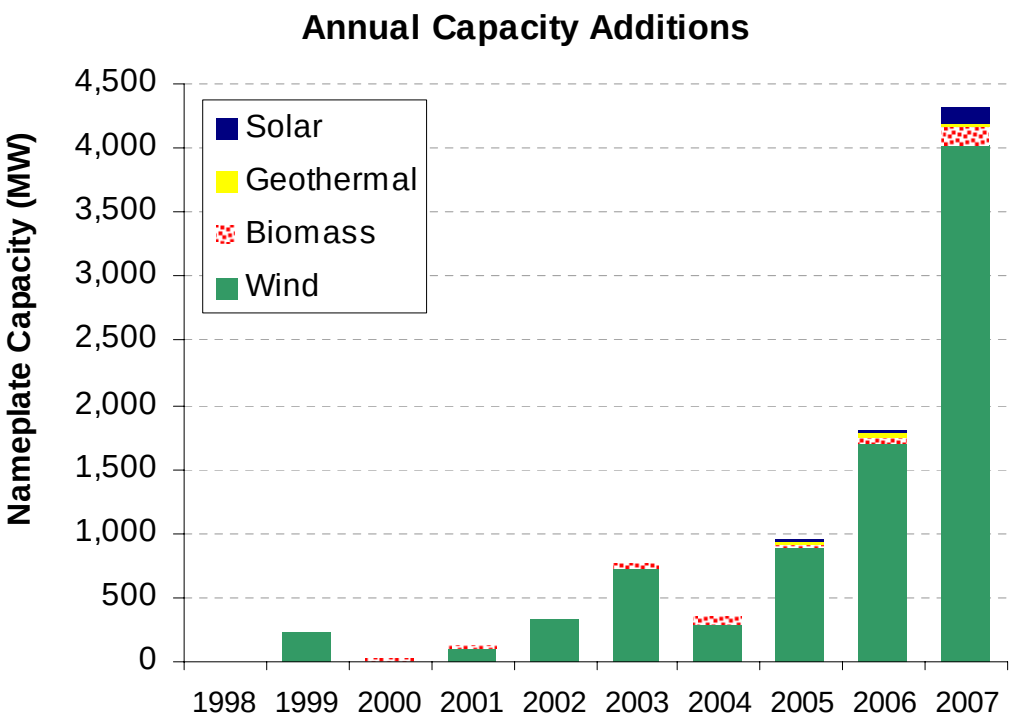


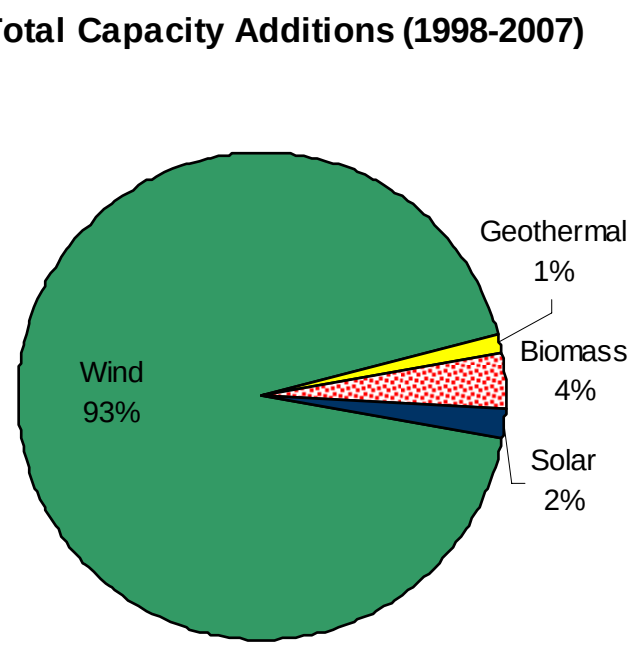


Though not an ideal metric for RPS-impact, over 50% of non-hydro renewable additions (8,900 MW) since the late 1990s have come from RPS states; metric increases to 76% in 2007 alone

State RPS Policies Are Primarily Supporting Wind Power

Non-Hydro Renewable Energy Capacity Additions in RPS States





Other Technologies Will Also Benefit, in Some States

Wind power is facing increased competition in California from solar, geothermal, and biomass

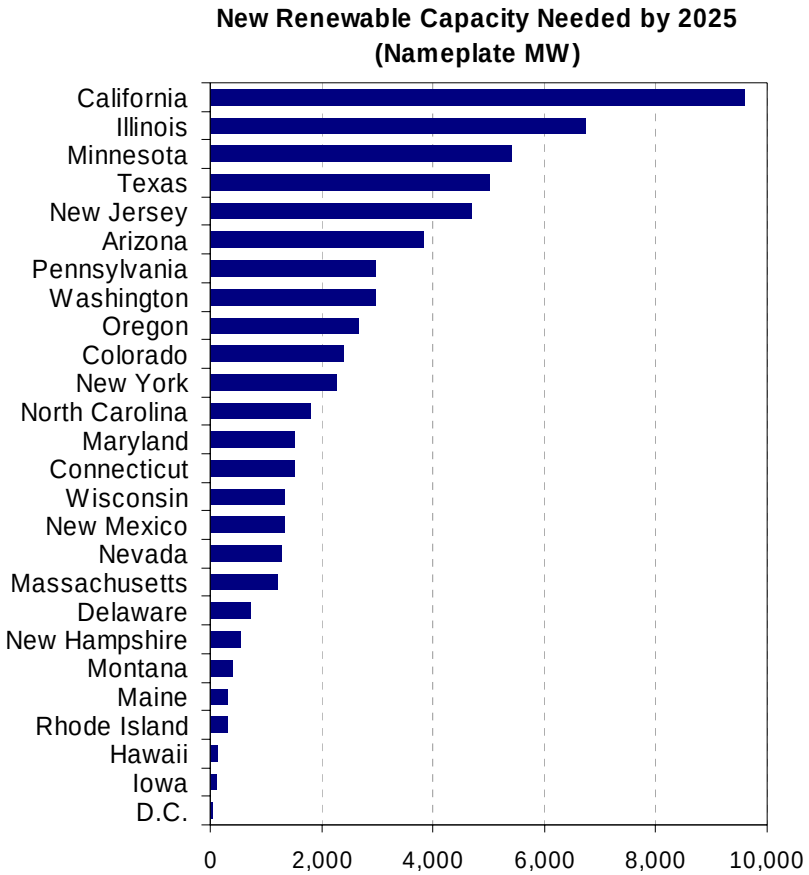
The same is true, to a lesser extent, in other states

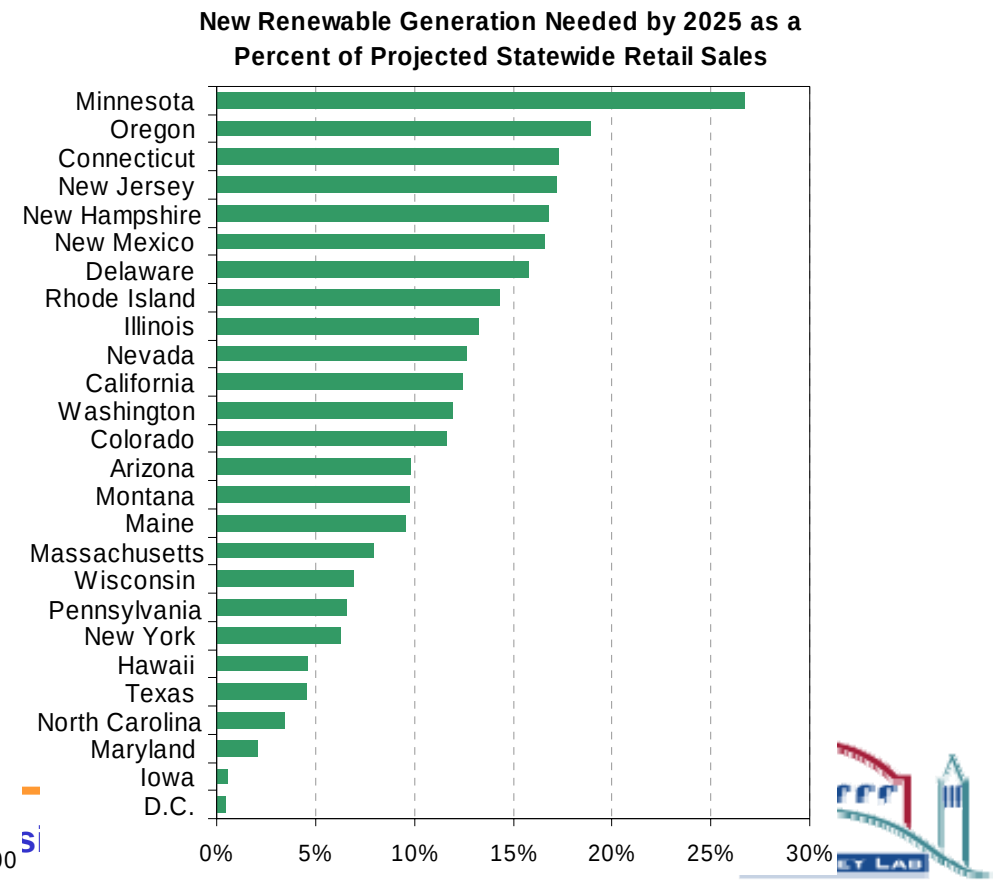
More than 7,000 MW of contracts with new renewable generators signed in California since 2002

Wind	58%
Solar	23%
Geothermal	12%
Biomass/MSW	7%
Small hydro	<1%
Ocean	<1%

Future Impacts of Existing State RPS Policies Are Projected To Be Relatively Sizable

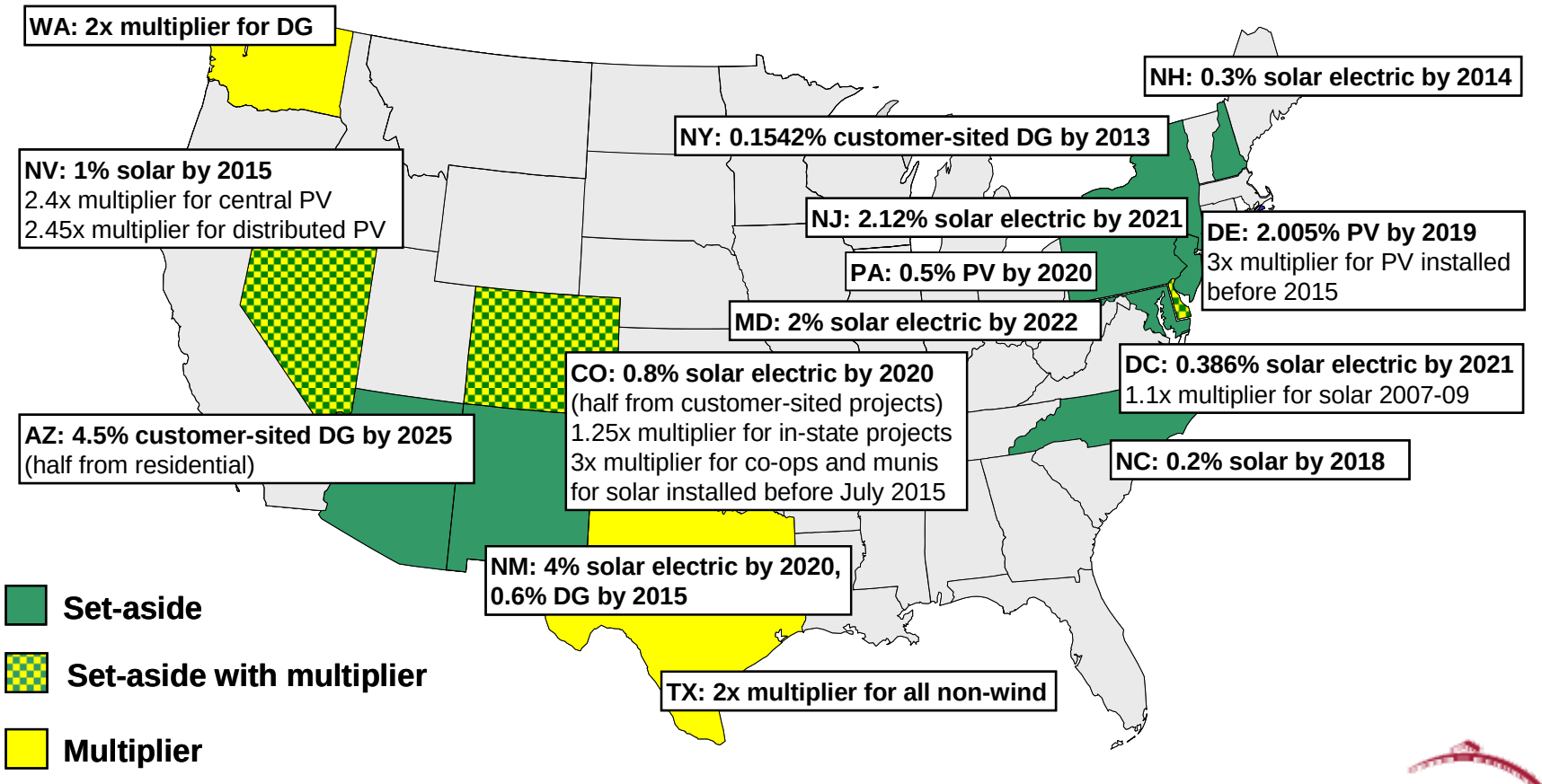
- Roughly 61 GW of new renewables capacity by 2025, if full compliance is achieved (increases to 77 GW including all non-binding renewable targets)
- The 61 GW would represent ~4.7% of total U.S. generation in 2025
- 15% of projected load growth from 2000-2025 met by this new generation



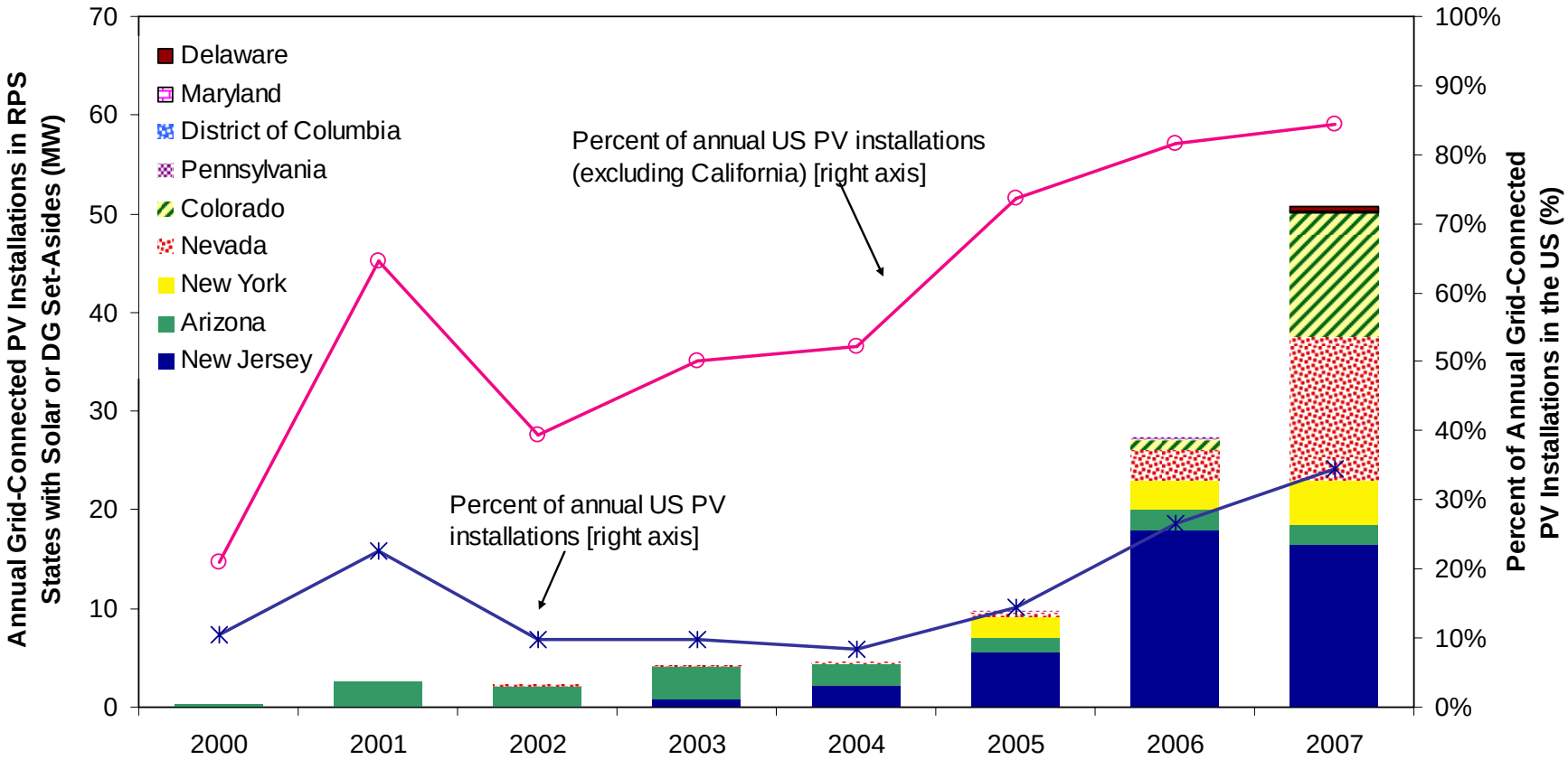


Solar-Specific RPS Designs Are Becoming More Prevalent

11 states and D.C. have solar or DG set-aside (5 of which were created in 2007), sometimes combined with credit multipliers



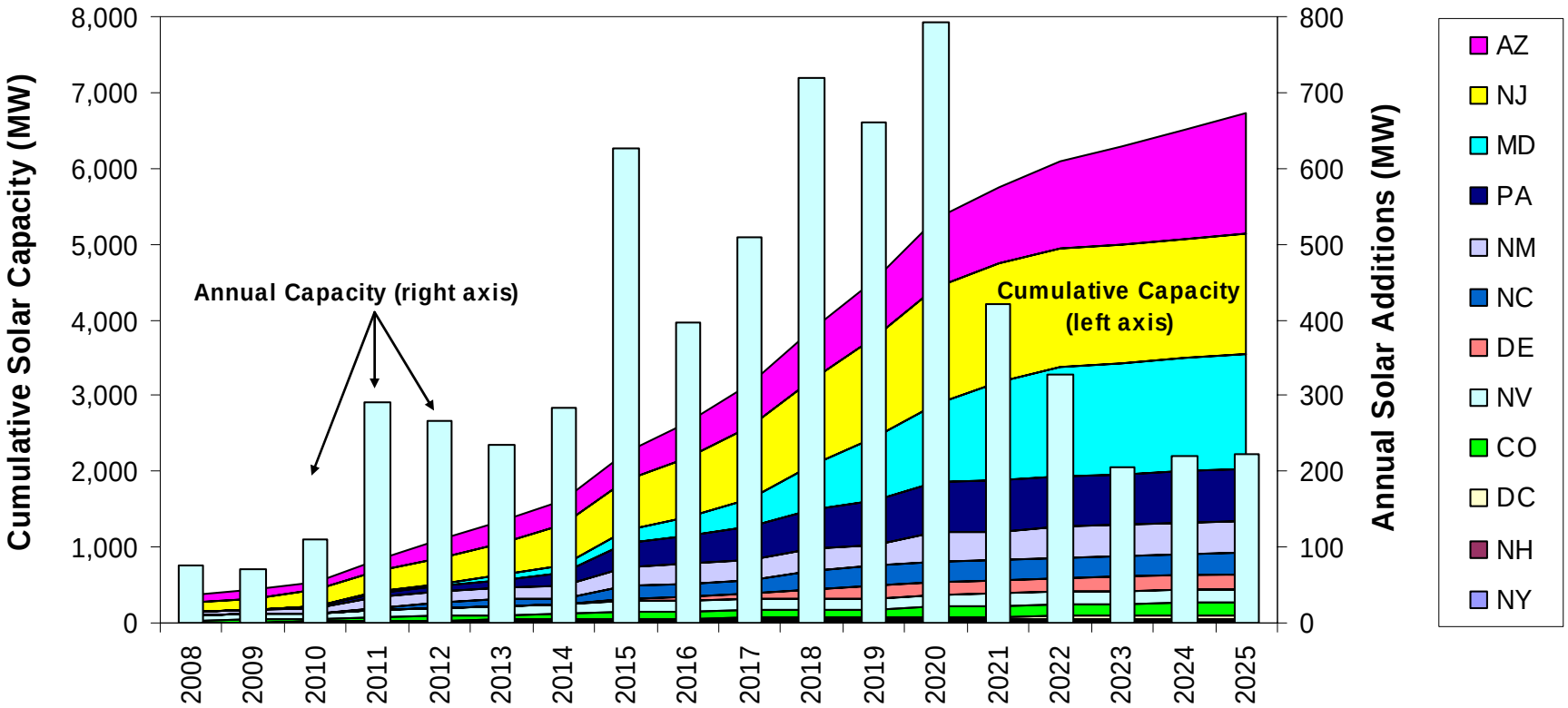
Impact of Solar/DG Set-Asides Is Growing: 102 MW PV, 65 MW CSP from 2000-07



Set-asides also benefiting solar-thermal electric (CSP): 1 MW (Arizona) constructed in 2006, and 64 MW (Nevada) in 2007

Future Impacts of Solar/DG Set-Asides Are Projected To Be Substantial

- 550 MW of solar required by 2010, growing to 6,700 MW by 2025
- Largest markets driven by these policies include: AZ, NJ, MD, PA
- In near-term, NV, NM, and CO are also significant



Graphic assumes that full compliance is achieved

Whether Full Compliance Is Achieved with Solar/DG Set-Asides Will Be Influenced By…

- The attractiveness of federal tax incentives for solar
- State RPS and REC cost caps, which may be binding in some states
- *Force majeure* events that may excuse supplier compliance with solar/DG set-asides
- Whether load-serving entities willingly enter into long-term contracts with solar suppliers

"Compliance" with State RPS' Has Been Strong in General, with Notable Exceptions

State	1999	2000	2001	2002	2003	2004	2005	2006
AZ	-	-	89%	64%	31%	31%	26%	25%
CA	-	-	-	-	-	100%	100%	98%
CT	-	no data	no data	no data	no data	100%	100%	93%
HI	-	-	-	-	-	-	100%	-
IA	100%	100%	100%	100%	100%	100%	100%	100%
MA	-	-	-	-	100%	65%	64%	74%
MD	-	-	-	-	-	-	-	100%
ME	-	100%	100%	100%	100%	100%	100%	100%
MN	-	-	-	61%	72%	72%	81%	no data
NJ	-	-	100%	100%	100%	100%	100%	100%
NM	-	-	-	-	-	-	-	100%
NV	-	-	-	-	31%	30%	95%	39%
NY	-	-	-	-	-	-	-	52%
PA	-	-	no data	no data	-	-	-	100%
TX	-	-	-	99%	96%	99%	99%	100%
WI	-	40%	100%	100%	100%	100%	100%	100%
Weighted Average	**100%**	**98%**	**100%**	**90%**	**86%**	**94%**	**96%**	**94%**

blank cells = no compliance obligation existed in that year
no data = unable to obtain compliance data for that year

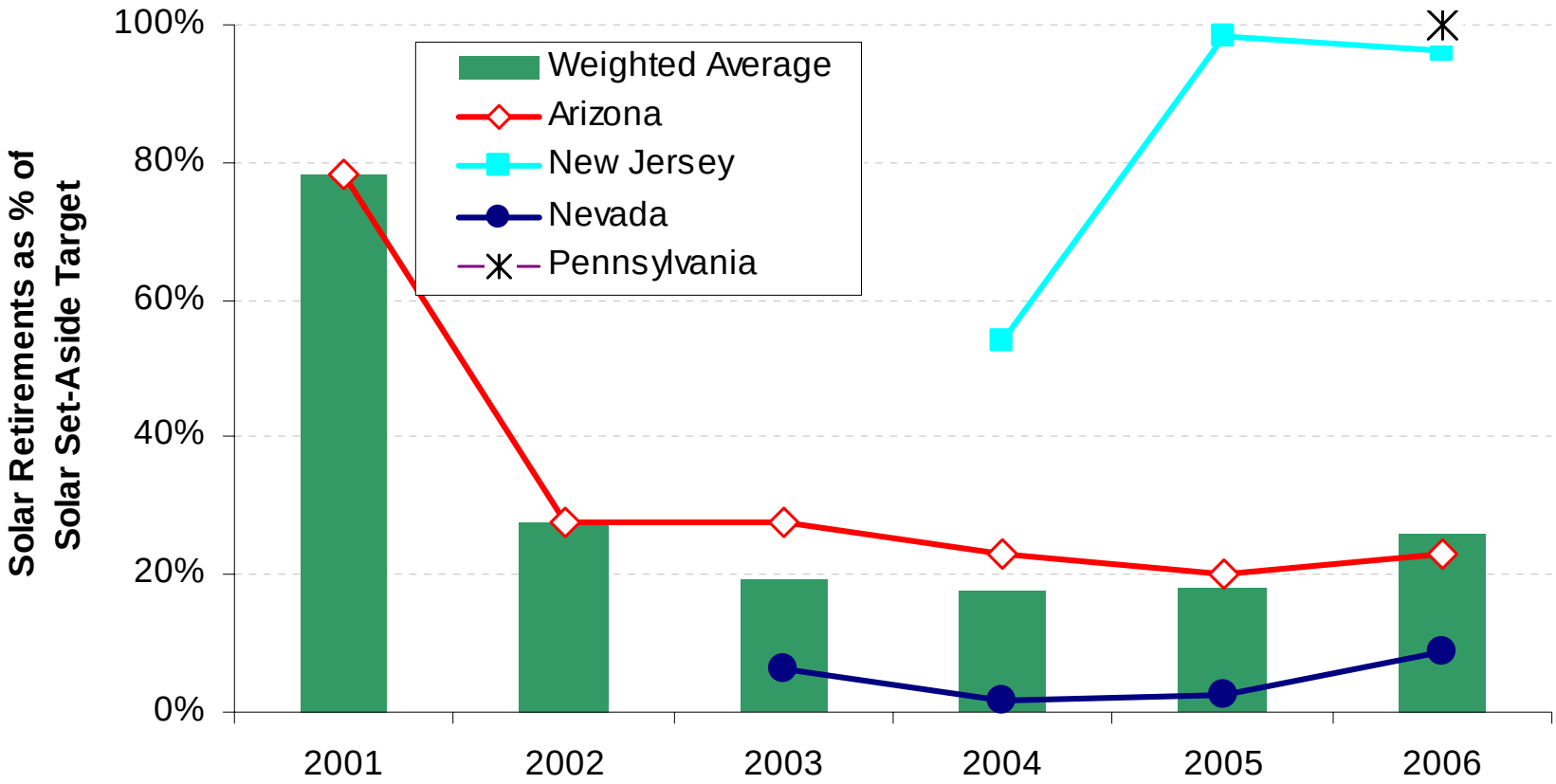
"Compliance" is defined here as the application of renewable electricity or RECs towards RPS targets, including the use of available credit multipliers, but excluding use of ACPs; this definition is not the same as used in individual states

Some States Have Struggled to Meet Even Early-Year RPS Targets

Arizona	compliance well below 50% since 2003 because specified funding amounts have been insufficient to achieve full compliance
Massachusetts	eligible RECs have been in short supply, in part because of a difficult project-development climate in New England
Connecticut	a moderate shortage of eligible RECs began in 2006
Minnesota	statewide RPS achieved 94% compliance in '05; Xcel's additional mandate for biomass and wind has not strictly been achieved on schedule, so overall "compliance" levels have been lower
Nevada	contract failures and project delays have impeded compliance
New York	the first-year RPS target was missed because of a modest delay in the on-line date of one renewable facility, and in part due to REC prices that were higher than initially anticipated

Because "compliance", as defined here, is not the same as used in any individual state, one should not assume that lack of "compliance" automatically leads to enforcement actions

Compliance with Solar Set-Asides Has Been Mixed, But Experience Remains Limited



States Have Established a Variety of Enforcement Mechanisms

$18.2 million in alternative compliance payments (ACPs) collected in 3 states in 2006: MA, NJ, MD *(vast majority in MA)*

Financial penalties have only been levied in TX ($32 k) and CT ($5.6 million)

Lack of compliance in other states has been excused

Penalties for Non-Compliance	States	Notes
ACP, Automatic Cost Recovery	MA, ME, NH, NJ, RI	Payments generally go to a renewable energy fund; if failure to pay ACP, remedies can include license suspension or revocation and/or financial penalties; ME ACP applies only to new renewables target
ACP, Possible Cost Recovery	DE, MD, OR, DC	Cost recovery sometimes only allowed if ACPs are deemed to be the least-cost compliance option; payments generally go to a renewable energy fund; if failure to pay ACP, remedies can include license suspension or revocation and/or financial penalties
Explicit Financial Penalties, No Automatic Cost Recovery	CA, CT, MT, PA, TX, WA, WI	CA, CT, MT, PA, TX, WA: penalty in $/MWh applies to shortfall; WA: penalty may, in some circumstances, be recoverable in rates; WI: penalty ranges from $5,000 to $500,000; suppliers often given opportunity to petition for a waiver
Discretionary Financial Penalties, No Cost Recovery	AZ, CO, HI, MN, NV	Financial penalties assessed at the discretion of the PUC; penalties can be waived with sufficient cause; in MN, PUC can order renewable investment and can impose financial penalties
Enforcement at PUC Discretion	NC, NM	PUC has legislative authority to enforce compliance, but no rules have been established to document how this will occur
Not Applicable	IA, IL, NY	IL and NY rely on administrative agencies to procure renewables on behalf of LSEs; IA RPS has already been fully met

The Use of Renewable Energy Certificates and Certificate Tracking Systems Expand

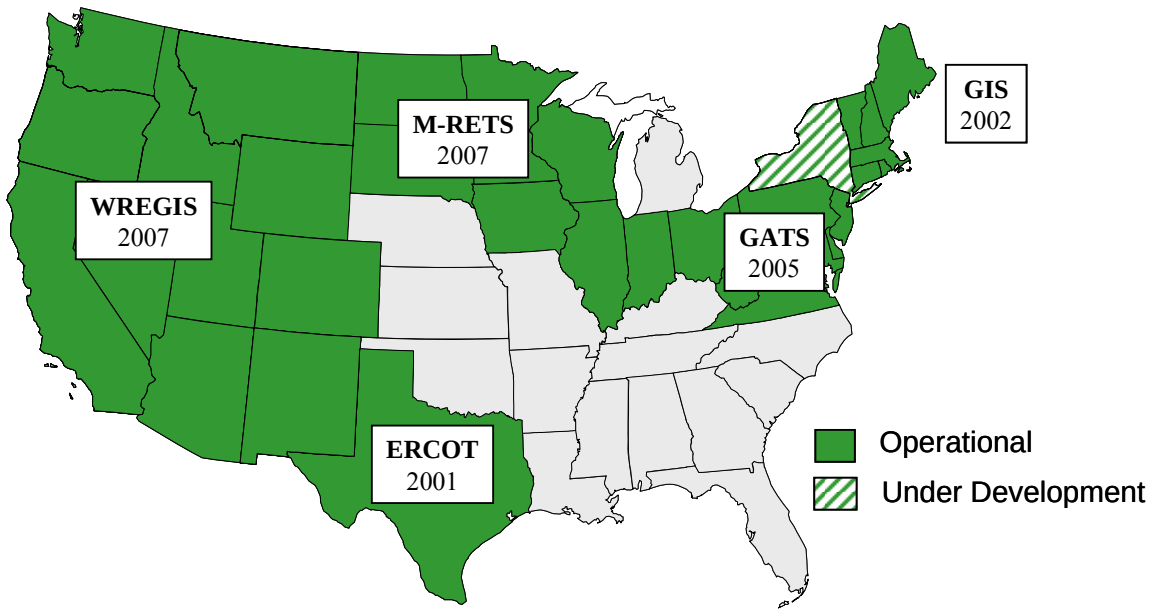
Electronic REC tracking systems are prevalent

Most state RPS policies now allow unbundled RECs (often with some restrictions)

Exceptions are Arizona, California, Hawaii, and Iowa

REC definitions are not uniform across states

Electronic REC Tracking Systems

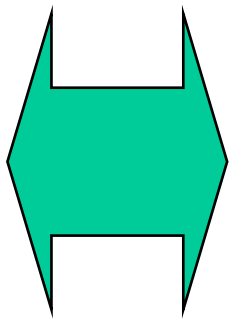


Trade in Renewable Energy Is Affected by Contracting Practices

Regulated Markets

Dominated by long-term bundled contracts for electricity and RECs

Utility RFP solicitations or bilateral negotiations, with regulatory oversight



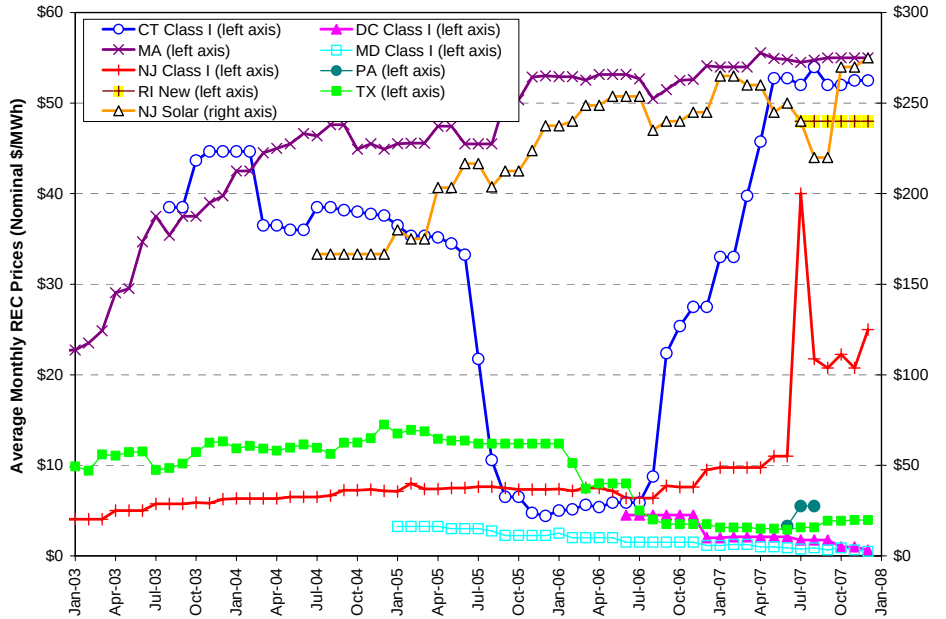
Restructured Markets

More often dominated by short-term trade in RECs, without PUC oversight

Developers often sell electricity and RECs separately

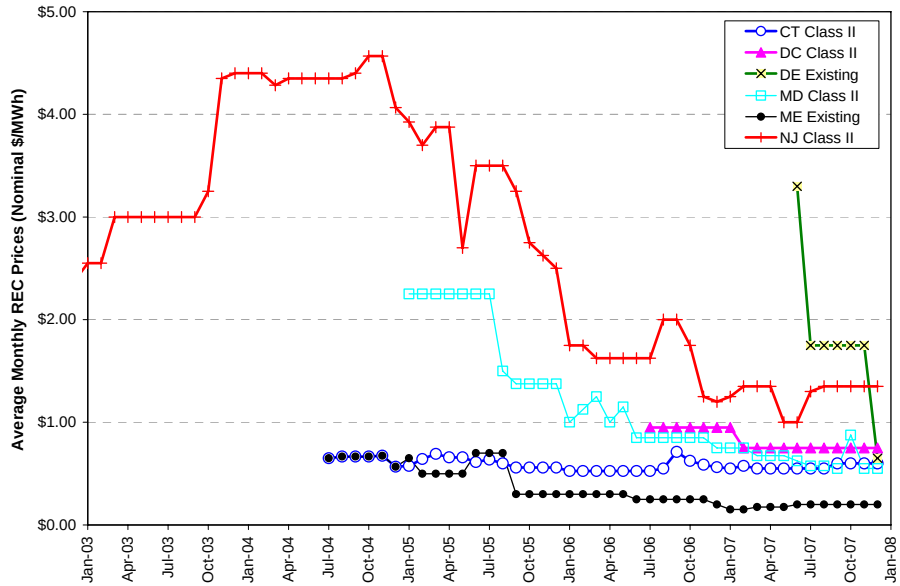
Two states require a government-directed agency to conduct procurements under the RPS: New York and Illinois

Where Short-Term Trade in RECs Has Occurred, Prices Have Been Variable



Main Tier and Class I RECs

Existing Tier and Class II RECs



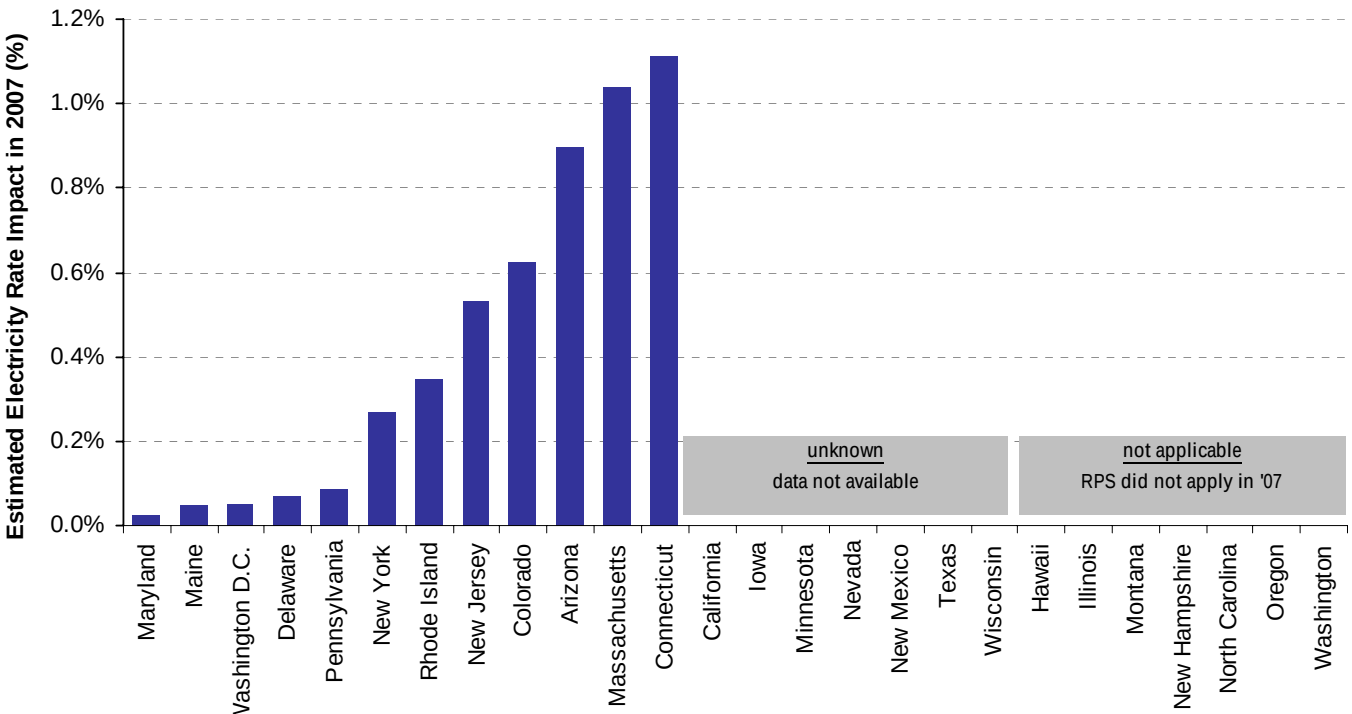
A Number of States Have Encouraged Longer-Term Contracting

Renewable projects are capital intensive, and concerns about the challenges of project financing with REC price variability has spurred some states to adopt provisions to help projects secure financing

Contract Duration Requirement	CA	10+ yrs
	CO	20+ yrs
	CT	100 MW, 10+ yrs
	IA	ownership or long-term contract
	MD	solar, 15+ yrs
	MT	10+ yrs
	NV	10+ yrs
	NC	solar, sufficient length to stimulate development
	PA	good faith effort includes seeking long-term contracts
	RI	PUC requires that default utility investigate long-term contracting
Central Procurement	NY	central procurement where NYSERDA purchases attributes under long-term contract
	IL	central procurement in which long-term contracts are likely to be offered
Credit Protection	NV	created program to protect payments to generators from utility credit concerns
	CA	initially exempted utilities from meeting RPS until they became creditworthy
Renewables Fund Support	MA	renewable energy fund created "green power partnership" that offers guaranteed REC purchase or option contracts of up to 10 years

Rate Increases Associated with State RPS Policies Have Rarely Exceeded 1%, So Far

Translating short-term REC prices and state-specific funding limits to rate impacts in 2007 yields the results shown below



Rate impacts of RPS policies that are dominated by long-term contracts are unknown, but anecdotal evidence suggests limited impacts, and possibly even rate reductions

Given Uncertainty in Future Costs, Cost Caps of Various Designs Have Been Common

Design and implementation of cost caps vary by state

Majority of states have capped retail rate impacts at well below 10%, and in eight states rate impacts are capped at below 2%

State	ACP		Retail Rate/ Revenue Req. Cap	Renewable Energy Contract Price Cap	Per-Customer Cost Cap	Renewable Energy Fund Cap	Financial Penalty May Serve as Cost Cap	Maximum Effective Retail Rate Increase
	Auto. Cost Rec.	Possible Cost Rec.						
AZ					•	•		to be determined
CA						•		cap for portion of cost
CO			•					1.7%
CT							•	6.5%
DE		•						16.3%
HI				•				0.0%
IA								no explicit cap
IL			•					1.4%
MA	•							3.3%
MD		•	•					2.1%
ME	•							4.8%
MN								no explicit cap
MT				•				0.1%
NC					•			1.9%
NH	•							8.3%
NJ	•							10.6%
NM			•	•	•			1.8%
NV								no explicit cap
NY						•		0.9%
OR		•	•					4.0%
PA							•	no explicit cap
RI	•							6.4%
TX							•	2.1%
WA			•					4.0%
D.C.		•						2.5%
WI								no explicit cap

States Are Increasingly Recognizing Transmission as a Key Limitation

- **Texas:** Competitive Renewable Energy Zones designated in 2007
- **Colorado:** Energy Resource Zones identified in 2007, and CPCN process has begun
- **California:** California ISO received FERC approval for a new tariff designed to benefit location-constrained resources in 2007
- **Minnesota:** RPS requires transmission plans, and state has history of proactive transmission development for wind

Seven states have created transmission infrastructure authorities; two specifically designed to support renewable energy: NM and CO

Federal RPS Policies Have Received Consideration in the U.S. Congress

- Though Federal RPS proposals contain common design features, the specifics of each individual bill have varied
- U.S. Senate has passed a Federal RPS on three occasions since 2002
- U.S. House passed a Federal RPS for the first time in 2007
- Two chambers have yet to agree to a common approach, so a Federal RPS has not reached the President's desk

Conclusions

- The popularity of state-level RPS policies has grown
- The importance of these programs for renewable energy is expected to build over the coming decade
- The design of these policies vary, and state implementation experience has been mixed
- Comparative experience of states that have and have not achieved substantial renewable energy growth highlight the importance of design details
- Emerging challenge is how to make changes to RPS programs without unduly destabilizing planning and investment decisions made under previous RPS designs

For More Information...

See full report for additional findings, a discussion of the sources of data used, etc.

- http://eetd.lbl.gov/ea/ems/re-pubs.html

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