



# State Drivers: Input for Regional Profiling

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# Overview

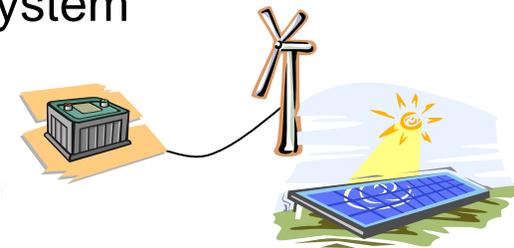
- **Regional Profiling for distributed resource integration**
  - What is meant by distributed resources
  - Scope of Task 1.1
  - Defining regions
- **Regional Drivers**
  - Regional market conditions (economics)
  - Regional resource constraints (reliability)
  - State policy and financial incentives
  - Utility programs and tariffs to support distributed resource integration
- **Regional Barriers and Activities**
  - Primary research via interviews and survey monkey
  - Vet results via webcasts and regional workshops
- **Integration Framework**
  - Relate utility programs, retail tariffs, and pilot implementations
  - Identify trends and gaps
  - Recommend other implementations enabled by smart grids towards overcoming integration barriers

# Regional Profiles Task

## Regional Profiling to clarify drivers, barriers, and activities to integrate distributed resources along the distribution system



- Also review **utility distributed resource programs and retail tariffs** designed to coordinate electricity usage with power system or market conditions or to accommodate renewables
- Scope of **distributed resources**:
  - located along the distribution system or customer-side of the meter
  - distributed generation, storage, dispatchable load, PHEV, etc. integrated to respond in coordinated fashion
  - renewable resources located along distribution system



# Distributed Resource Integration Drivers & Barriers

## Drivers



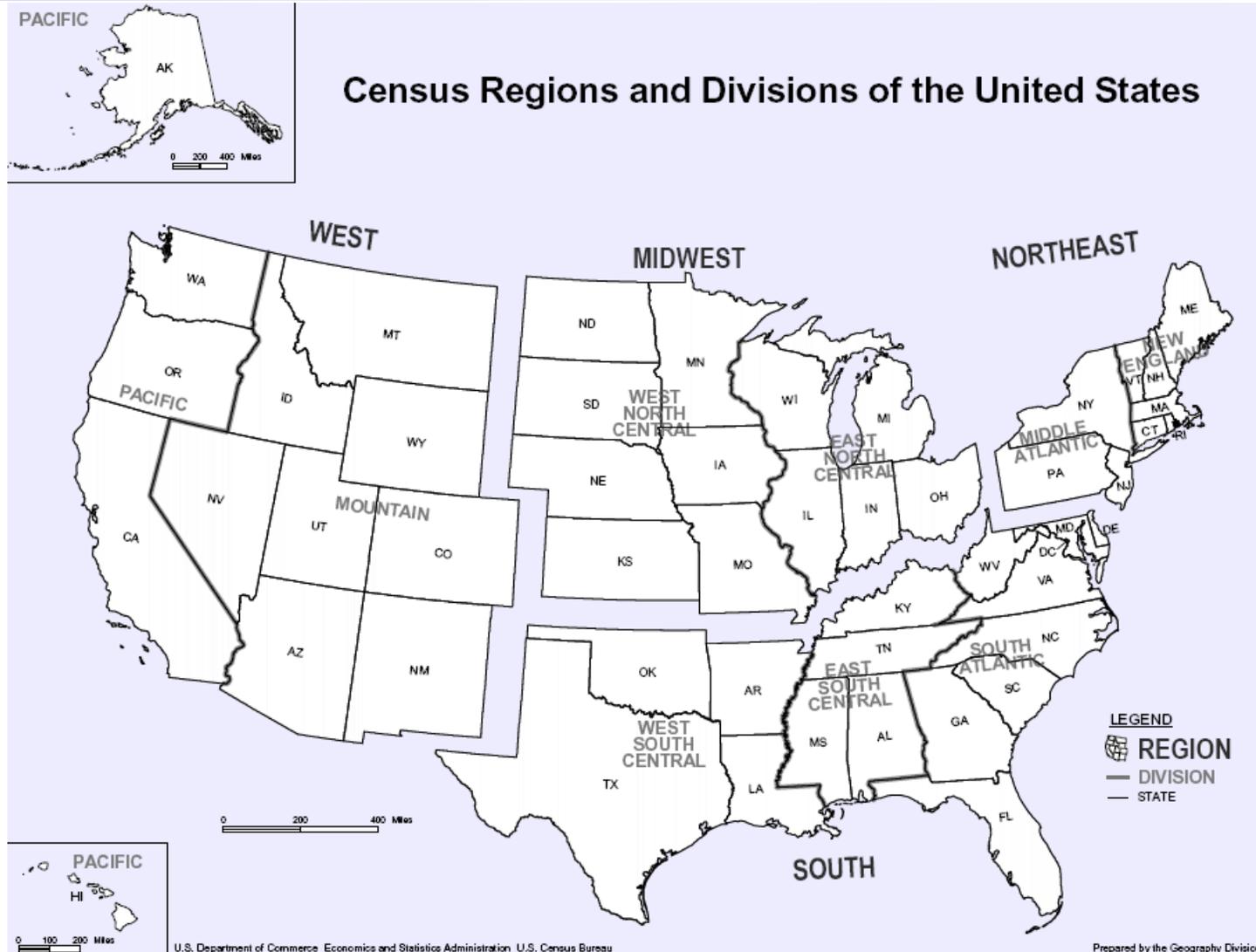
- Peak resource constraints
- Improve economics
- Reliability concerns
- Environmental concerns
- Enhanced innovation

## Barriers



- Aggregation
- Automation
- System operator confidence
- Economic justification
- Wholesale market structures and retail rates
- Customer convenience

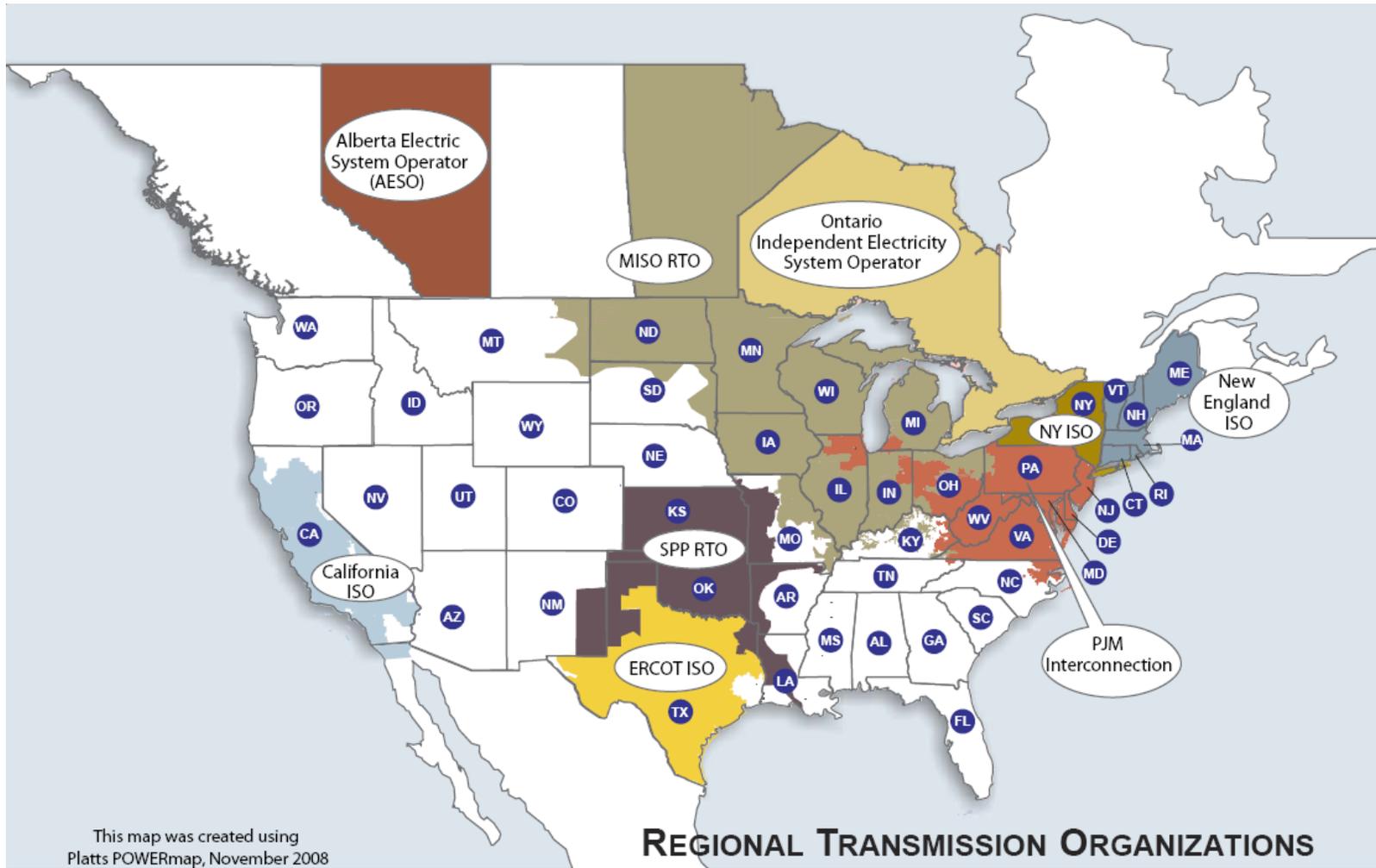
# U.S. Census Regions and Divisions



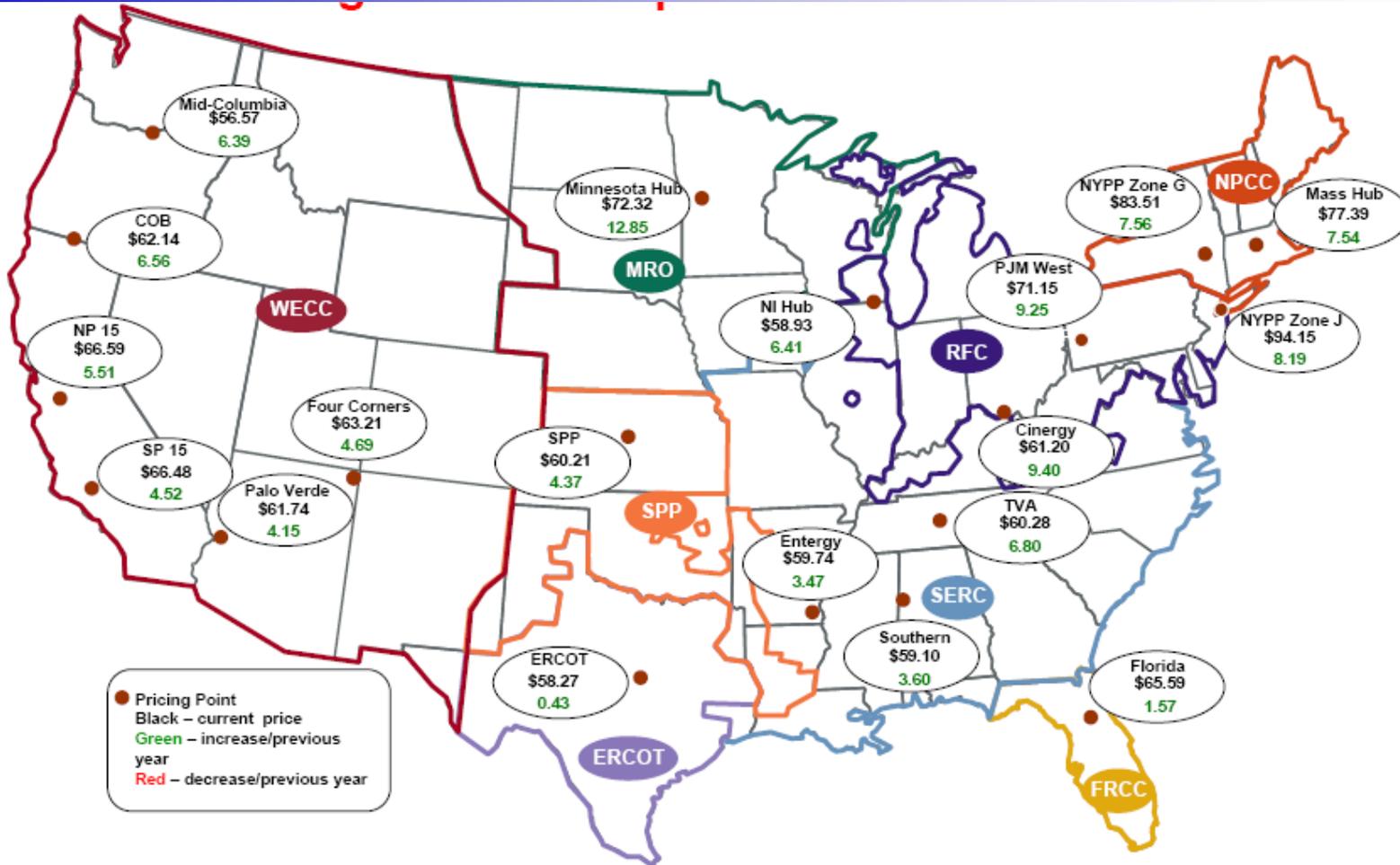


# ***Regional Market Conditions (Market Economics)***

# Regional Wholesale Electricity Markets



# Average On-Peak Spot Electricity Prices 2007



Source: Derived from Platts data.

Updated March 20, 2008

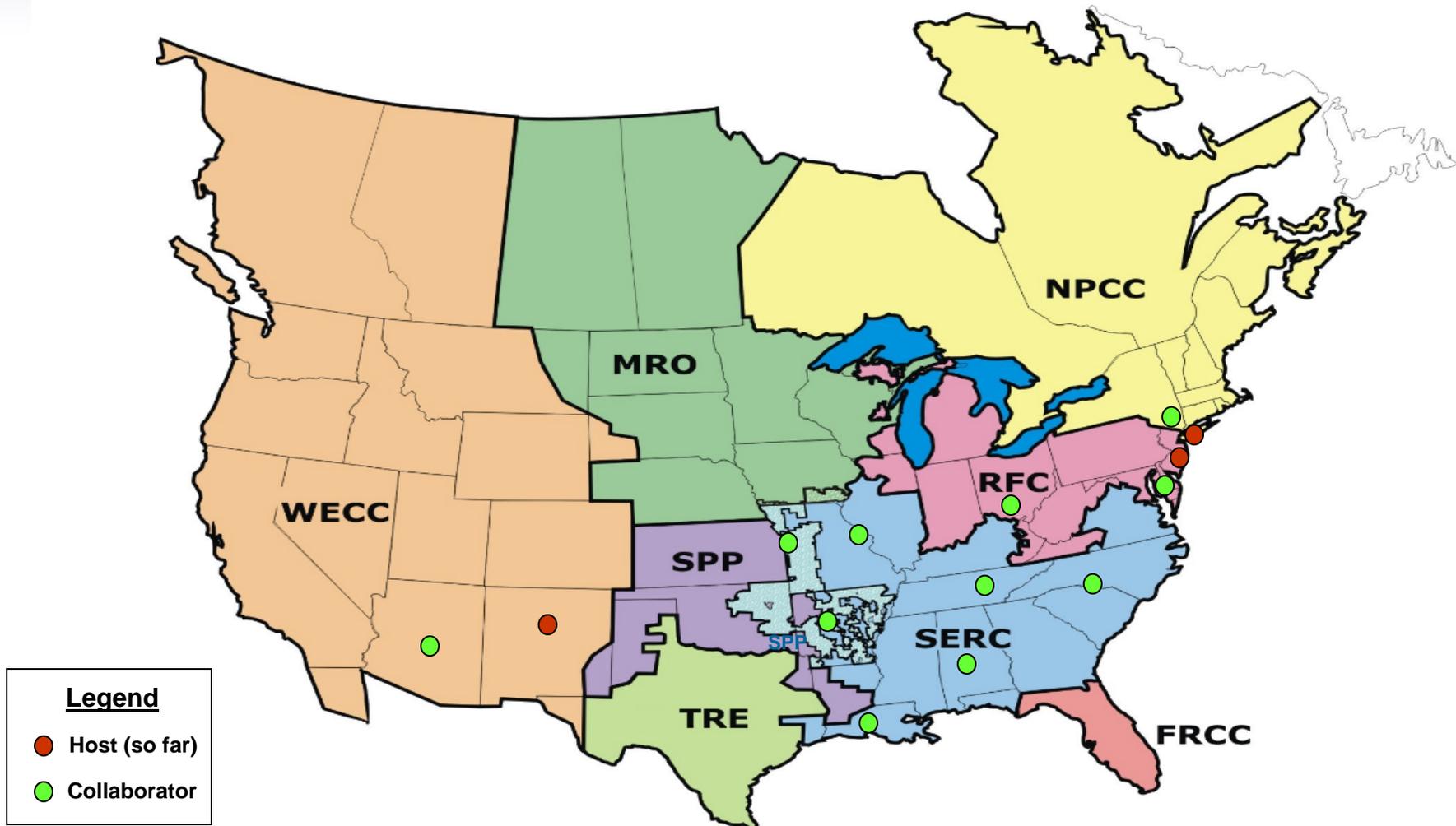
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Source: FERC Market Oversight



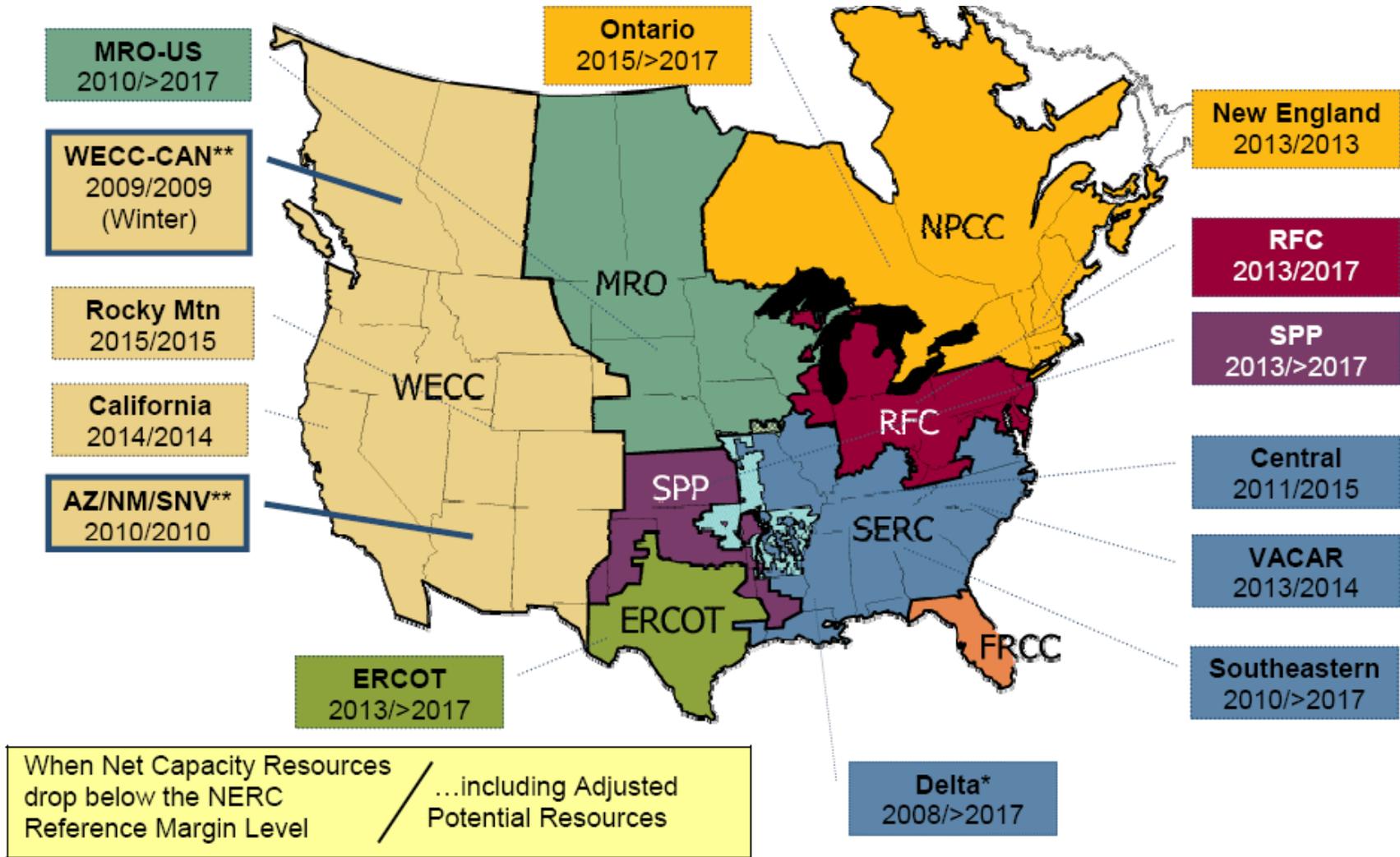
# ***Regional Resource Constraints (Reliability)***

# Smart Grid Demo Participants by NERC Region



EPRI Confidential

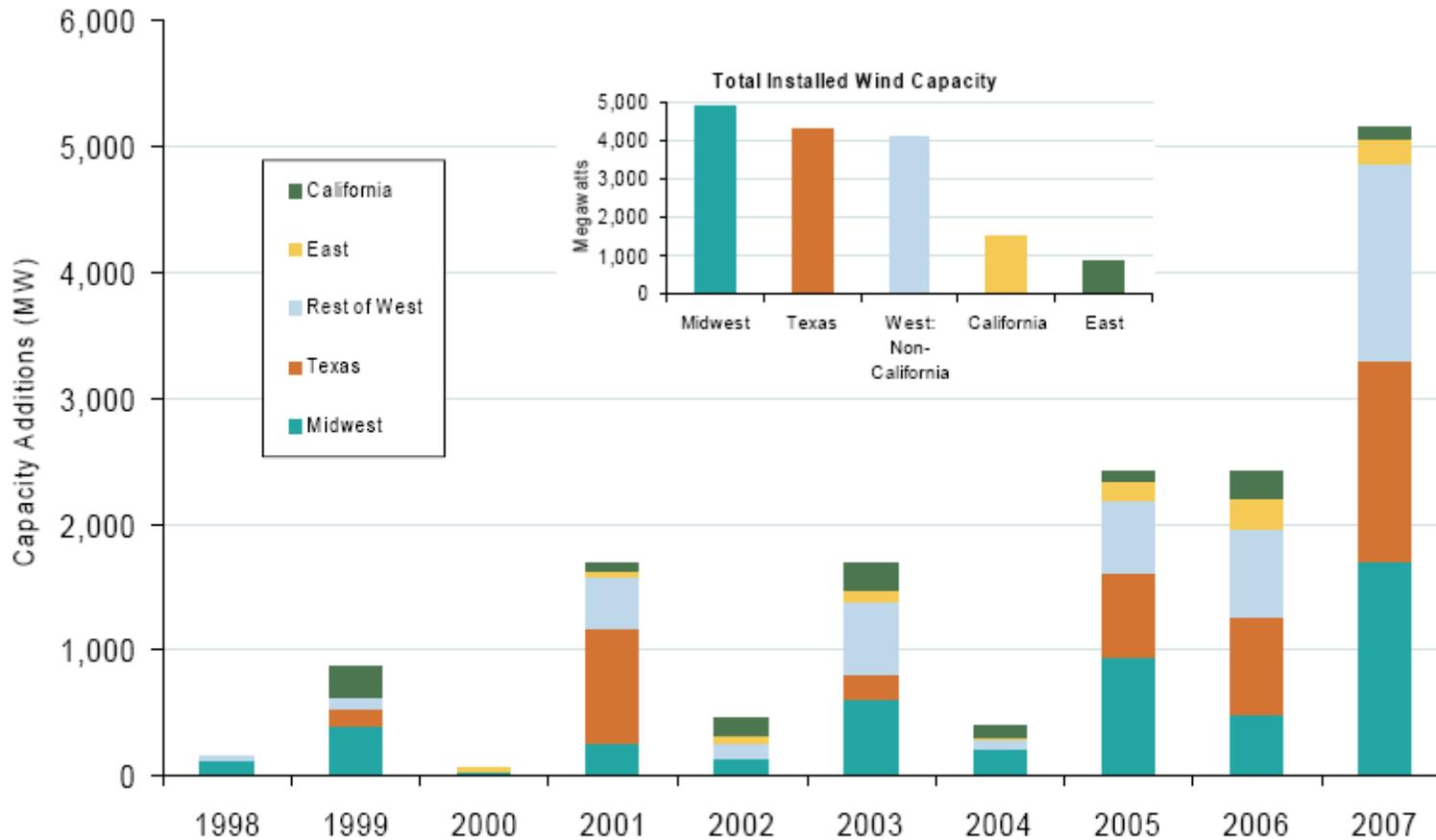
# Year Net Capacity below NERC Reference Margin Level



Source: NERC Long-Term Reliability Assessment (2008)



# Growth of Installed Wind Capacity in U.S. (MW)



Midwest includes: IL, IA, KS, MI, MN, MS, NE, ND, OH, OK, SD, WI  
 East includes: ME, MA, NH, NJ, NY, PA, RI, TN, VT, WV

Source: American Wind Energy Association (AWEA)

Source: FERC Market Oversight

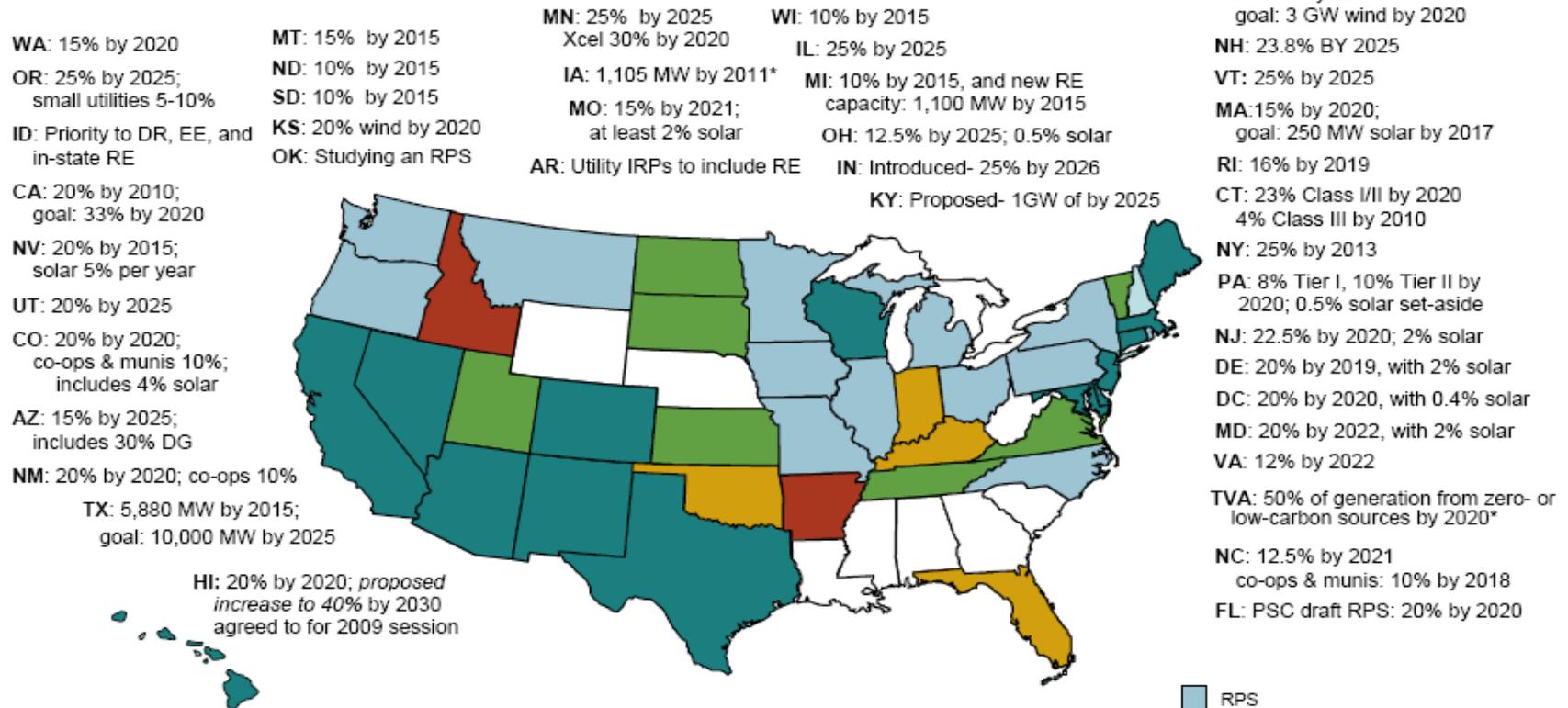
Updated March 7, 2008



# ***State Policy Drivers (Green House Gas Reduction)***

# Renewable Portfolio Standard

## 28 states and D.C. have an RPS

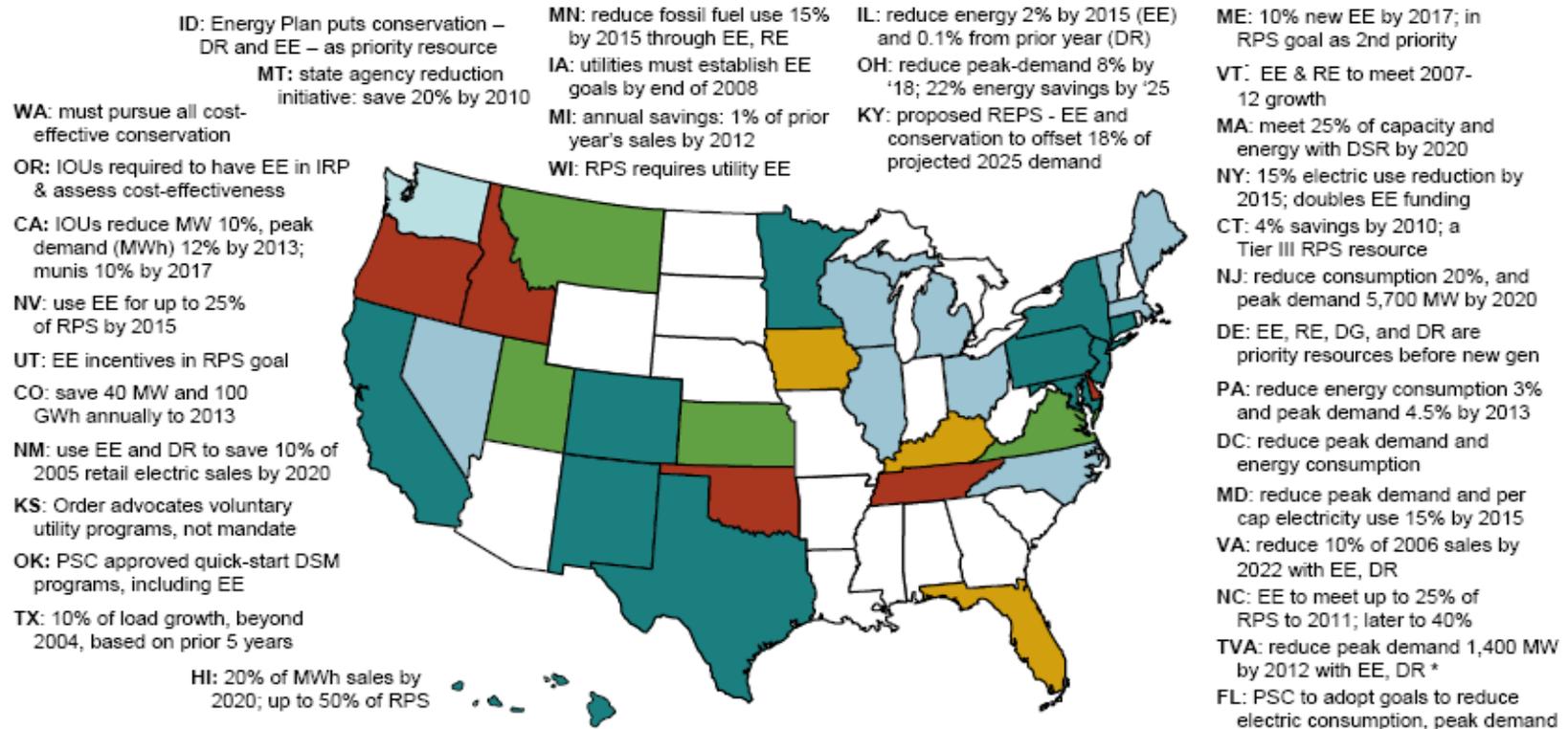


**All but 13 states have RPS, voluntary standards, or renewable energy goals.  
Four states have proposed RPS or studies in progress.**

Source: FERC Market Oversight

Updated January 13, 2009

# Energy Efficiency Resource Standards



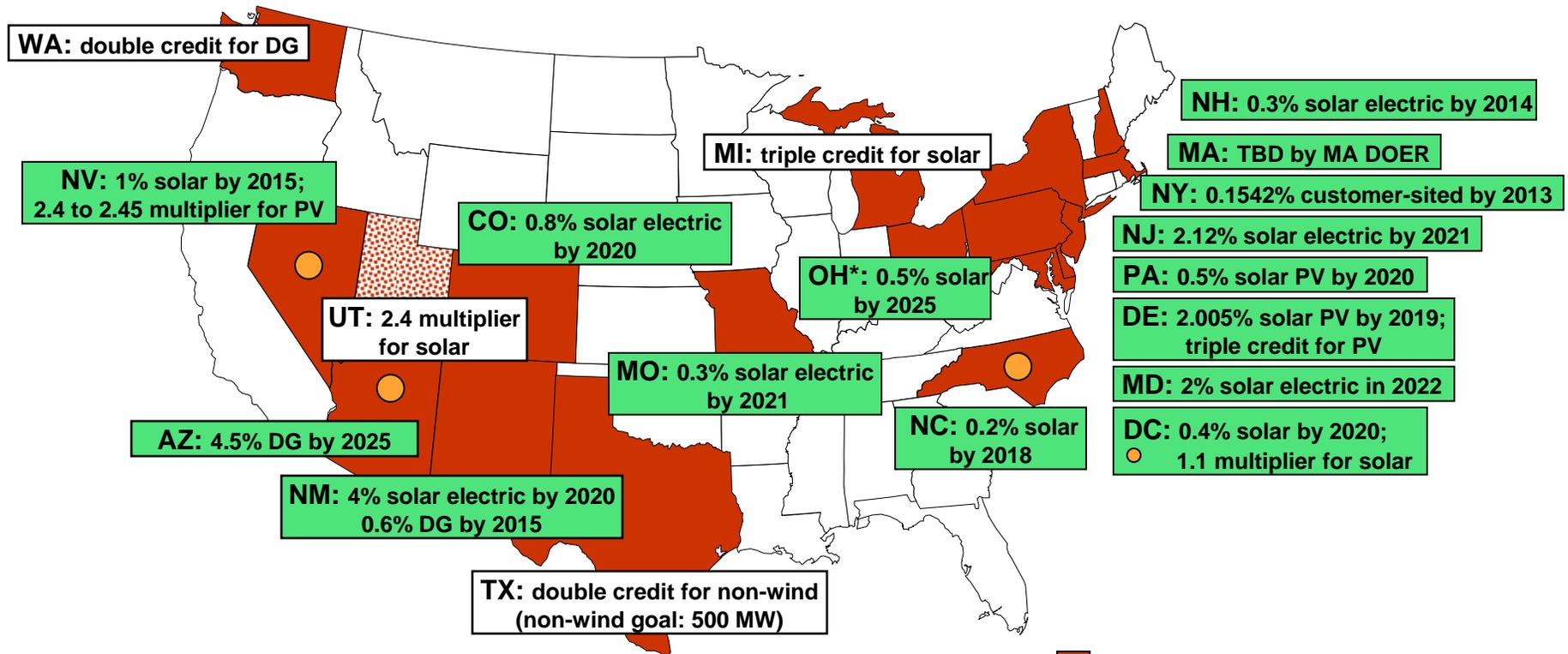
**9 states have EE only as part of RPS, 10 have stand-alone regulation, and 4 have voluntary standards. 3 states have proposed EE goal or studies in progress.**

- EE only as part of an RPS law, rule, or goal
- EERS by regulation or law (stand-alone)
- Voluntary standards (in or out of RPS)
- Energy efficiency goal proposed / being studied
- Other energy efficiency or demand-side rule or goal

Updated December 5, 2008

Source: FERC Market Oversight

# Solar/DG Provisions in RPS Policies

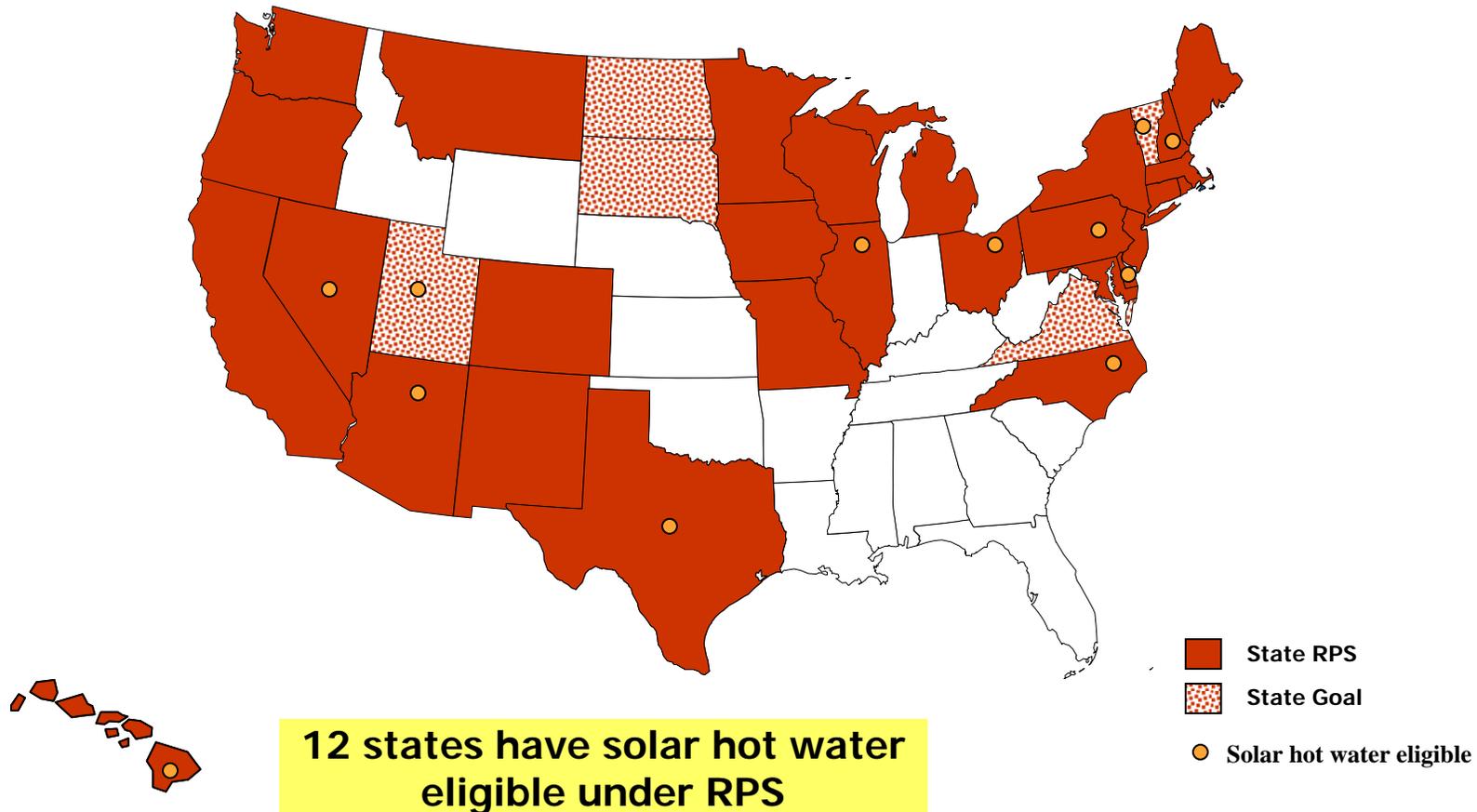


**DG: Distributed Generation**

\* It is unclear if solar water heating is eligible for OH's solar carve-out.

Source: [www.dsireusa.org](http://www.dsireusa.org) (January 2009)

# Solar Hot Water in RPS Policies

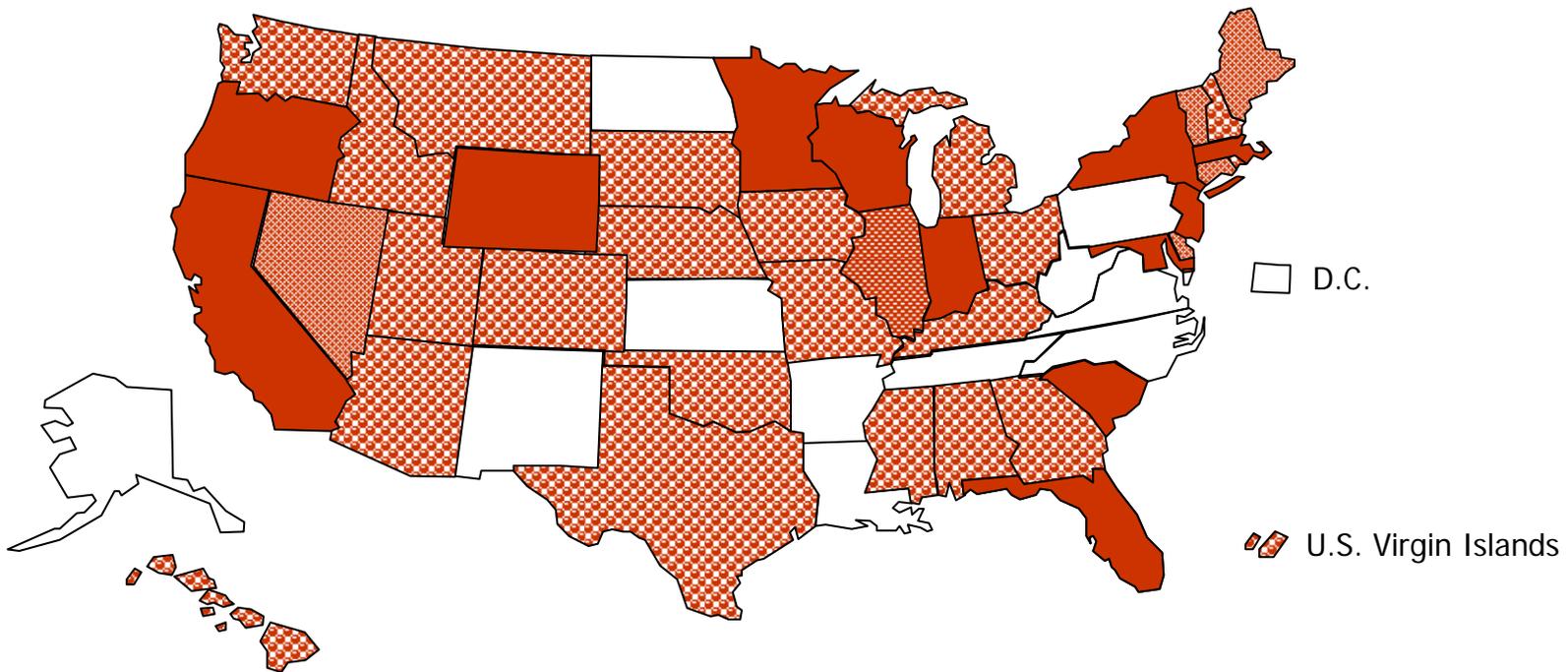


Source: [www.dsireusa.org](http://www.dsireusa.org) (January 2009)



# ***Financial Incentives by State (Economics for Renewable Energy)***

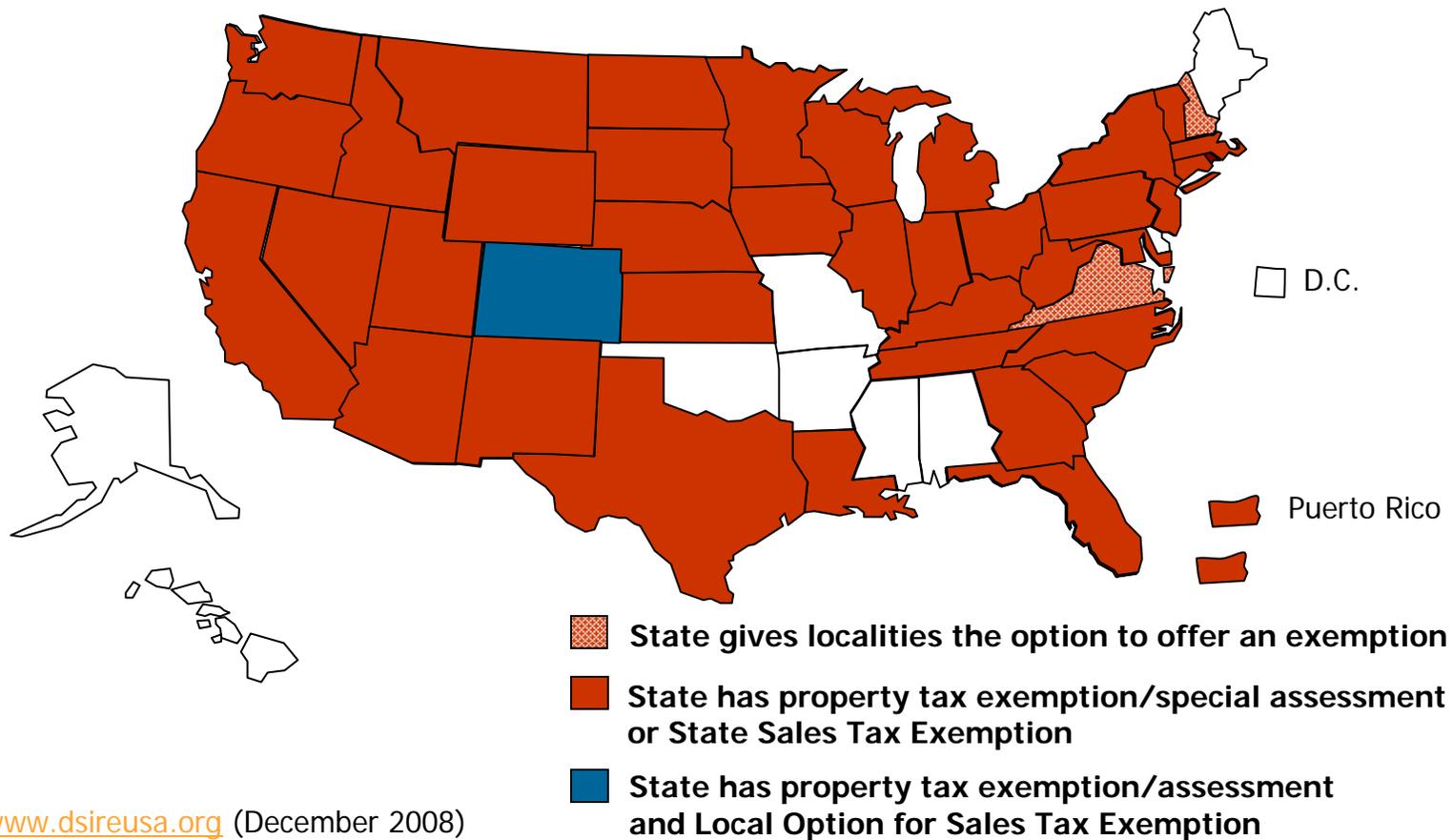
# Rebate Programs for Renewable Energy Technologies



**All but 11 states have utility or state rebate programs for renewable energy technologies.**

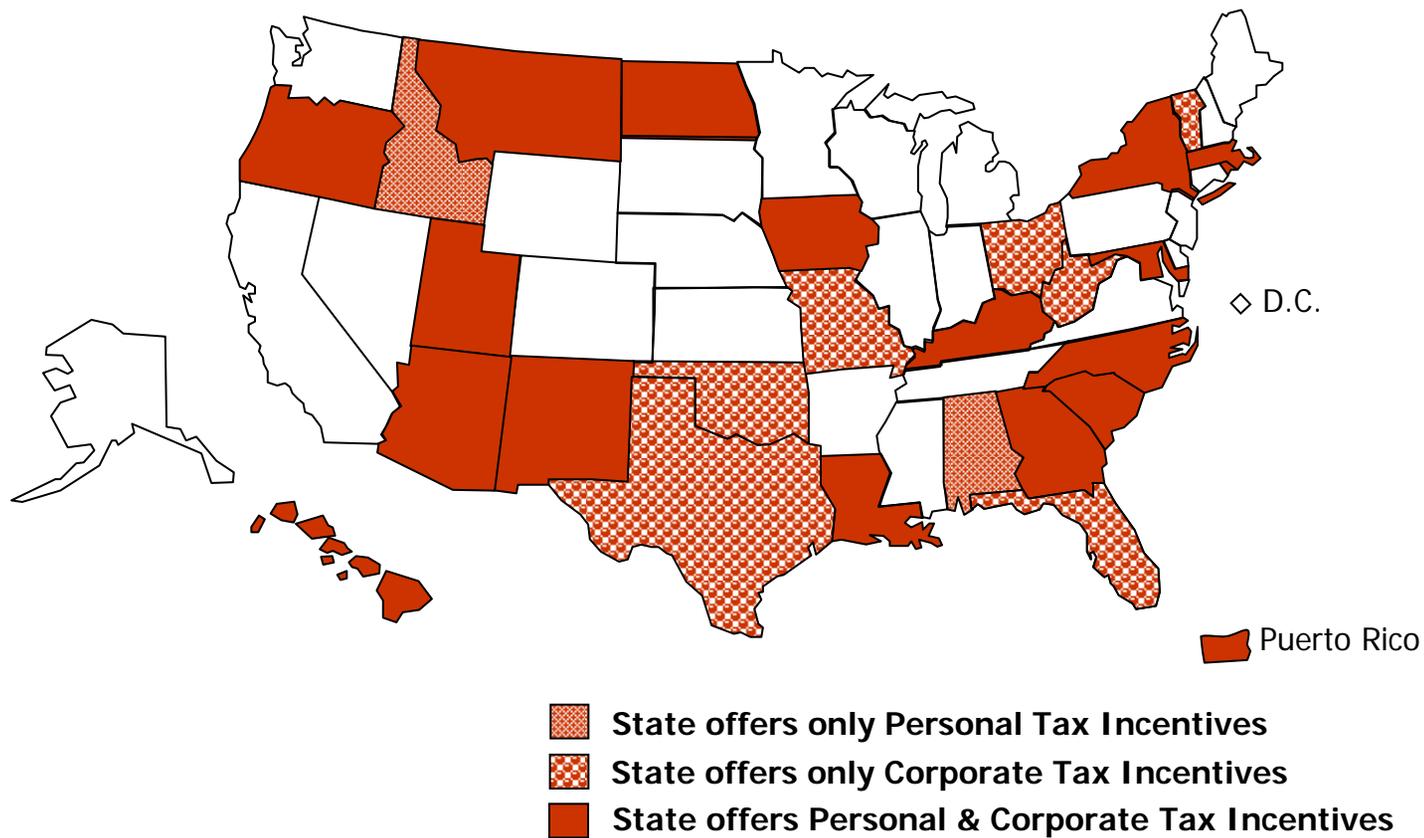
Source: [www.dsireusa.org](http://www.dsireusa.org) (December 2008)

# States with Sales Tax or Local Property Tax Exemptions for Renewables



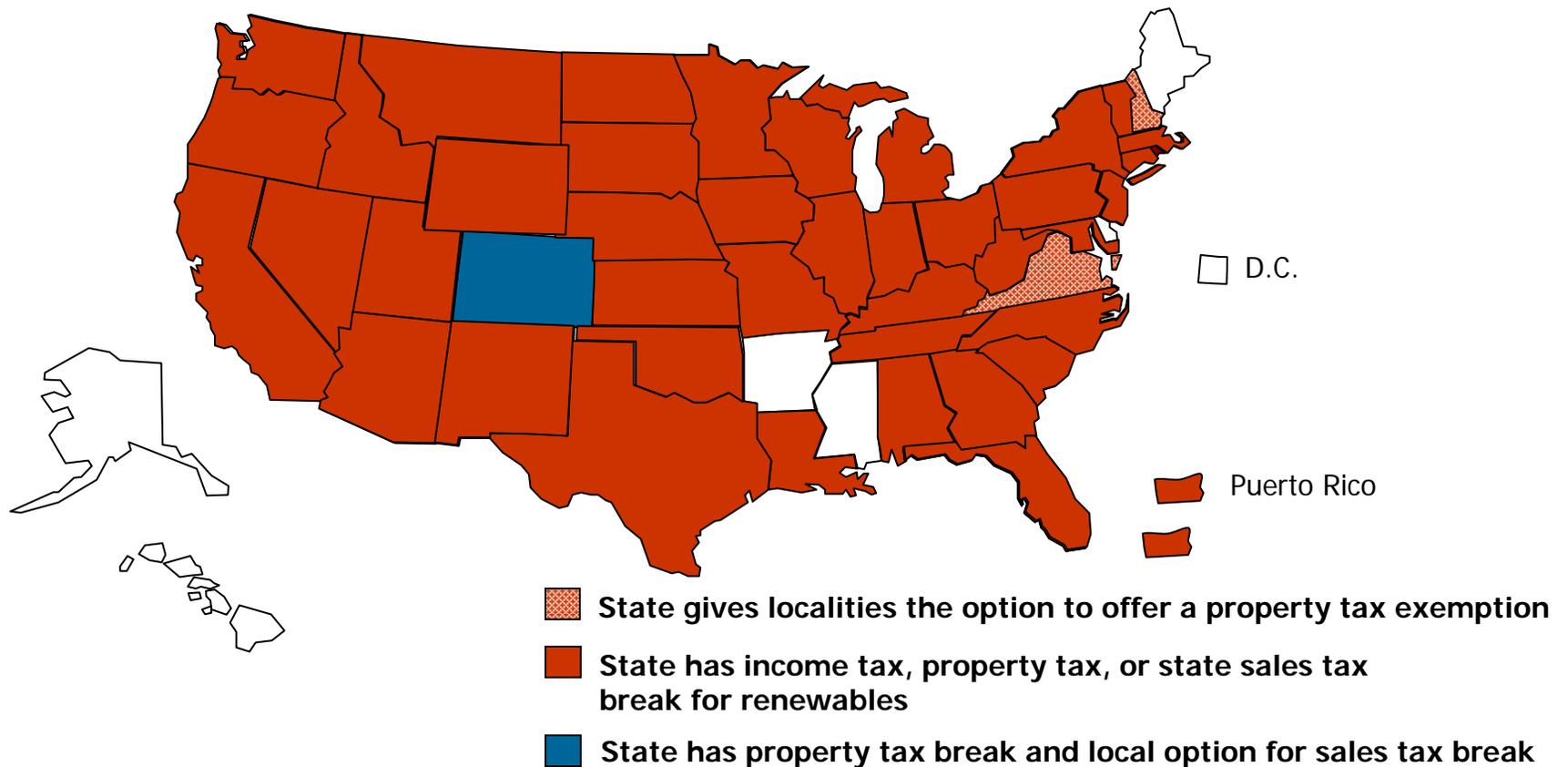
Source: [www.dsireusa.org](http://www.dsireusa.org) (December 2008)

# State Income Tax Credits & Deductions for Renewables



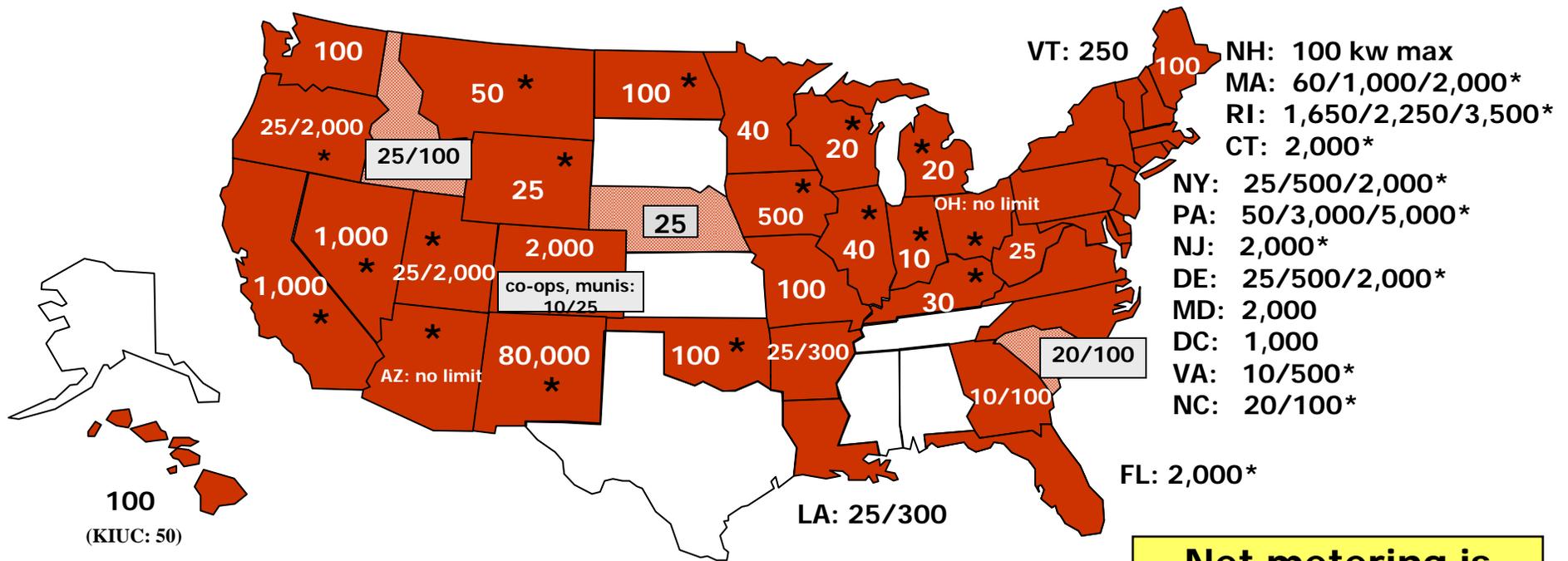
Source: [www.dsireusa.org](http://www.dsireusa.org) (December 2008)

# States with Income Tax Credits/Deductions, Sales Tax, or Local Property Tax Exemptions for Renewables



Source: [www.dsireusa.org](http://www.dsireusa.org) (December 2008)

# Net Metering



- State-wide net metering for all utility types
- \* State-wide net metering for certain utility types only (e.g., investor-owned utilities)
- Net metering offered voluntarily by one or more individual utilities

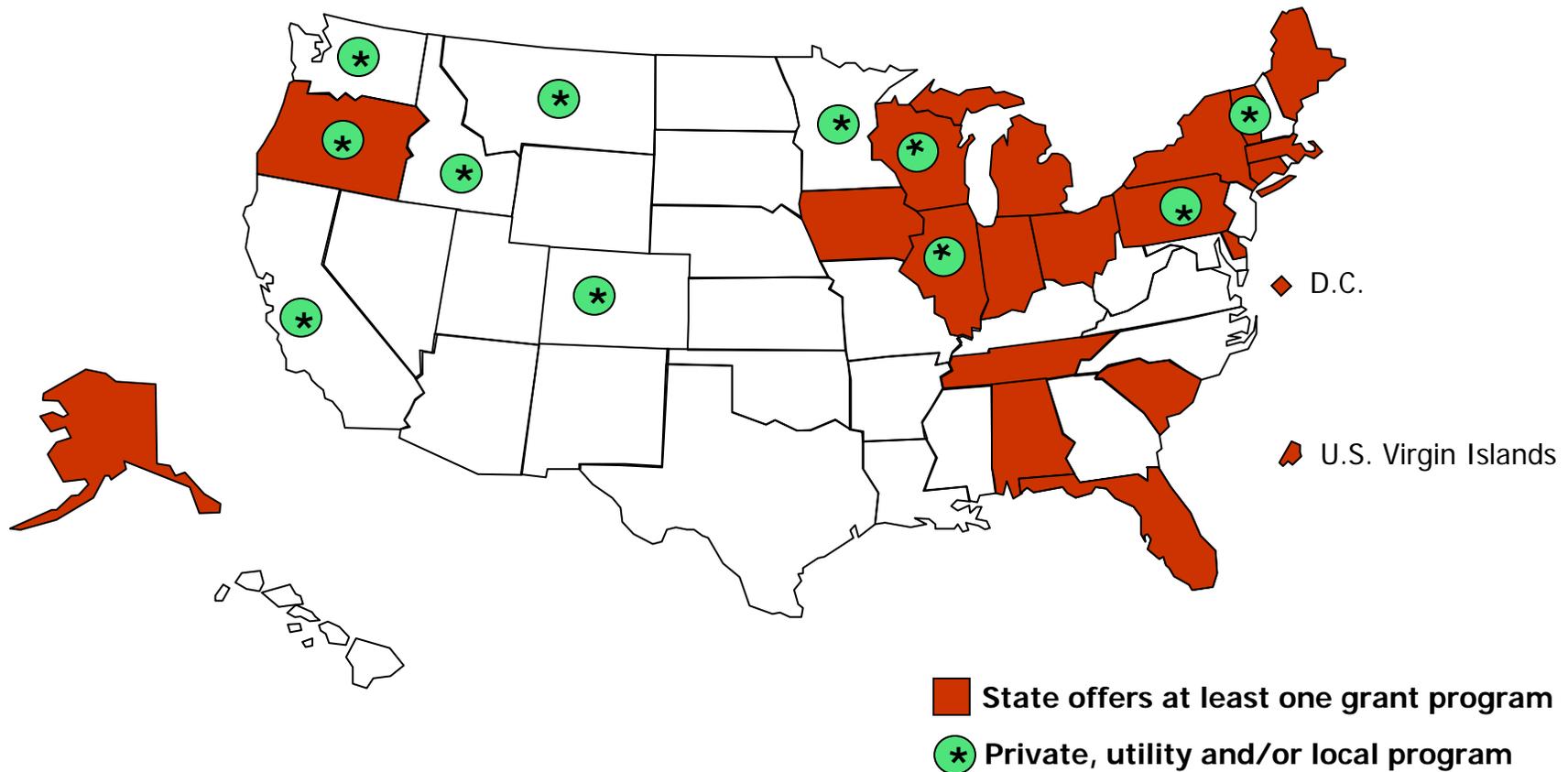
**Net metering is available in 43 states + D.C.**

*Note: Numbers indicate individual system size limit in kilowatts (kW). Some states' limits vary by customer type, technology and/or system application; this is the case when multiple numbers appear for one state. Other limits may also apply. For complete details, see [www.dsireusa.org](http://www.dsireusa.org).*

Source: [www.dsireusa.org](http://www.dsireusa.org) (January 2009)



# Grants for Renewable Energy Technologies



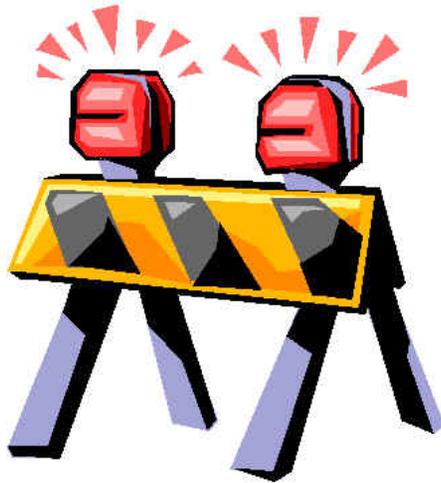
Source: [www.dsireusa.org](http://www.dsireusa.org) (December 2008)



# *Regional Pilots and Integration Activities*

# Distributed Resource Integration: Barriers and Program Objectives

## Barriers



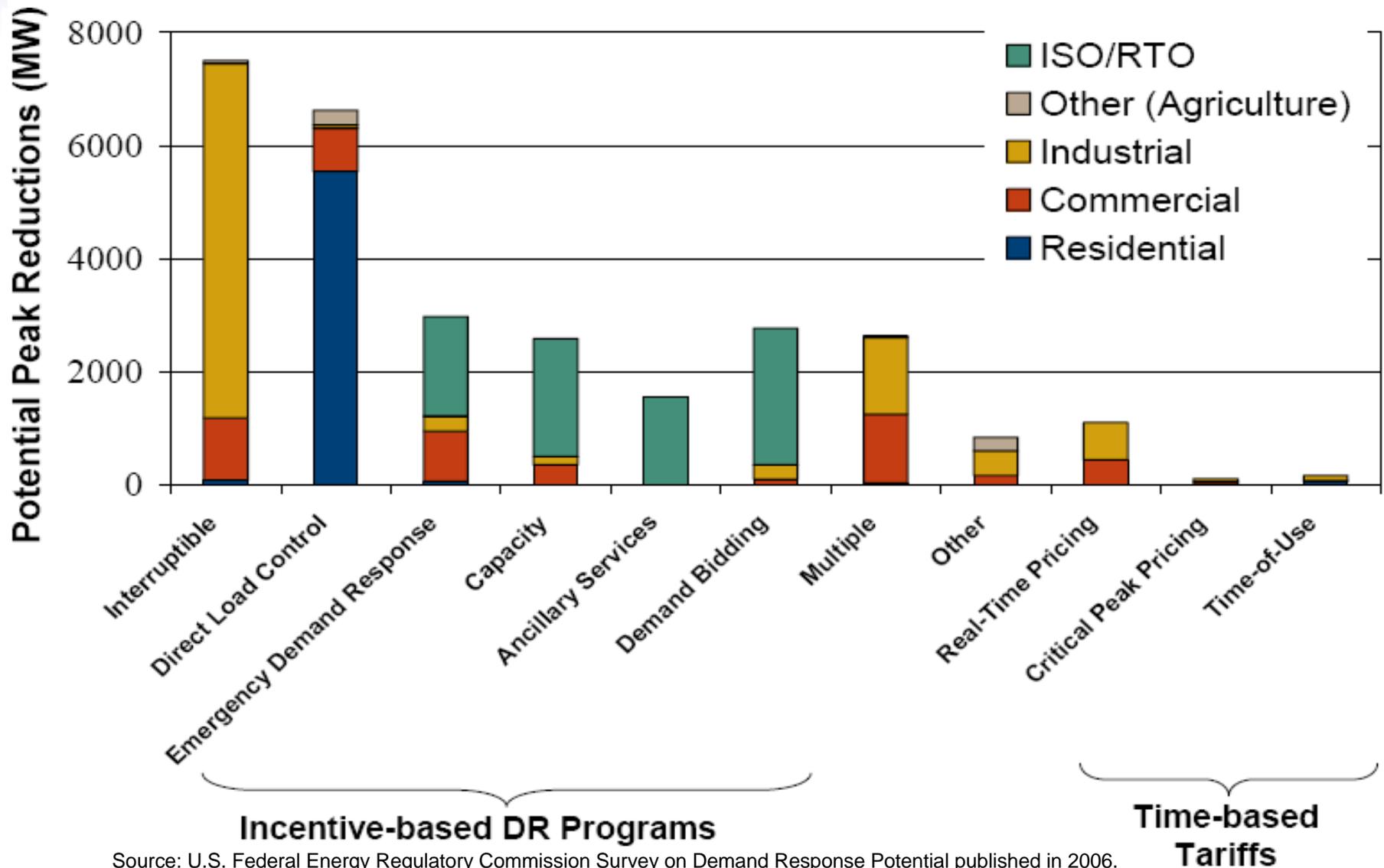
- Aggregation
- Automation
- System operator confidence
- Economic justification
- Wholesale market structures and retail rates
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## Objectives



- Market Economics
- Green House Gas Reduction
- Grid Support
- Reliability
- Security/Protection
- Power Quality

# Program Participation Levels

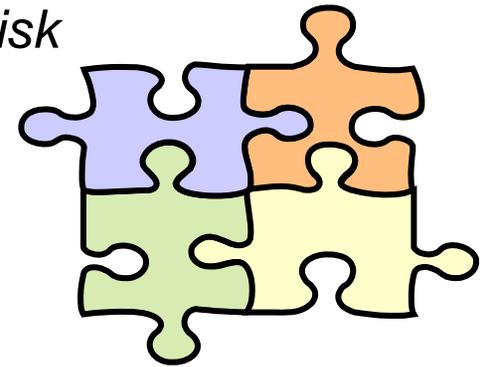


Source: U.S. Federal Energy Regulatory Commission Survey on Demand Response Potential published in 2006.

# Implementation Framework Parameters

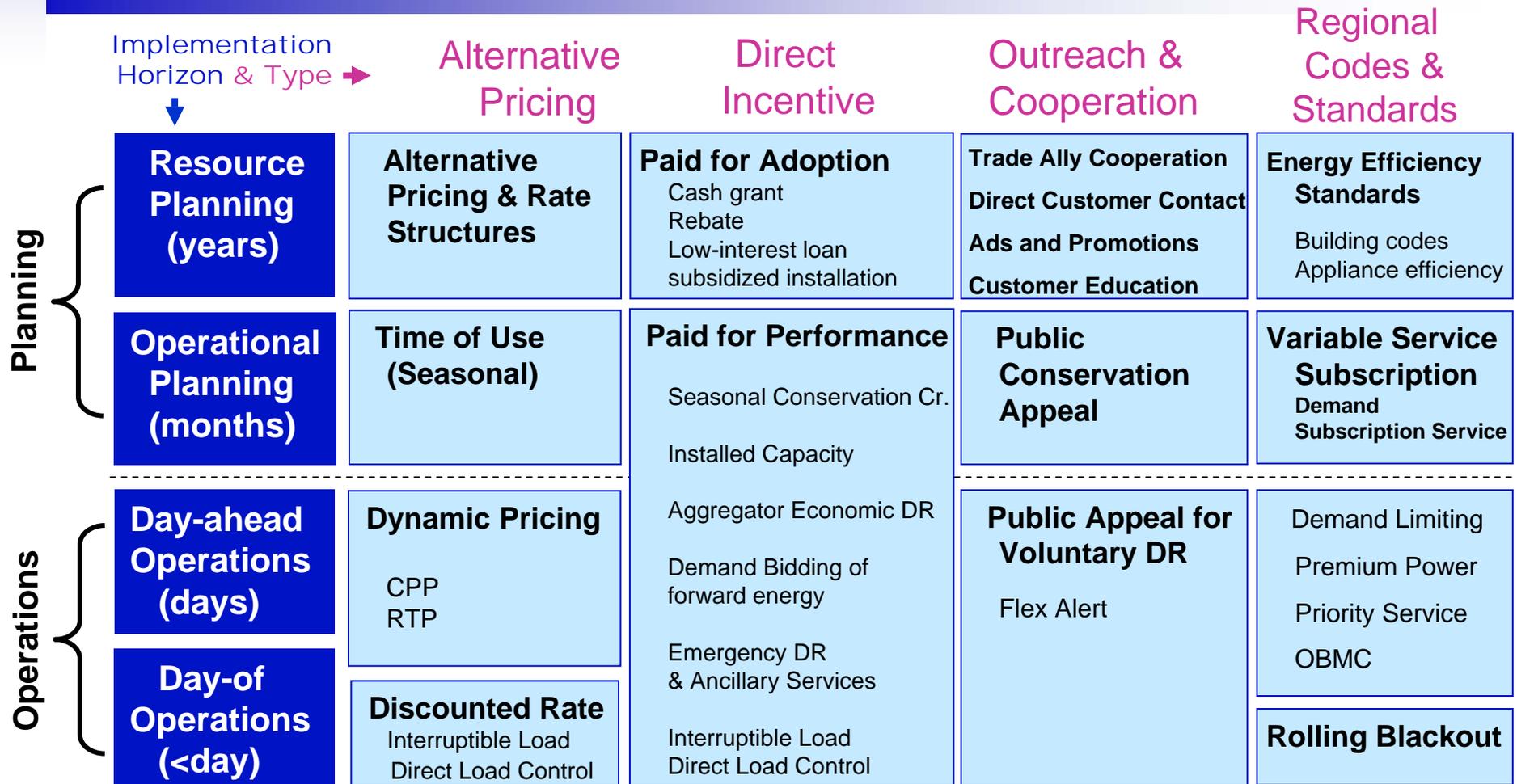
Implementation methods can be related by

- Time Horizon - *Timeframe to address imbalance risk*
  - Resource Planning (year)
  - Operational Planning (months)
  - Day-ahead Operations (day)
  - Day-of Operations (<day)
- Implementation Type - *Motivation for participant engagement*
  - Alternative Pricing: pricing structures determine what customers pay
  - Direct Incentives: financial incentives determine rewards to participants
  - Outreach and Cooperation\*: information exchange to engage customers or encourage voluntary behavior
  - Regional Codes & Standards\*: dictate minimum regional requirements



\* Chuang and Gellings (CIGRE paper, 2008)

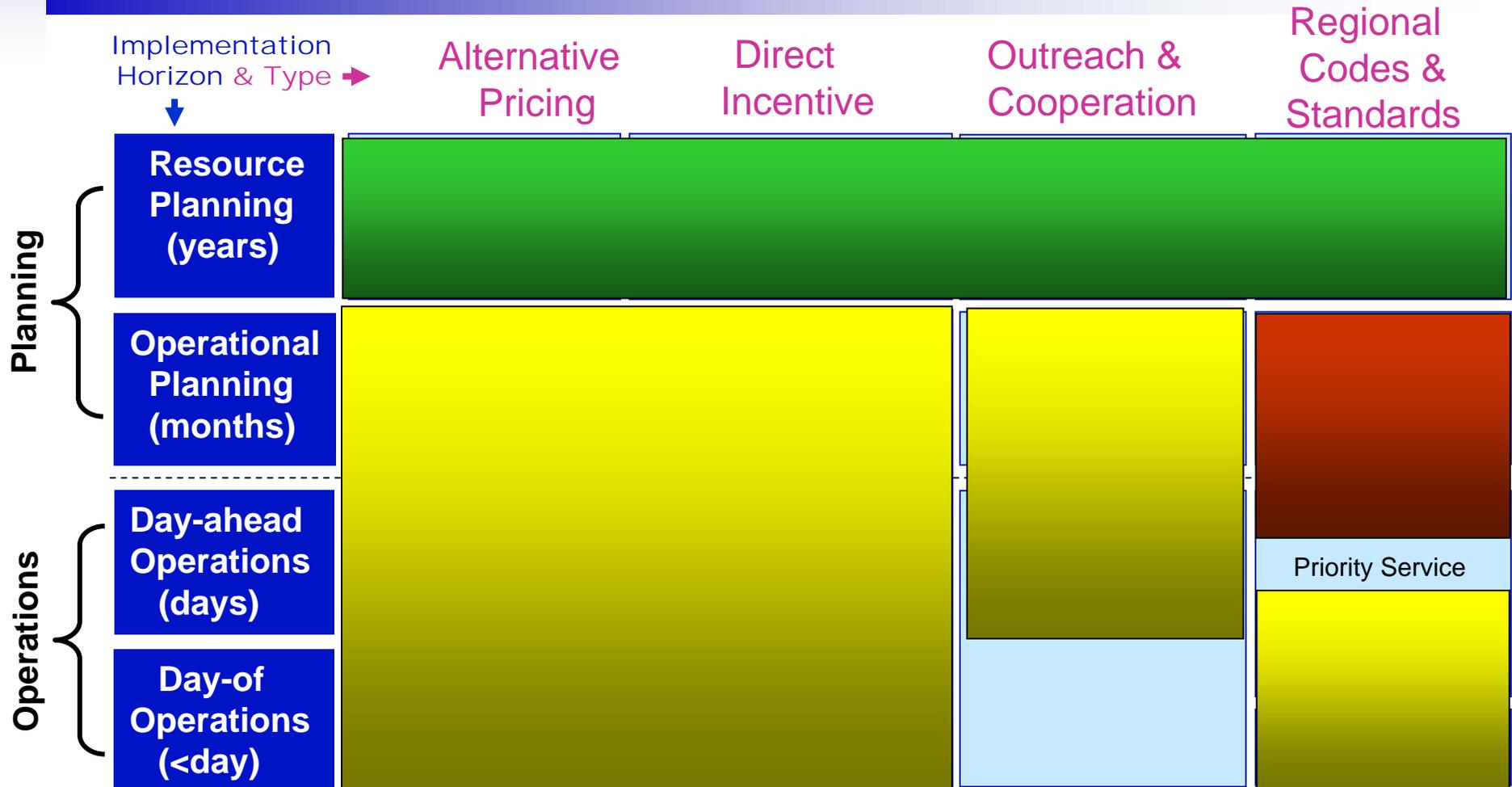
# Demand-Side Implementation Framework



# Extension of Demand-side Framework to include Renewable Programs

		Implementation Horizon & Type →	Alternative Pricing	Direct Incentive	Outreach & Cooperation	Regional Codes & Standards*
Planning	Resource Planning (years)		Alternative Pricing & Rate Structures Net Metering	<b>Paid for Adoption</b> Cash grant & Rebate Tax incentive Low-interest loan subsidized installation	Trade Ally Cooperation Direct Customer Contact Ads and Promotions Customer Education	Energy Efficiency Standards Renewable Port- folio Standards
	Operational Planning (months)		Time of Use (Seasonal)	<b>Paid for Performance</b> Seasonal Conservation Cr. Installed Capacity	<b>Public Conservation Appeal</b>	<b>Variable Service Subscription</b> Demand Subscription Service
Operations	Day-ahead Operations (days)		<b>Dynamic Pricing</b> CPP RTP	Aggregator Economic DR Demand Bidding of forward energy Emergency DR & Ancillary Services	<b>Public Appeal for Voluntary DR</b> Flex Alert	Demand Limiting Premium Power Priority Service OBMC
	Day-of Operations (<day)		<b>Discounted Rate</b> Interruptible Load Direct Load Control	Interruptible Load Direct Load Control		<b>Rolling Blackout</b>

# Application of Framework to Identify Gaps



 Domestic utility demand response program

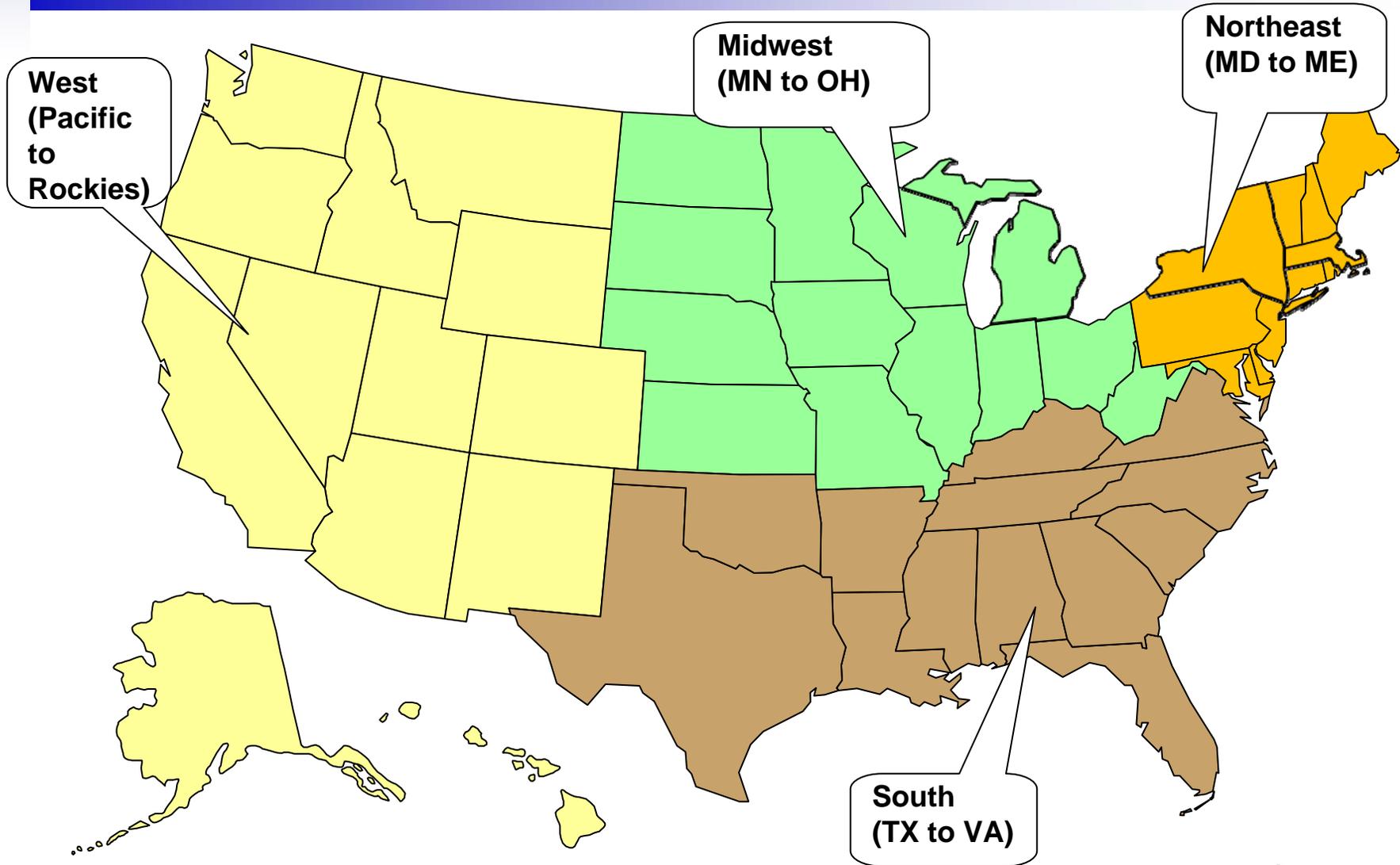
 Utility demand-side planning, state policies and incentives

 European utility examples (so far)

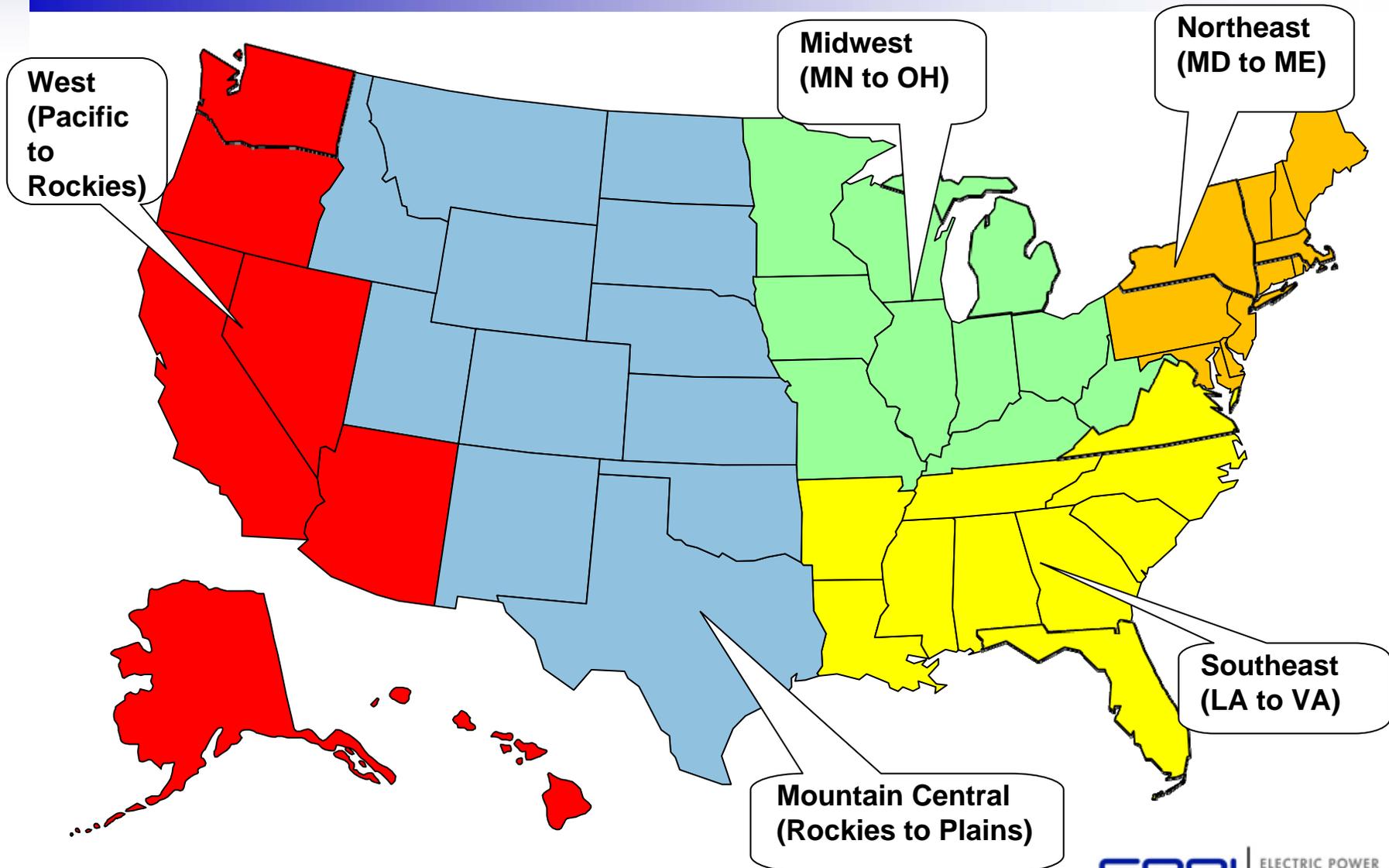
# Next Steps

- **Continue Secondary Research**
  - Develop table characterizing drivers supporting distributed resource integration
  - Data mining for regional activities
- **Regional Barriers and Activities**
  - Characterize regional results and vet via webcast
  - Survey additional utility programs and tariffs that support distributed resource integration
  - Refine regional boundaries for Workshop Invitations and Surveys
  - Primary research via interviews, survey monkey, and workshop feedback
- **Integration Framework**
  - Relate utility programs, retail tariffs, and pilot implementations
  - Identify trends and gaps
  - Identify characteristics of other implementations enabled by smart grids towards overcoming integration barriers

# Defining Regions for Workshops (Example)



# Defining Regions for Workshops (Alternate)



# Smart Grid Demonstrations of Distributed Resource Integration (TBD)





# Together...Shaping the Future of Electricity