

# **Woody Biomass Utilization Local Considerations & Challenges**

**RETECH**

**February 4, 2010**

# Some Considerations

- Dynamic landscape of policies and requirements at the federal, state, and local levels related to:
  - What biomass can be used
  - Air quality considerations, upfront and on-going
  - Federal and State energy policies
  - New federal climate change policies
- Know where siting facilities may be precluded given existing policies and environmental conditions
- Know availability of woody biomass and other forms of biomass
- Consider how other industries/uses will influence markets and prices (i.e., supply and demand)

# Challenges

- Availability of Woody Biomass and Competing Uses
- EISA Renewable Biomass Definition vs. Farm Bill Definition of Renewable Biomass
- Air Quality Regulations and Policies Relevant to Bioenergy Facilities
- Renewable Energy Standard

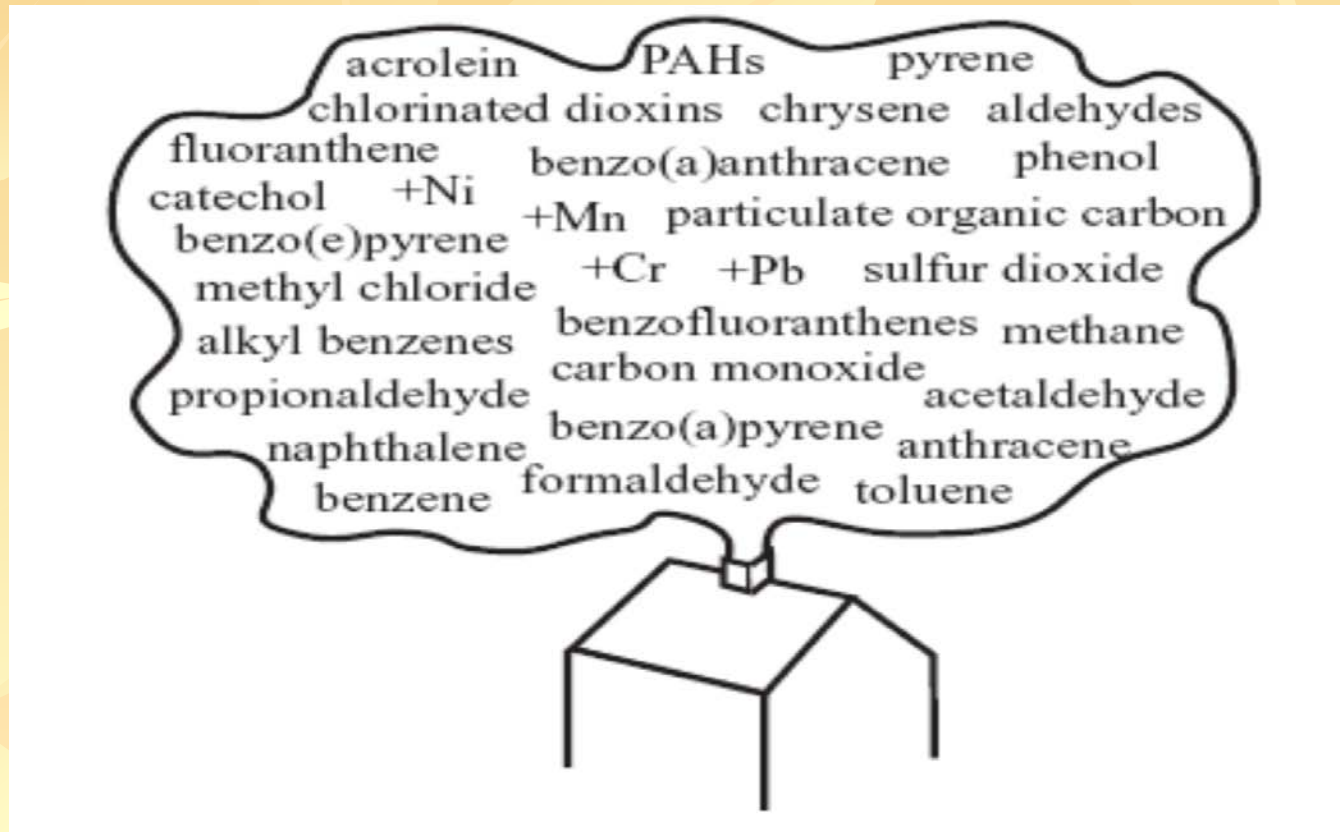
# Federal Legislative Definitions of Renewable Biomass Vary

- **EPAAct 2005**
  - no mention of whether biomass can be removed from Federal lands
  - six varying definitions of biomass, but essentially treats biomass either as:
    - a “waste material” of sorts
    - “any organic matter” in other definitions
- **EISA – Energy Independence and Security Act 2007**
  - Title II, Sec. 201(I)(i), Renewable Fuel Standard:
    - Woody biomass that is allowed to be used for purposes of the RFS program:
      - Slash and pre-commercial thinnings that are from non-Federal forestlands...but not forests or forestlands that are old-growth or ecologically sensitive forests
      - Biomass obtained from immediate vicinity of buildings or infrastructure in areas at risk of wildfire
      - Planted trees and tree residue from actively managed tree plantations on non-federal lands cleared any time prior to 12/19/2007
  - Title XII, Sec. 1201 and Sec. 1203(e)(z)(4)(A), Small Business Energy Programs:
    - Trees grown for energy production
    - Wood waste and wood residues
- **Tax Code**
  - From Title 26, Subtitle A, Chapter I, Subchapter A, Part IV, Subpart D, Sec. 45
    - ‘closed-loop biomass’ – any organic material planted exclusively for purposes of being used at a qualified facility to produce electricity
    - ‘open-loop biomass’ – any lignin material which is segregated from other waste materials and which is derived from forest-related resources: mill and harvesting residues, pre-commercial thinnings, slash, and brush
  - From Title 26, Subtitle A, Chapter I, Subchapter A, Part IV, Subpart E, Sec. 48
    - Biomass means (iii) other products of forest maintenance
- **2008 Farm Act, Title IX, Sec. 9001(12)**
  - Allows biomass removal from Federal lands as feedstock and allows the removal and development of woody biomass on Federal lands
  - Renewable Biomass
    - Materials, pre-commercial thinnings, or invasive species from National Forest System land and public lands...that are
      - By-products of preventive treatments
      - Would not otherwise be used for higher-value products
      - Are harvested in accordance with ... applicable law
      - Any renewable organic matter (including wood waste and wood residue) from non-Federal lands or Indian lands
- **ARRA** explicitly allocates \$50 Million in funding to promote increased utilization of biomass from Federal, State, and private lands

# Increased Demand for WBM Utilization

- Biomass has surpassed hydropower as largest domestic source of renewable energy & provides >3 % of total energy consumed in US
- Expanded focus of wood-fuel industry from residential to commercial and institutional applications
- National Fire Plan & Ten-Year Comprehensive Strategy
- Healthy Forest Restoration Act
- State Renewable Energy Portfolios & Legislative Initiatives

# Wood Burning and Air Quality



**Wood burning: complex mix of gases/particles including criteria pollutants  $PM_{10}$ ,  $PM_{2.5}$ ,  $SO_2$ ,  $NO_2$  and CO, and HAPs, including metals, PAHs, benzene, mercury and dioxins**

# Air Quality and Health

- Epidemiologic studies conducted in several cities showed an association between daily changes in concentration of ambient particulate matter (PM) and daily mortality counts.”<sup>1</sup>
- ↑ Air pollution, (PM 2.5, HAPs, other air toxics) =  
↑ Asthma, ↑ Heart attacks, ↑ mortality, ↑ morbidity, ↑ hospitalizations,  
↑ cancer risk<sup>2</sup>
- Short term exposure: asthma attacks, acute bronchitis, respiratory infection, heart attack, stroke<sup>3</sup>
- Long term exposure: reduced lung function, chronic bronchitis, premature death<sup>3</sup>
- U.S. Asthma prevalence: 12.9% of adults (2007); 8.3% of children (2004).<sup>4</sup> Asthma rates increased 75% from 1980-1994, and rates in children under five increased 160% during the same time.<sup>5</sup>
- Biomass burning in developing countries is a known cause of acute respiratory infections (ARI). Acute respiratory infections account for more than 6% of global burden of disease.<sup>6</sup>

1. The National Morbidity, Mortality, and Air Pollution Study: Methods and Methodologic Issues. U.S. EPA, NCER. [http://cfpub1.epa.gov/ncer\\_abstracts/index.cfm?fuseaction/display.abstractDetail/abstract/2398/report/0](http://cfpub1.epa.gov/ncer_abstracts/index.cfm?fuseaction/display.abstractDetail/abstract/2398/report/0)

2. State of the Air 2009. American Lung Association. <http://www.lungusa.org/assets/documents/publications/state-of-the-air/state-of-the-air-report-2009.pdf>

3. Particle Pollution and Your Health. [http://airnow.gov/index.cfm?action=particle\\_health.page1#3](http://airnow.gov/index.cfm?action=particle_health.page1#3)

4. Centers for Disease Control and Prevention. Behavior Risk Factor Surveillance System (BRFSS) Asthma Prevalence Data: 2007 and 2004. <http://www.cdc.gov/asthma/brfss/default.htm>

5. American Academy of Allergy, Asthma and Immunology. Asthma Statistics. <http://www.aaaai.org/media/statistics/asthma-statistics.asp>

6. Ezzati, M., Kammer, D.M. Quantifying the Effects of Exposure to Indoor Air Pollution from Biomass Combustion on Acute Respiratory Infections in Developing Countries. *Environmental Health Perspectives*, 2001.

# National Emission Standards for Hazardous Air Pollutants (NESHAPs)

- Section 112(k) of CAA lists area source categories that emit HAPs, including industrial boilers and institutional/commercial boilers
- Section 112(c)(6) list of categories accounting for 90% of emissions of 7 listed HAPs includes industrial boilers and institutional/commercial boilers
- Different approaches for new vs. existing sources:
  - New source standards reflect what is achieved by the best controlled similar source
  - Existing sources reflect what is achieved by the average of the best 12% of existing sources
- Different approaches for large (major) vs. smaller (area) sources
- EPA is directed by court order to propose rules by April 15, 2010 and take final action by December 16, 2010
  - Requires new NESHAPs for new and existing major and area sources of toxic air pollutants
  - It will be effective on the date it is proposed
- Both air toxic pollutant rules:
  - require limits based on “maximum achievable control technology” with later evaluations of remaining risk and stricter standards if needed (MACT)
  - Will use information on boilers and incinerators and emissions testing, including 37 biomass units



# Size Matters

## Major vs. Area Source

### Major Source

- Emits 10 TPY of a single hazardous air pollutant (HAP) or 25 TPY of total HAPs

### Area Sources

- Emit < 10 TPY of a single HAP or < 25 TPY of total HAPs

Under Section 112 (c)(6) source categories, MACT for both major and area sources applies to both industrial boiler and institutional/commercial boilers for

- Mercury
- POM
- Alkylated lead
- Hexachlorobenzene
- Polychlorinated biphenyls
- 2,2,7, 8 tetrachlorodibenzofurans
- 2,3,7,8 tetrachlorodibenzo-p-dioxin

### HAPs (Section 112 CAA)

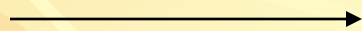
- Formaldehyde (known to occur from WBM)
- Hg
- Polycyclic Organic Matter
- Dioxins
- Acetaldehyde
- Polycyclic Aromatic Hydrocarbons (PAH)
- Benzene
- Metals

### Other Criteria Pollutants (Title I CAA)

- CO
- PM 2.5 and 10
- NOx
- SOx

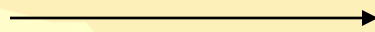
# Type of Woody Biomass Feedstock Matters

**Clean wood**



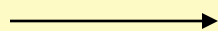
**Subject to Boiler MACT  
Standard**

**Discarded  
Wood**



**Subject to Commercial &  
Industrial Solid Waste  
Incinerator MACT  
Standard**

**WMB Co-fired  
with Coal**



**Subject to Utility MACT  
Standard**

# Type of Conversion Technology Matters

## Boilers

### Major sources

- Standards must be set for all emitted toxic air pollutants based on Maximum Achievable Control Technologies (MACT)

### Area sources

- Smaller sources may be regulated based on less stringent “generally achievable control technology” (GACT) (includes management practices)
- However, emission limits for mercury and polycyclic organic matter (POM) based on MACT

## CISWI

- Standards must be set for 9 specific pollutants, not all of which are “air toxics”
- No provision for GACT for smaller sources

# Environmental Conditions at Location of Facilities Matters

- Attainment vs. Non-attainment
  - Attainment area – a geographic area that meets or does better than the national ambient air quality standards
  - Non-attainment area – geographic areas where air pollution levels persistently exceed NAAQS
    - Generate maps at: <http://www.epa.gov/air/data/geosel.html>
  - Pollutants include:
    - 1 and 8 hour Ozone
    - Carbon Monoxide
    - Nitrogen Dioxide
    - Sulfur Dioxide
    - Particulate Matter PM – 10 and 2.5
    - Lead
    - All Criteria Pollutants

# Size and Amount of Emissions Matter

- Permitting mainly by State/Local agencies, except Tribal & Territories
- Construction Permits Required for new major or minor sources and modifications on existing sources
- Major Sources in Attainment Areas
  - Defined as emitting  $\geq 250$  TPY of a regulated pollutant  
 $\geq 100$  TPY for listed 28 source categories (including industrial/institutional/commercial boilers)
  - Construction requires Prevention of Significant Deterioration (PSD) permit
    - Best Available Control Technology and Air modeling impacts
    - Significant levels for NO<sub>x</sub> and SO<sub>x</sub> are 40 TPY
    - Significant levels for CO are 100 TPY
- New or modified Major Sources in Non-attainment Areas
  - Defined as emitting  $\geq 100$  TPY of the non-attainment pollutant
  - Construction requires Non-attainment New Source Review (NNSR) permit,
    - Lowest Achievable Emissions Rate (LAER)
    - offset provisions (often 2:1)
- Operating Permits – Title V, CAA
  - Sources emitting 100 TPY of any regulated air pollutant  
10 TPY of any hazardous air pollutant (HAP)  
25 TPY of combined HAPs

# Control Technologies Are Advantageous for Long-term WBM Use

- Area sources w/o control technologies can lead to non-attainment areas
- Non-attainment triggers States to develop required State Implementation Plans (SIPs) for achieving National Air Quality Standards (NAAQS)
- States and EPA carefully look at NSR permits
- Difficulty in siting large facilities;
  - Offset provisions hard to get
  - Offset emissions in a 2:1 ratio
- Maximizing technology efficiencies contributes to better short- and long-term air quality
- For more info on effective area source control technologies see: <http://www.4cleanair.org/>

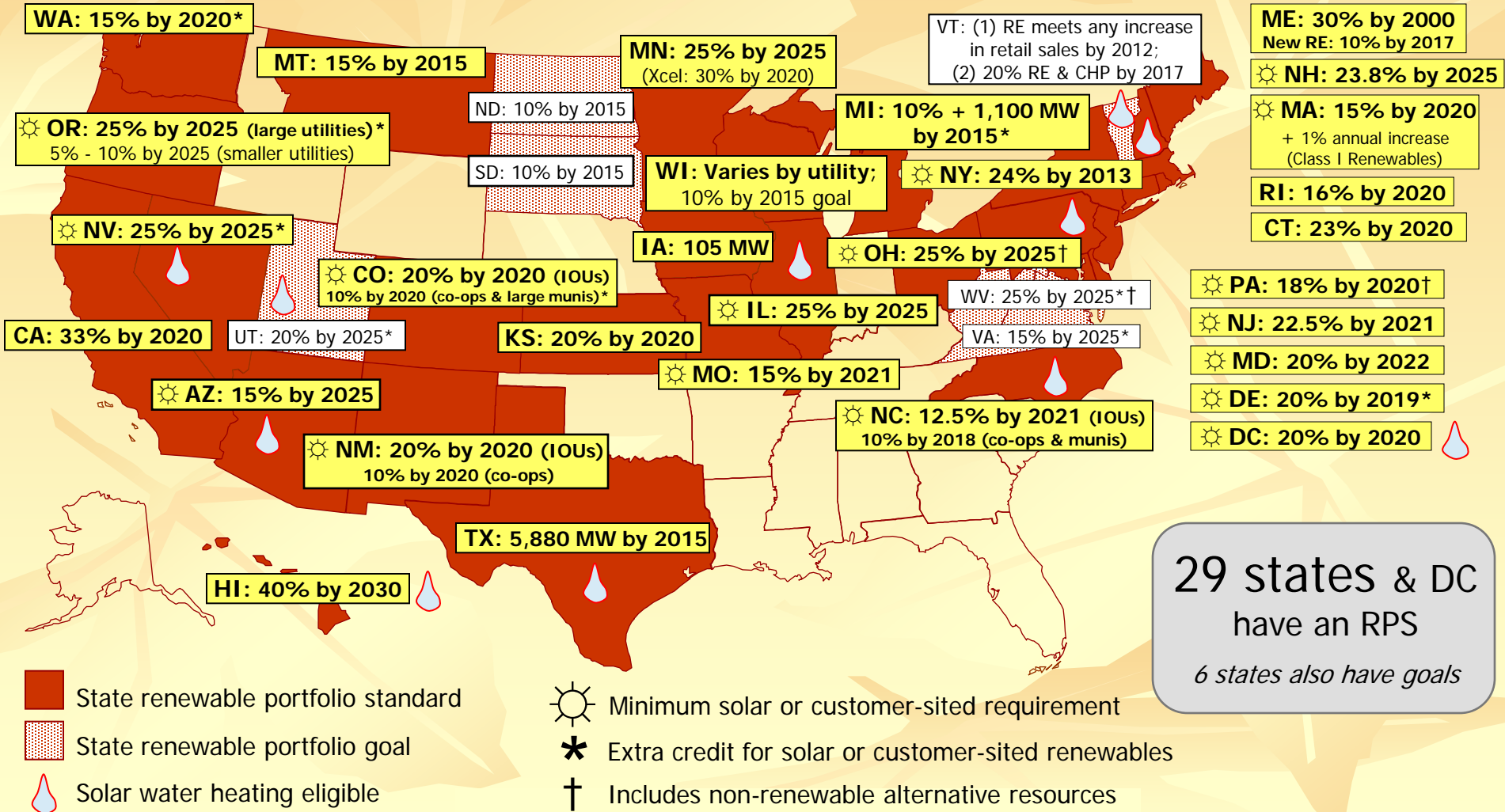
# Renewable Energy Standards

- Various RES/RPSs in 29 States + DC
- Variations in:
  - Definitions of eligible renewables
    - varies by State based on locally available cost-effective resources, economic development goals, etc.
  - Fuel diversity State goals for use of RE technologies (e.g., wind, solar, biomass, geothermal)
  - Pricing structures
  - In-state, in-region generation requirements vary
- Pros and Cons of a Federal RES
  - Pros:
    - Could increase minimum goals in states with a low RES if the Federal RES goals are aggressive
    - Encourage reliance on existing regional and state REC tracking systems
  - Cons:
    - Could Create Federal RECs distinct from state RECs for same MWh
    - Could create uncertainty about ownership of Federal RECs in existing contracts
    - Could create possible double-counting for alternative compliance payments

Source: Matt Clouse, Program Director, Green Power Partnership, Office of Air & Radiation, US EPA

# Renewable Portfolio Standards

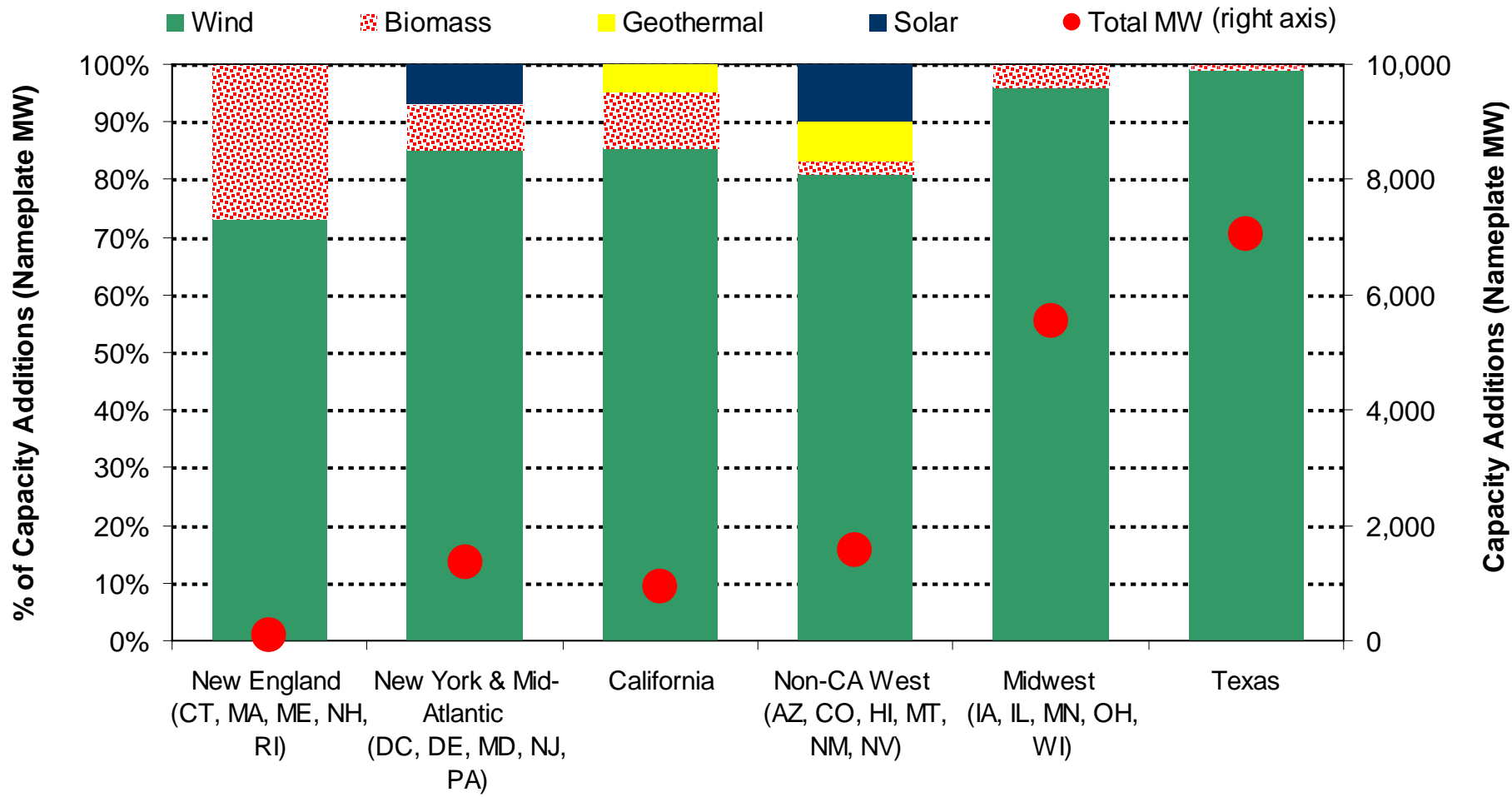
[www.dsireusa.org](http://www.dsireusa.org) / November 2009



**29 states & DC**  
have an RPS  
*6 states also have goals*



# More RPS-Driven Resource Diversity Is Apparent in Some Regions than in Others



**Note: The RED dots go with the right vertical axis**

# Lots of Considerations

- Availability and type of feedstock, including other demands for that particular resource
- Type of Conversion Technology Used
- Location – attainment / non-attainment
- Amount of btu input and State/local standards
- State/local Amounts and types of emissions
- State and local Renewable Energy Standards