NEW BIOMASS ENERGY REGULATIONS IN MASSACHUSETTS: CONTEXT FOR THE NORTHEAST

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NRDC & Partnership for Policy Integrity
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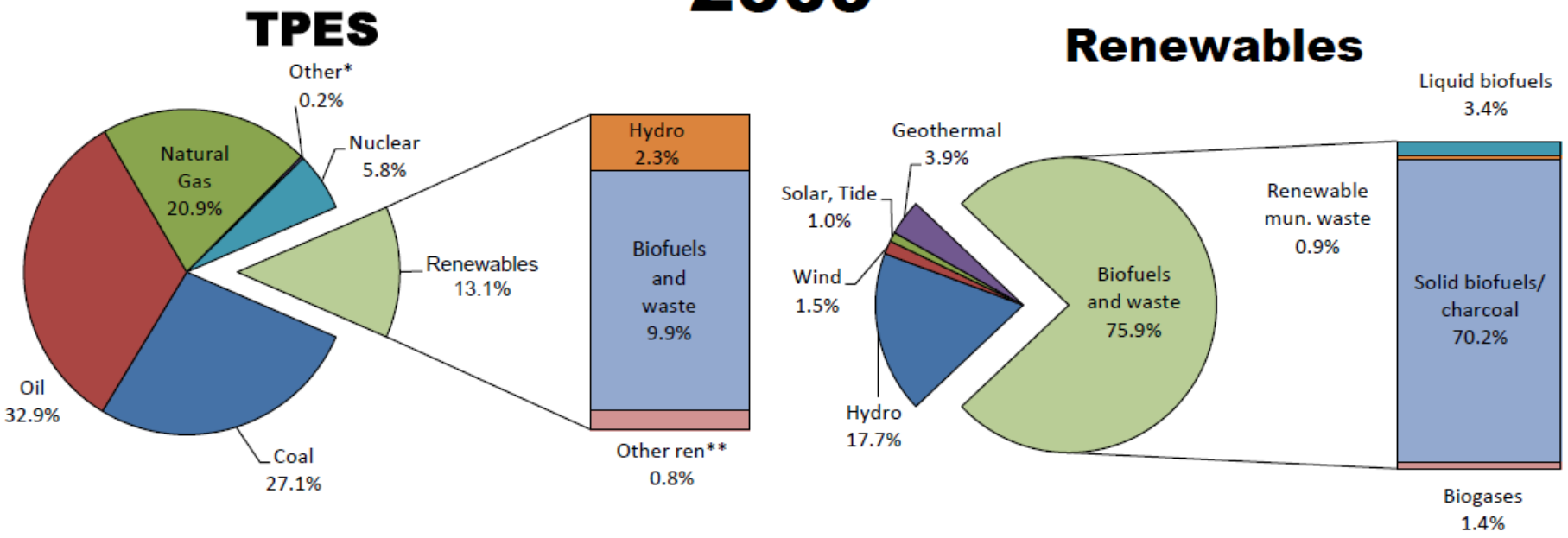
RENEWABLE FUELS IN THE WORLD, 2009



12,169 Mtoe

1,589 Mtoe

Majority of renewable energy from solid biofuels and hydroelectricity

"Biomass energy"

For the purposes of this talk:

- Combustion of wood and other biological materials to produce steam and generate heat and power; or gasification of fuel to drive a turbine. Not talking about biofuels—energy for transportation
- Combustion at "direct-fired" plants or as co-firing with coal
- "Biomass" = wood. Few facilities using agricultural residues or energy crops
- Considered "renewable energy": eligible for same incentives and subsidies as wind and solar power.
- Many have assumed its "carbon neutral" – now changing

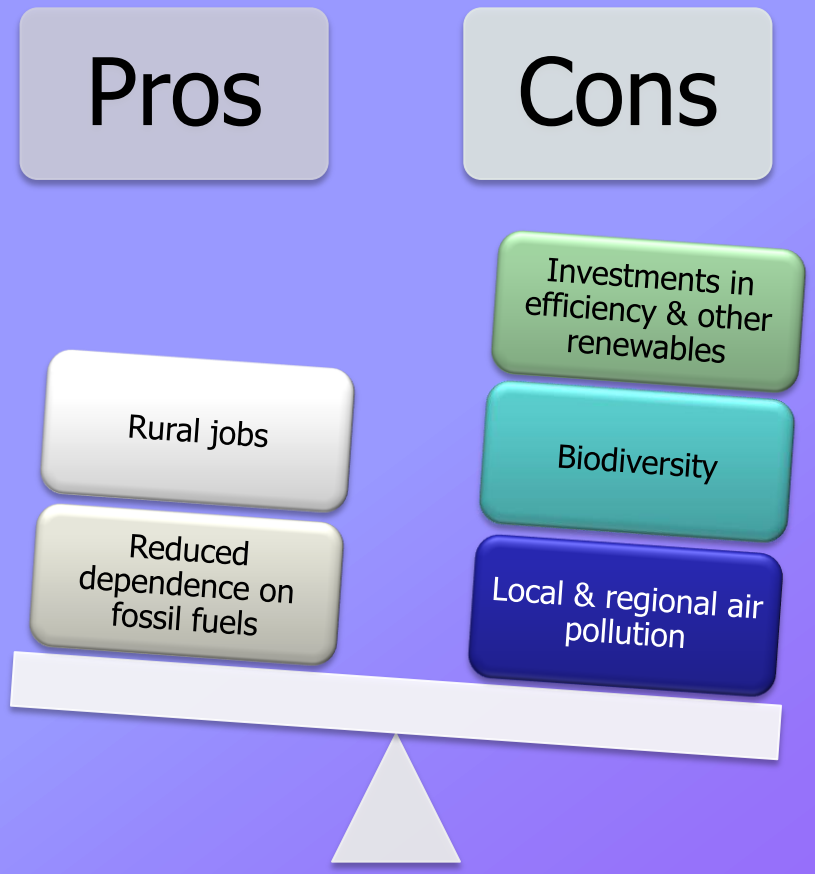
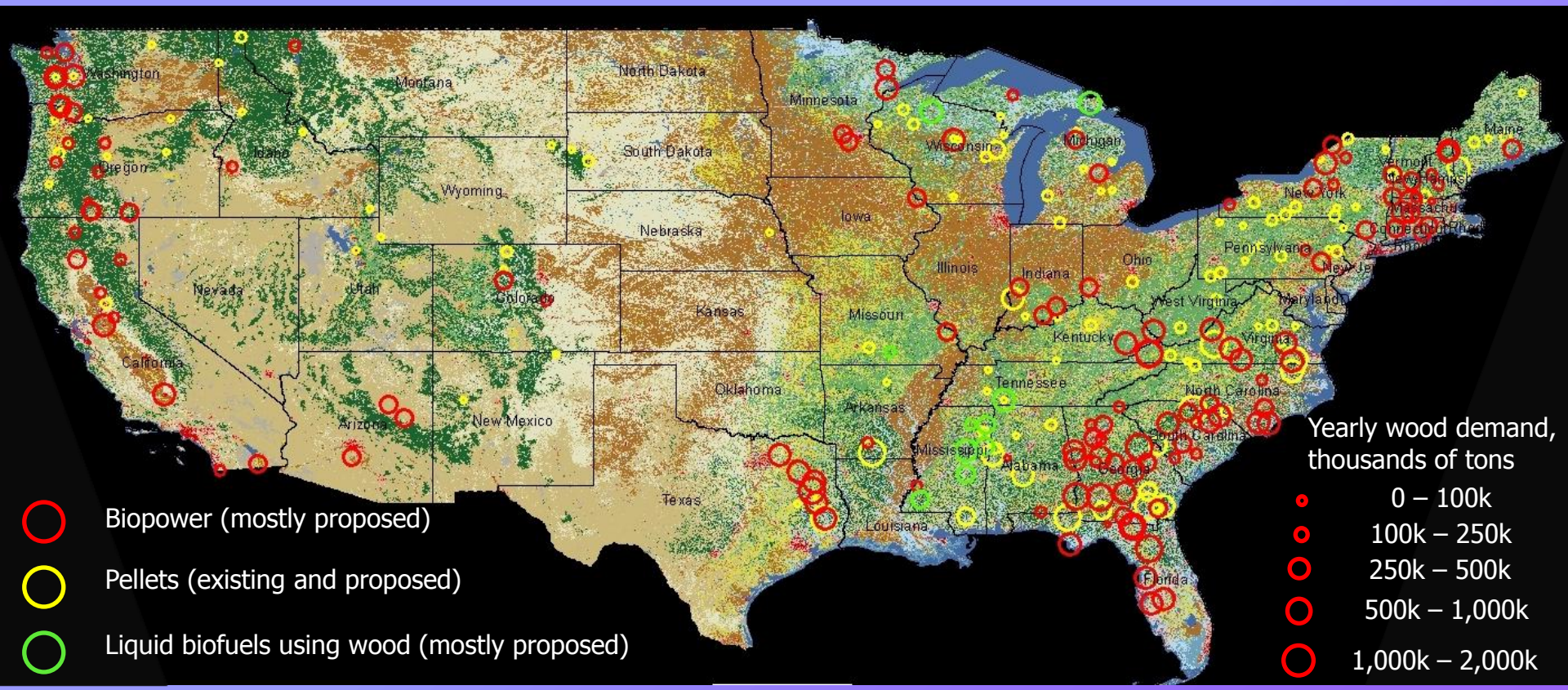
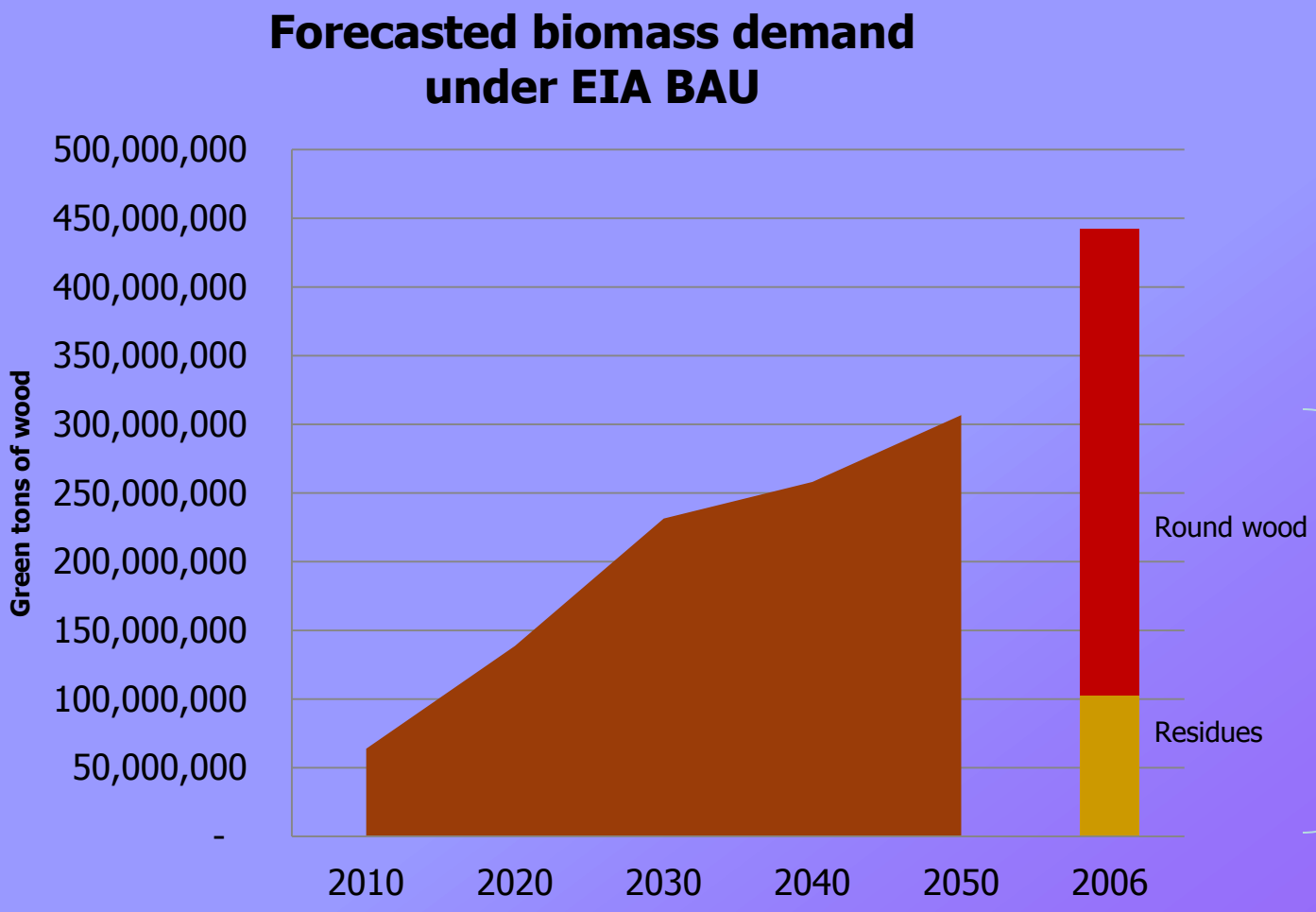

Pros
Cons
Investments in efficiency & other renewables
Rural jobs
Biodiversity
Reduced dependence on fossil fuels
Local & regional air pollution

Photo: Chris Matera, Massachusetts Forest Watch

Millions of tons of new demand for "energy wood"



PFPI
driven by data



739 TWh

Equivalent to 3.8 million acres per year (3.8 x RI)

Renewable energy credits, tax incentives

Promote renewable energy tech that:

- Reduce use of fossil fuels
- Foster energy independence
- Reduce greenhouse gas emissions

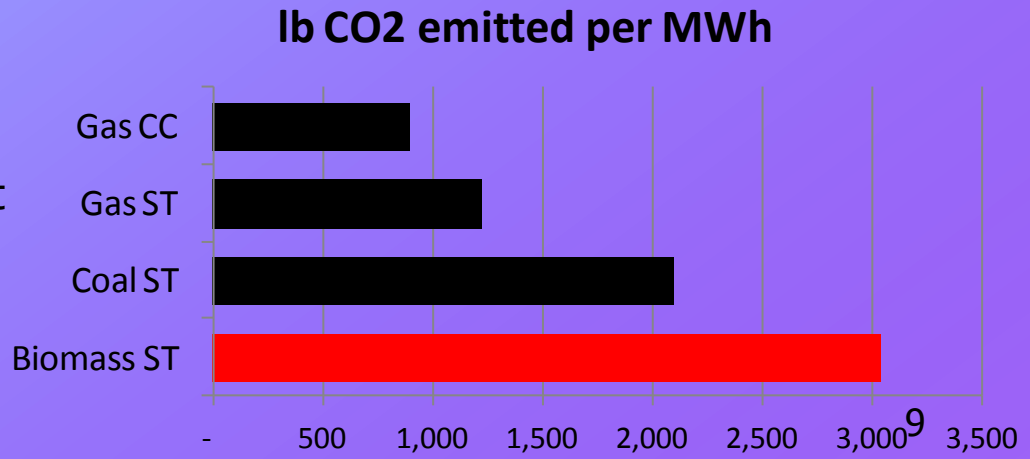
Biomass power facilities emit more CO2 than coal or gas facilities

	Fuel CO2 per heat content (lb/mmbtu)	Facility efficiency	Fuel mmbtu required to generate 1 MWh	Lb CO2/MWh
Gas combined cycle	117.1	0.45	7.54	**883**
Gas steam turbine	117.1	0.33	10.40	**1,218**
Coal steam turbine	205.6	0.34	10.15	**2,086**
Biomass steam turbine	213	0.24	14.22	**3,029**

A biomass plant emits

~150% the CO2 of a coal plant
~250% the CO2 of a gas plant
~ 340% the CO2 of a combined cycle plant

Fuel CO2 per heat content data are from EIA. Efficiency for fossil fuel facilities calculated using EIA heat rate data (http://www.eia.gov/cneaf/electricity/epa/epat5p4.html); biomass efficiency value is common value for utility-scale facilities.



Biomass industry CO_2 emissions, 2009

Fuel type	fuel (tons)	heat input (mmbtu)	CO2 emissions (tons)
Agricultural fuels	4,252,601	32,312,178	5,613,433
Wood solids	48,165,174	489,243,148	48,566,550
Pulping liquors	57,011,003	645,150,689	32,923,854
"other" biomass solids	1,981,226	20,853,306	1,997,736
Total	**111,410,004**	**1,187,559,321**	**89,101,573**

~260 facilities
~8,000 MW

Equivalent to combined reported power sector emissions from RI, SD, DE, AK, ME, NH, CT, HI, OR, WA, and NJ

Why has biomass energy been treated as "*carbon neutral*"?

- The "waste" argument: Materials burned are "waste" and would decompose/emit CO2 anyway
  - No *net* increase in CO2, but combustion is immediate, while decomposition takes years to decades.
- The "resequestration" argument: Forest growth takes up carbon released by burning
  - No net release of CO2, but resequestration takes decades to centuries.

Concerns in Massachusetts

- 3 large biomass plants proposed in Western MA
- Fuel/yr: 1.3 million tons forest wood; 255k tons C&D
- 135 MW combined; <1% of state's 2008 generation
- CO2 emissions: ~1.7 million tons/yr, 6.9% increase over power sector emissions

But MA Global Warming Solutions Act mandates 20% CO2 reduction by 2020, 80% by 2050.

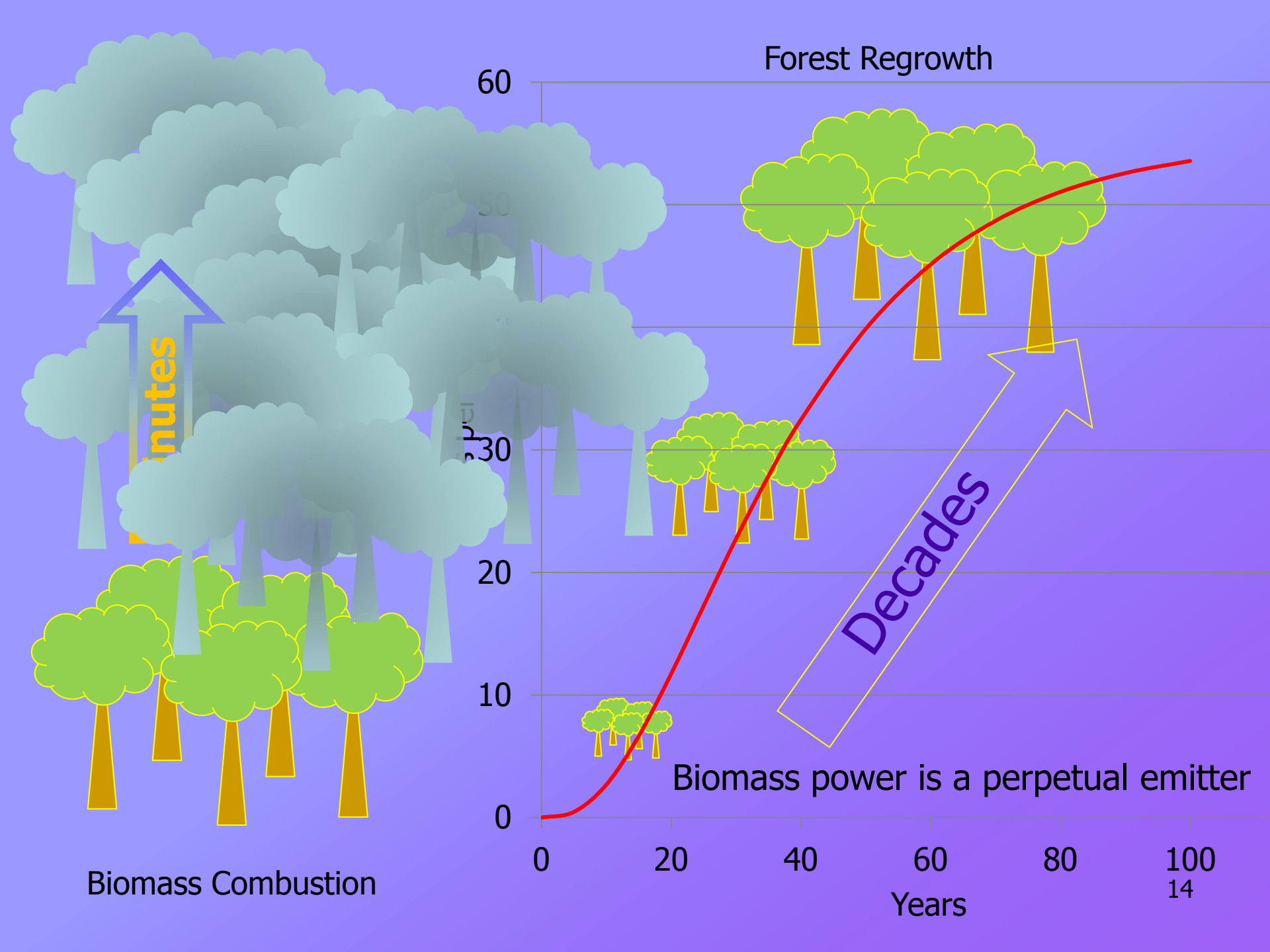
Massachusetts commissions Manomet Study

Modeling study using Forest Service data

- Examined "waste" wood and whole tree fuel
- Modeled forest carbon uptake following cutting
- Acknowledged forests *currently* take CO2 out of the atmosphere

Concluded: burning biomass creates a "carbon debt" relative to fossil fuels

- Time to repay debt depends on type of biomass ("waste" wood vs. whole trees), boiler efficiency


Forest Regrowth
60
30
20
10
0
0
20
40
60
80
100
Years
Decades
Biomass power is a perpetual emitter
Biomass Combustion

25-ACRE CLEARCUT, MAINE

~ 1,700 green tons biomass
Enough fuel to power a 50-MW biomass plant for ~21 hours

Little regrowth after almost ten years

Biomass electricity plant CO2 emissions "worse than coal" for decades

Years to Achieve Equal Flux with Fossil Fuels				
Harvest Scenario	Fossil Fuel Technology			
	Oil (#6), Thermal	Gas, Thermal	Coal, Electric	Gas, Electric
Mixed Wood	15 - 30	60 - 90	45 - 75	>90
Logging Residues Only	<5	10	10	30

High efficiency boilers fueled with "waste" wood have shortest carbon payback times

Biopower creates carbon debt

Manomet Study: Northeastern Forests

When using whole trees as fuel, net CO2 emissions **exceed coal emissions for more than 45 years, and exceed gas emissions for more than 90 years**, even taking forest regrowth into account.

Southeastern Study (Colnes et al, 2012)

Executive summary: *"The expanded biomass scenario **creates a carbon debt that takes 35-50 years to recover.** This outcome depends on the fossil fuel pathway used for comparison and assumes forests re-occupy the site through planting or natural regeneration, with no forest land conversion."*

Do carbon accounting wrong, and you end up with this…

Rhymes with Orange

by Hilary Price | About

Give us Feedback

Massachusetts biomass regulations

Efficiency

- 50% efficiency to qualify for ½ REC/MWh (60% for full REC)
  - Promotes combined heat and power

GHG emissions accounting

- Accounts for carbon debt of whole tree harvesting
- Requires 50% reduction in GHGs over 20 yrs compared to combined cycle natural gas facility

Harvesting Sustainability

- Amount of biomass harvested as % of forest products harvested depends on soil conditions
- Protection old growth, steep slopes; retention of naturally down woody material, den trees
- Harvest plans/fuel sourcing plans required

No construction-demolition-derived fuels

RPS eligibility for biopower in New England and New York

- **Massachusetts**: Class I: "low-emissions, advanced power conversion technology using eligible biomass fuel." Rigorous PM and NOx emissions standard; Class II: same emission standard.
- **Maine**: Few if any restrictions on biomass power. Class I: post-2005 facilities; Class II: older facilities
- **New Hampshire**: Biomass excludes construction and demolition wood. Class I: restrictions on NOx and PM emissions. Class III: pre-2006 biomass up to 25 MW. Have added thermal to RPS.
- **Vermont**: No RPS; Sustainably Priced Energy Enterprise Development (SPEED) program requires utilities to purchase power from in-state eligible tech up to 2.2 MW. Biomass required to be 50% efficient.
- **Rhode Island**: Eligible biomass: diverse suite of wood, ag waste; facilities must maintain compliance with air permits
- **Connecticut**: Class I: "Sustainable" biomass; Class II:pre-1998 trash-to-energy, biomass with lenient NOx limit.
- **New York**: Main Tier: Post-2003 facilities; some pre-2003 facilities if can demonstrate financial need. Some mixed C&D allowed.

Number of RPS-eligible biomass facilities

Massachusetts: 3 facilities:

- Schiller, NH (50 MW)
- Seaman Paper, MA (small CHP)
- Covanta W. Enfield, ME (27.5 MW)

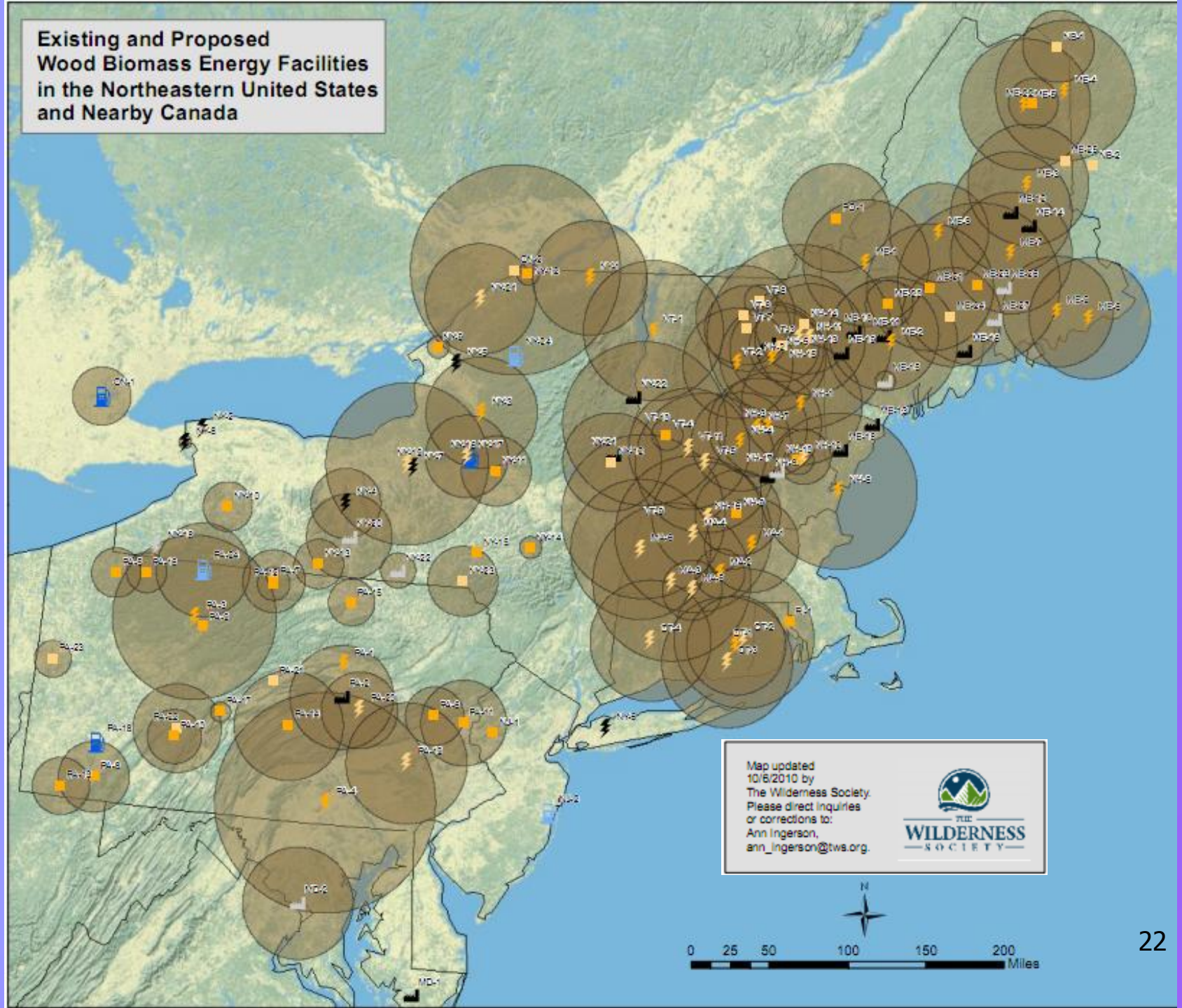
Maine: 19

Connecticut: 13

New Hampshire: 3

New York: 2

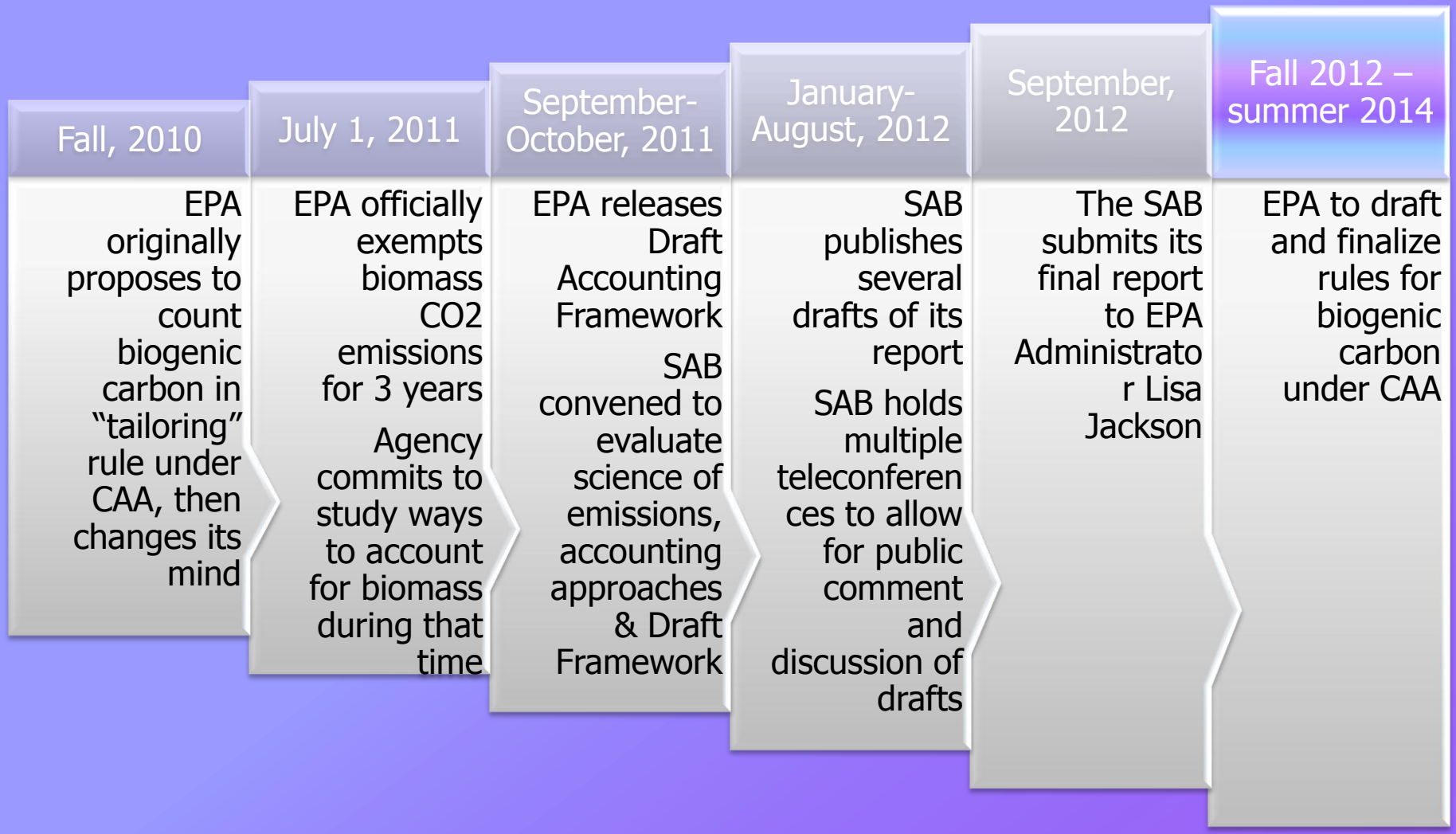
Rhode Island: 2


Existing and Proposed
Wood Biomass Energy Facilities
in the Northeastern United States
and Nearby Canada
Map updated
10/6/2010 by
The Wilderness Society.
Please direct inquiries
or corrections to:
Ann Ingerson,
ann_ingerson@tws.org.
THE WILDERNESS SOCIETY
N
0 25 50 100 150 200
Miles

New facilities use whole trees for fuel

- Burgess BioPower, Berlin NH: 70 MW (under construction)
  - **~850,000 green tons/yr**
  - Air permit*: "113 tons 'whole log' chips/hr"*
- Winstanley plant, North Springfield VT: 30 MW (proposed)
  - **~430,000 green tons/yr**
  - *"If the PSB or the legislature placed harvest standard restrictions on new biomass electric facilities located in Vermont – or if the North Springfield Energy Project adopts such standards voluntarily – it is likely the cost for fuel would increase"* (INRS Biomass Availability Study for North Springfield Vermont)
- Beaver Wood Energy/Pellet plant, Fair Haven, VT: 34 MW, + 115,000 tons pellets (proposed)
  - **~600,000 green tons/yr**
- Russell Biomass, Russell, MA: 50 MW (proposed; likely won't be built)
  - **~630,000 green tons/yr**
  - Air permit*: "The expected total volume of whole tree fuel to be purchased will be 250,000-350,000 tons per year."*

Timeline of EPA's process



Key Science Advisory Board findings

Biomass cannot be assumed *a priori* to be carbon neutral.

EPA's regional approach to assessing the carbon impacts of bioenergy scientifically unjustified—biopower plants cannot be given credit for forest growth that would be happening anyway without increasing net carbon emissions to the atmosphere.

Biomass should be disaggregated into categories based on carbon turnover rates; for whole trees, need to compare to an "anticipated future" baseline in order to capture only *additional* carbon sequestration.

Focus on the importance of considering time scales in EPA's policy choices about regulating biogenic CO2 emissions.

Moving forward

As EPA works to finalize biomass carbon accounting rules, the agency must:

- Write rules for biogenic CO2 sources that are consistent with the key scientific conclusions of the SAB.
- Look to nation-leading biomass standards, such as those in Massachusetts, as a blueprint.
- Recognize the urgent need for near-term emission reductions.
- Account for leakage emissions, including those attributable to indirect land use change.

Why this matters

The last two years have seen significant advances in the science examining the CO2 emissions of different biomass types for energy production. These advances have clarified that:

Burning whole trees in esp in low efficiency power plants increases CO2 emissions relative to fossil fuels for anywhere from 40 to 100 years or more.	The large-scale burning of wood for electricity will accelerate industrial logging, threatening our forests.	Forest are already one of our best defenses against global warming, absorbing more than 13% of our economy-wide GHG emissions each year.

In addition, a major shift to wood as an energy source could undermine efforts to expand clean and low-carbon energy sources, such as solar and wind. Likewise, the rules EPA adopts for U.S. bioenergy facilities, will likely serve as a model for other countries.

Effect of Massachusetts & EPA regulations on the biopower industry?

Remains to be seen, but in a carbon constrained world these regulations are as important for economic efficiency as climate

- Biopower facilities are expensive and projected to remain dependent on public policies
- Wrong policies will waste money
  - Not just slow reductions but speed emissions
- Right policies will create lasting jobs, safer and healthier environment

References for "New biomass energy regulations in Massachusetts: Context for the Northeast"

October 22, 2012

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Graphic: Renewable fuels in the world

Source:

Map: millions of tons of new demand for "energy wood"

Facilities from FORISK database and PFPI research

Forecasted biomass demand

Data on biomass buildout from EIA NEMS modeling for business as usual, 2012; estimates of roundwood harvesting and residues from Smith, W.B., et al. 2007. Forest Resources of the United States, 2007. United States Forest Service, Gen.Tech Report WO-78. December, 2008..

Biomass versus fossil fuel CO2 emissions

Fuel CO2 per heat content data are from EIA, Electric Power Annual, 2009: Carbon Dioxide Uncontrolled Emission Factors (http://www.eia.gov/cneaf/electricity/epa/epaxlfilea3.pdf - link no longer active). Efficiency for fossil fuel facilities calculated using EIA heat rate data (http://www.eia.gov/cneaf/electricity/epa/epat5p4.html); biomass efficiency value is common value for utility-scale facilities.

Biomass industry CO2 emissions

Fuel use, mmbtus, from 2009 EIA-923 Monthly Time Series File. CO2 emissions calculated making standard assumptions about moisture content and carbon content of fuels.

Biomass electricity plant net emissions "worse than coal"

Walker, T. "Manomet & Biomass: Moving Beyond the Soundbite". USDA Bioelectricity and GHG Workshop, Washington, DC. November 15, 2010.

Biopower creates carbon debt

Manomet study available at http://www.manomet.org/manomet-study-woody-biomass-energy

Southeastern study available at http://www.southernenvironment.org/uploads/publications/biomass-carbon-study-FINAL.pdf

Massachusetts biomass regulations

MA DOER biomass regulations posted at http://www.mass.gov/eea/energy-utilities-clean-tech/renewable-energy/biomass/renewable-portfolio-standard-biomass-policy.html

RPS eligibility criteria in different states

Information on state RPS programs from various documents and sources; a good basic source is http://www.dsireusa.org/

Number of eligible facilities

Data for New England is from NEPOOL-GIS public reports (http://www.nepoolgis.com/)

Biopower facilities in development

Data on facilities in development from Forisk database (www.forisk.com)

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