

# CARBON AND FOREST IMPACTS OF BIOMASS ENERGY

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Partnership for Policy  
Integrity

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# Questions about bioenergy

- Can bioenergy be “carbon neutral”?
- Is bioenergy “clean”?
- Does harvesting for biomass impact forests?
- What role for bioenergy in the Clean Power Plan?

# A scary few weeks if you care about climate

*Scientists Warn of Perilous Climate Shift Within Decades, Not Centuries*

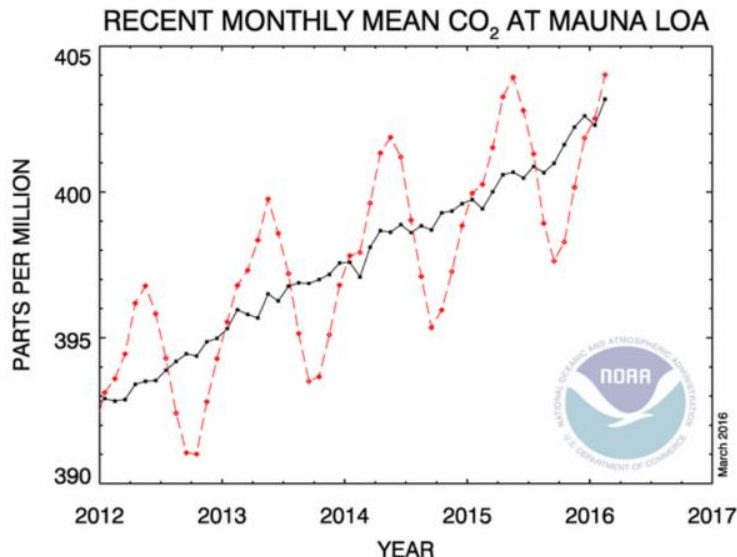
*The New York Times* March 22, 2016

*Climate Model Predicts West Antarctic Ice Sheet Could Melt Rapidly*

*The New York Times* March 30, 2016

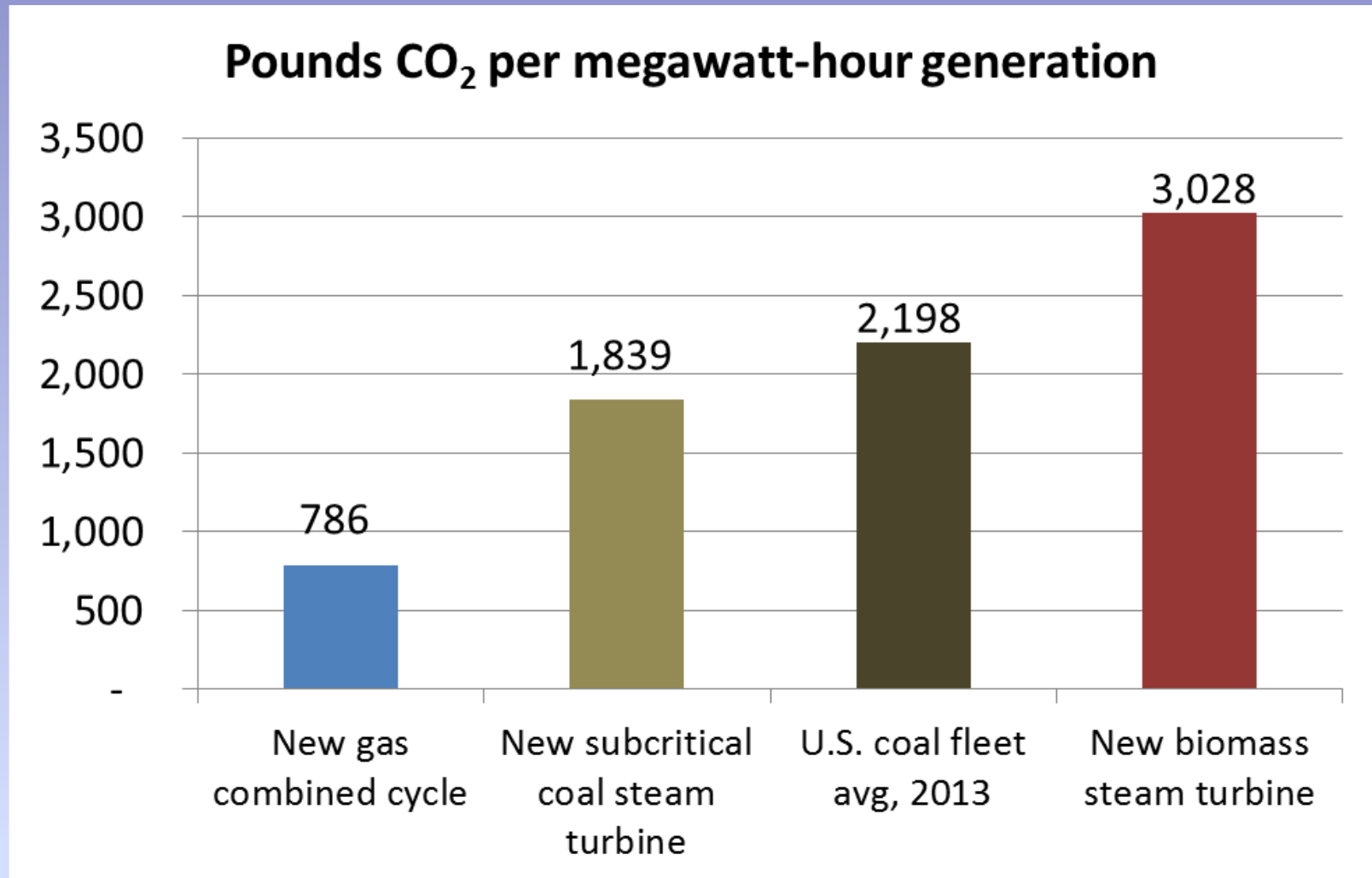
## Atmospheric carbon dioxide levels are showing a startling increase

*The Washington Post* March 10, 2016



“Atmospheric carbon dioxide concentrations have spiked more in the period from February 2015 to February 2016 than in any other comparable period dating back to 1959”

# Biomass power plants emit more CO<sub>2</sub> per megawatt-hour than coal or gas facilities



Biomass plants being built today emit **~65%** more CO<sub>2</sub> per MWh than modern coal plants, and **~285%** more than natural gas combined cycle plants



**Forest wood:  
50 MW McNeil plant, Burlington VT  
~625,000 green tons/year trees and residues**



**Pulp and paper wastes + wood  
Verso Androscoggin Mill, Jay, ME  
Mostly black liquor and wood; also natural gas  
paper mill sludge, waste oil**



Dust from wood chipping

# Tires, Waste wood: 18 MW L'Anse Warden plant, MI

## Tires, waste wood, and creosote- and pentachlorophenol-treated railroad ties

(EPA Region 5 currently investigating this plant: <https://www.epa.gov/mi/lanse-warden-power-plant>)



Railroad ties and waste wood



Soot-blowing

# Emissions from Maine biomass plants, 2012

(EPA “EGRID” data; boilers burning forest wood, waste wood, and black liquor)

Plant name	NOx (tons)	SO2 (tons)	CO2 (tons)
Androscoggin Mill	1,040	3,337	1,514,723
Domtar - Woodland Mill	358	1,669	589,808
East Millinocket Mill	270	51	192,179
Indeck Jonesboro Energy Center	80	3	85,226
Indeck West Enfield Energy Center	191	7	201,167
Lincoln Paper & Tissue	265	1,041	431,574
Red Shield Envir Old Town Facility	517	1,123	575,522
ReEnergy Fort Fairfield	467	54	316,280
ReEnergy Livermore Falls	105	53	311,313
ReEnergy Stratton LLC	143	74	433,381
Rumford Cogeneration	544	2,553	854,890
S D Warren Westbrook	620	300	358,553
Verso Paper	287	41	263,020

**Total, wood and black liquor boilers**      **4,889**      **10,308**      **6,127,636**

**Other power boilers (incl tires, garbage)**      **2,611**      **10,673**      **4,103,382**



# Typical arguments for “carbon neutrality” of bioenergy

- **Materials burned are “wastes” or “residues”** – and would decompose and emit CO<sub>2</sub> anyway.
  - But - combustion is instantaneous while decomposition takes years to decades.
- **Future forest growth (or other plant growth) will resequester carbon released by burning.**
  - But - forest regrowth takes decades to centuries

**Bioenergy carbon benefits depend on future offsetting of emissions**

# Manomet Study: Net CO<sub>2</sub> emissions from biopower exceed fossil fuel emissions for decades

<b>Years to Achieve Equal Flux with Fossil Fuels</b>		
<b>Fuel Source</b>	<b>Coal, Electric</b>	<b>Gas, Electric</b>
<b>Whole trees and logging residues</b>	45 - 75	>90
<b>Logging Residues Only</b>	10	30

Time to parity with coal emissions >45 years;  
time to parity with gas emissions > 90 years.

Massachusetts eliminated subsidies for low-efficiency biomass power after this study (retained subsidies for combined heat and power bioenergy).

1994: Global avg CO<sub>2</sub> = 358.8 ppm\*

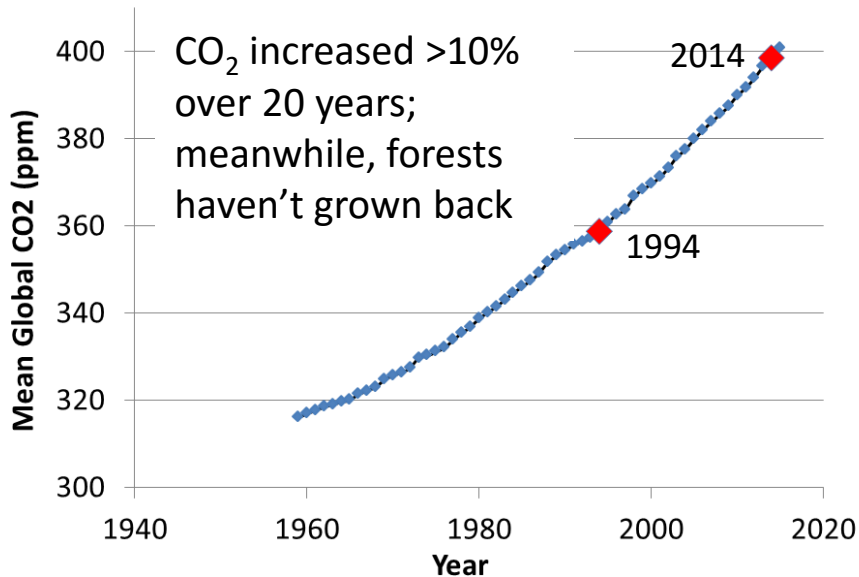


Gifford Pinchot National Forest, WA  
46.264868°, -121.941855°

25 acres - enough biomass to fuel  
a 50 MW plant for ~40 hours

\* [ftp://aftp.cmdl.noaa.gov/products/trends/co2/co2\\_annmean\\_mlo.txt](ftp://aftp.cmdl.noaa.gov/products/trends/co2/co2_annmean_mlo.txt)

2014: Global avg CO<sub>2</sub> = 398.6 ppm



# Bioenergy advocates want biomass emissions legislated as zero...

...While telling EPA that modeling must use 100-year timeframe

EPA must consider the carbon impacts of biomass using  
*“a national scale and a 100-year timeframe.”*



*“EPA should assess the net growth for timberlands based on long temporal horizons. A 100-year time horizon should be used for assessing the net benefits of using biomass as well as the net biogenic CO2 emissions.”*





## **Enviva pellet plant, Ahoskie, North Carolina – 78% hardwood**

Photo: Dogwood Alliance ([www.dogwoodalliance.org](http://www.dogwoodalliance.org))

Pellet industry harvesting in North Carolina: *“Little remains but stumps and puddles in what was once a bottomland hardwood forest”*



Joby Warrick, Washington Post 6/2/2015

*“How Europe’s climate policies led to more U.S. trees being cut down”*

# 3,000 MW Drax coal/wood plant, Yorkshire, UK

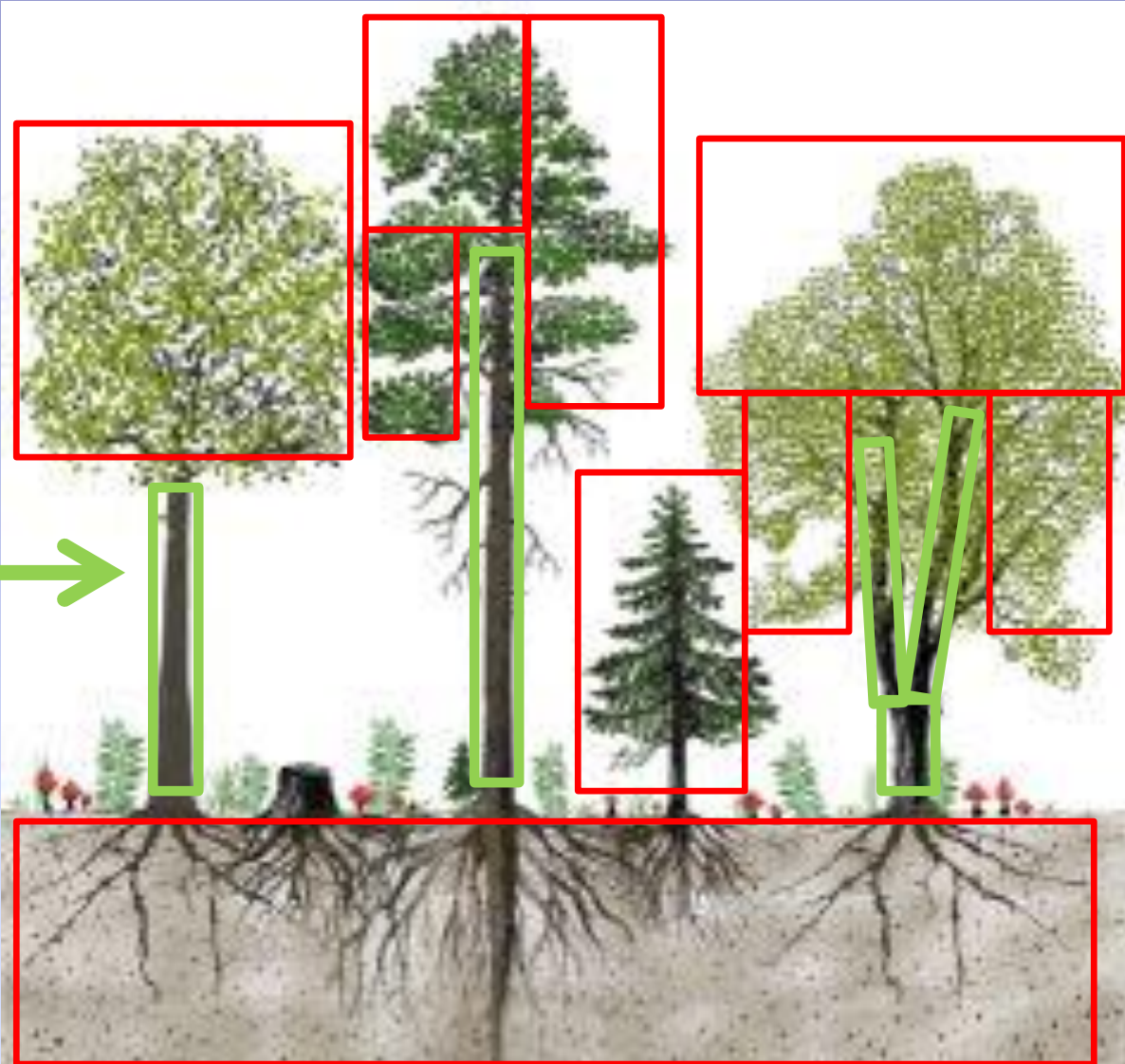


April 2014 – March 2015: Drax burned **4.8 million tons of biomass\***  
95% wood pellets, mostly from US and Canada

\* Data from UK Office of Gas and Electricity Markets (OFGEM)

# Wood pellets: counting just stack emissions undercounts carbon impacts

Biomass that is harvested and burned for process heat, or left onsite to decompose



Large-diameter roundwood suitable for pellet manufacture



Each ton of biomass carbon emitted from the smokestack represents **~2.85 tons total biomass carbon lost** (does not include fossil carbon burned in manufacturing, transport)



# 4<sup>th</sup> INDUSTRIAL WOOD PELLETS for COAL PLANT CO-FIRING/CONVERSIONS

A Renewable/Dispatchable Pathway to  
Compliance for Utilities & IPPs

JUNE 16-18, 2015 | MINNEAPOLIS MARRIOTT WEST | MINNEAPOLIS, MN

## THE NEW NORTH AMERICAN WOOD PELLET MARKET: THE EASY SOLUTION FOR UTILITIES & IPPS WITH AGING COAL PLANT ASSETS

- Get the Latest on the EPA's Clean Power Plan (CPP), 38+ State Renewable Portfolio Standards (RPS)/RPS variants, and other regulations impacting Coal Plant owners
- Learn how modifying pulverized coal power plants to utilizing industrial wood pellets can provide the lowest cost renewable and dispatchable power for CPP and RPS compliance
- Leading pellet producers discuss the prospects of the emerging North American market and outline benefits of the different types of pellets used following conversion
- U.S. and Canadian forest landowners provide perspectives and their projections for sustainable supplying a North American market
- Hear case studies from Utilities and Independent Power Producers (IPPs) who have successfully converted or are considering converting to wood pellets for power generation or co-firing

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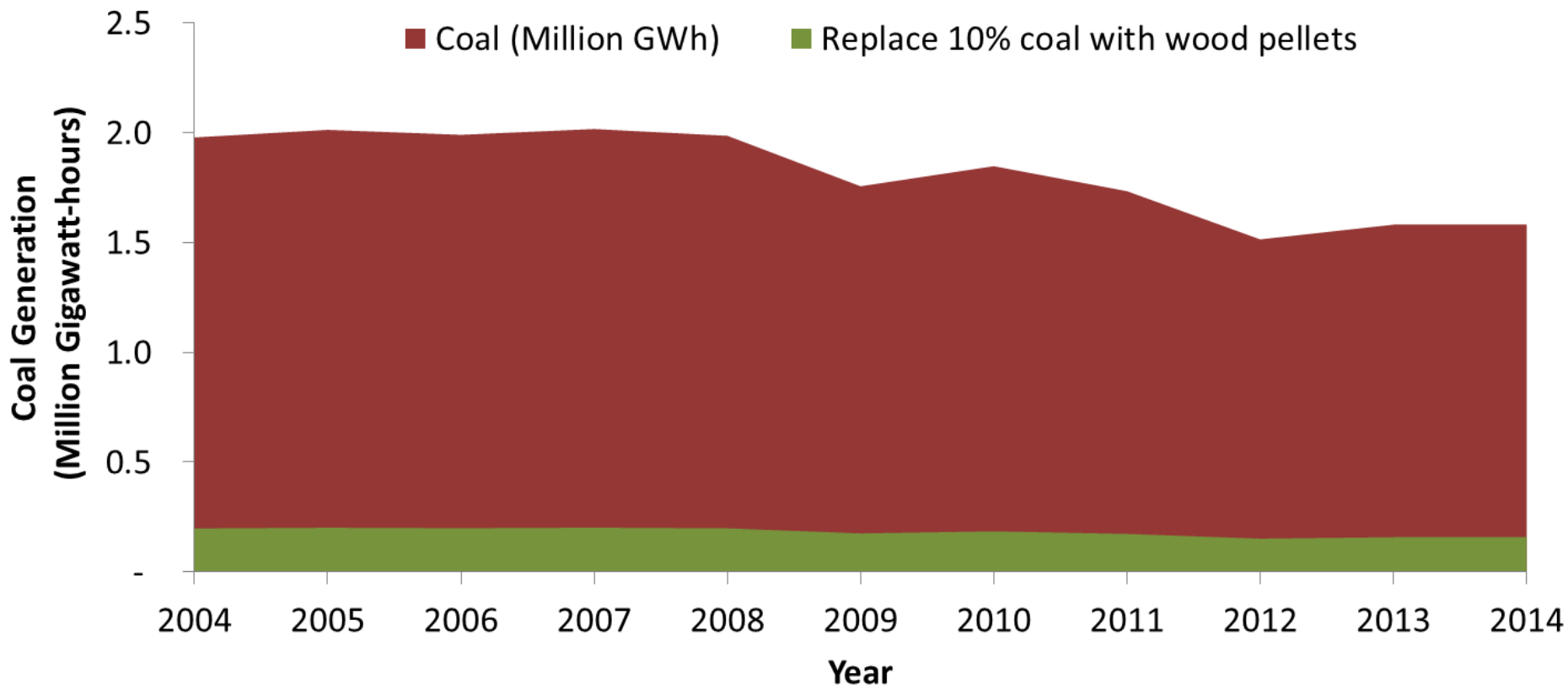
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# Replacing 10% of US coal power with wood pellets 2004 – 2014 would require cutting millions of acres of forest



**Total wood over 10 years: 3.3 billion tons**

**Total forest acres over 10 years: 39.2 million acres\***

**Total biomass CO2 over 10 years: 4.0 billion tons**

\*the equivalent of clearcutting 90% of timberland in Georgia and North Carolina

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