

# **Manomet & Biomass: Moving Beyond the Sound Bite**

Presentation to:  
Northeast Sustainable Energy Association

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# Overview & Learning Objectives

- *Summary*—Manomet approach and conclusions.
- *Response to critics*—issues of temporal and spatial scales; lifecycle assessment boundaries, and baselines for analysis.
- *Moving ahead*—a few considerations in translating GHG accounting insights into biomass energy policies.

# Forest Biomass Carbon Accounting

## What's the Issue Addressed by Manomet?

*What is the greenhouse gas (GHG) impact of substituting renewable forest biomass for fossil fuels in the Massachusetts energy sector?*

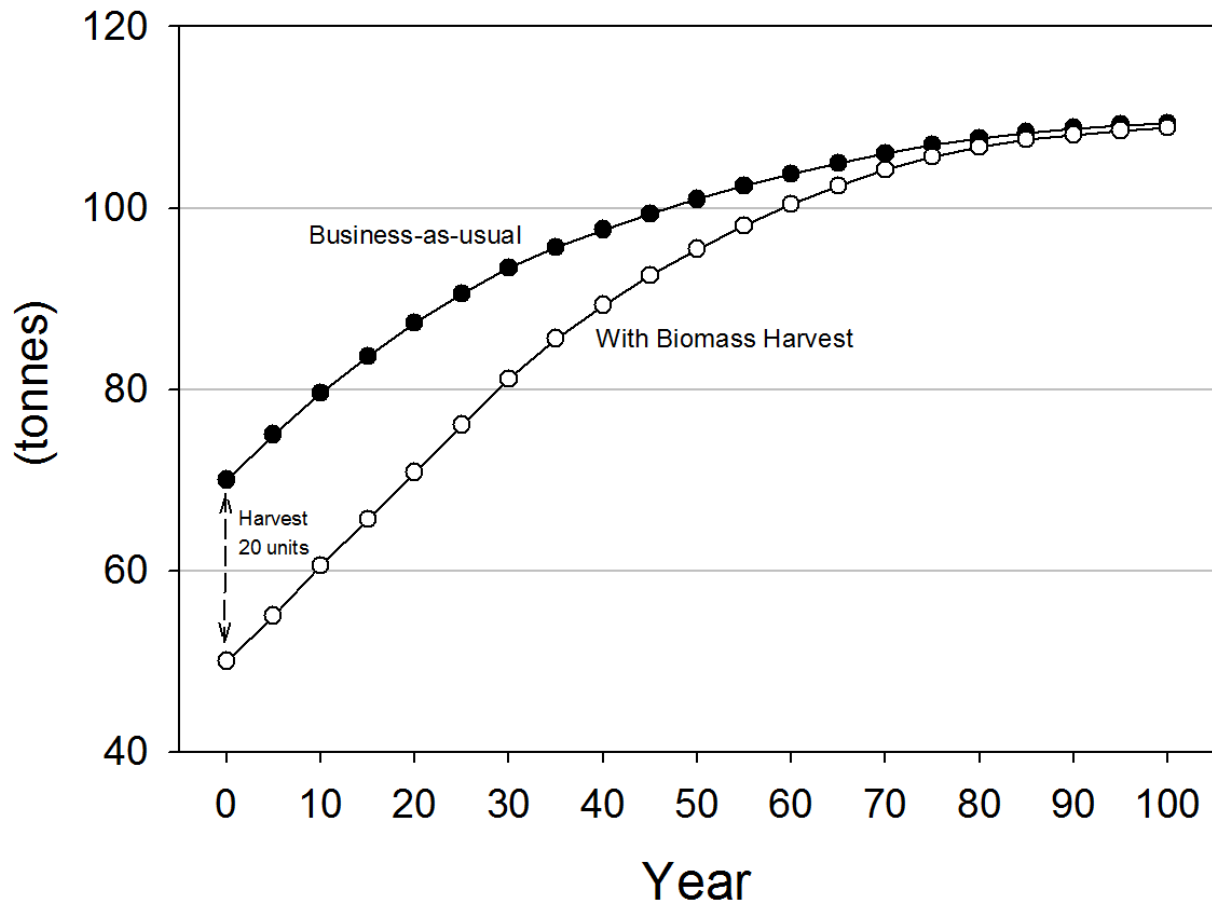
- ‘Debt-Dividend’ Framework – compares a ‘business as usual’ baseline with biomass energy scenario.
  - BAU assumes continued burning of fossil fuels and continued sequestration in forests harvested for timber but not biomass.
  - Biomass scenario assumes BAU harvest is augmented to include biomass (logging residues and additional whole trees) combusted to replace fossil fuels.
- Focus on net GHG changes in atmosphere rather than increases or decreases from today’s forest carbon levels—continued increase in forest carbon doesn’t rule out possibility that atmospheric GHG levels won’t be higher than in BAU.

# Carbon Emissions by Technology & Fuel

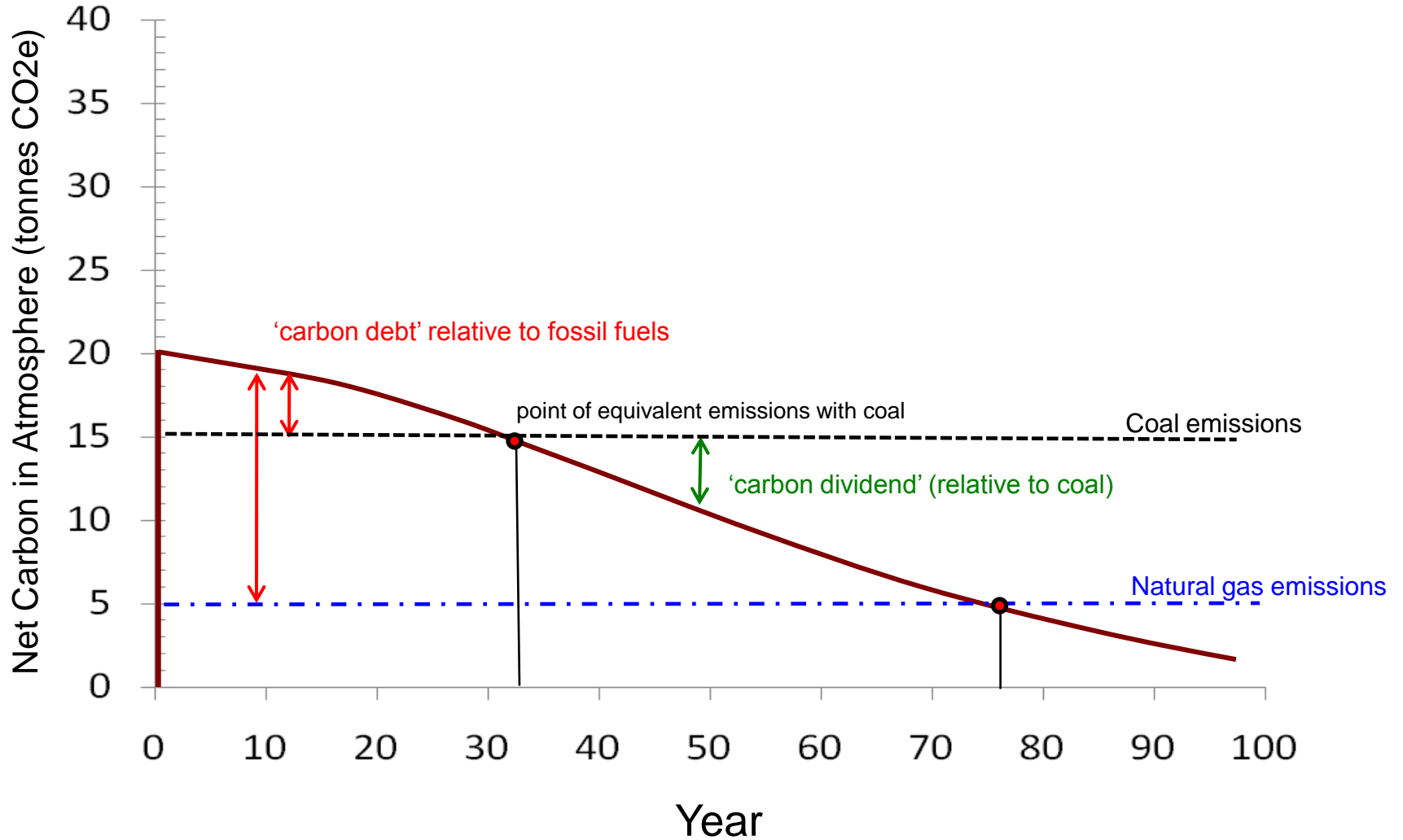
<b>Exhibit 6-6</b> <b>Carbon Emission Factors by Technology*</b> <b>Kilograms per Unit of Energy**</b>					
Scenarios	Biomass	Coal	Oil (#6)	Oil (#2)	Natural Gas
<b>Utility-Scale Electric</b>	Kilograms/MWh				
Fuel Prod & Transport	7	14			34
Fuel Combustion	399	270			102
Total	406	284			136
<b>Thermal</b>	Kilograms/MMBtu				
Fuel Prod & Transport	1		6	6	6
Fuel Combustion	35		27	25	17
Total	36		33	31	23
<b>CHP</b>	Kilograms/MMBtu				
Fuel Prod & Transport	1		7	6	6
Fuel Combustion	35		29	27	18
Total	36		35	33	24
<p>* As discussed below, emissions factors for pellets are characterized relative to the thermal technology using green chips which is shown in this table.</p> <p>** Sources and calculations for these data are described in the text.</p>					

# Forest Stand Dynamics

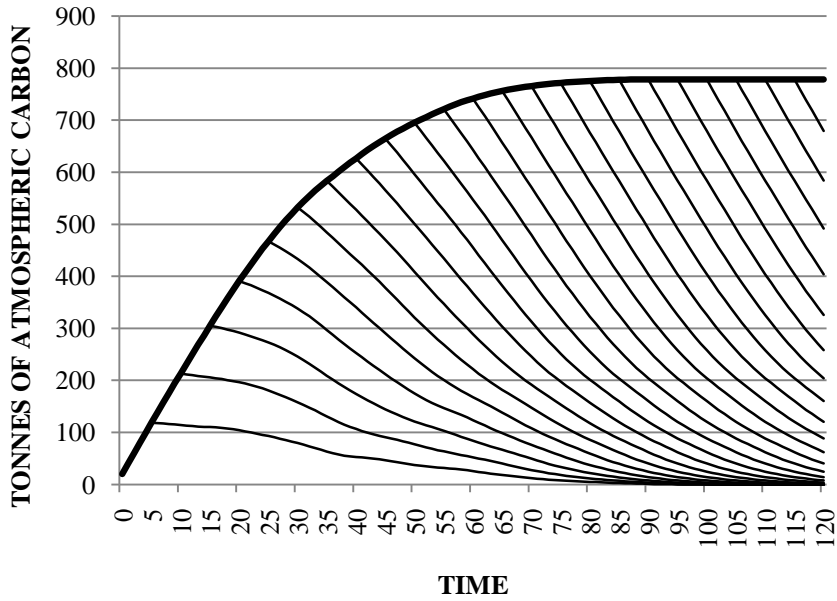
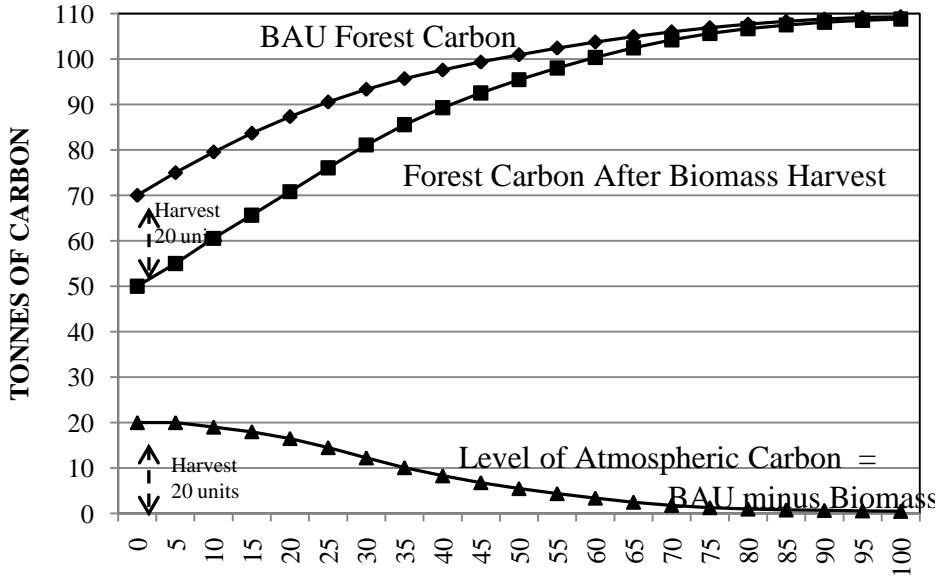
- Modeling of 88 Massachusetts FIA plots using USFS Forest Vegetation Simulator.
- Scenarios—two alternative BAU scenarios combined with three biomass harvest intensities.
- Both ‘mixed wood’ and logging residues analyses.



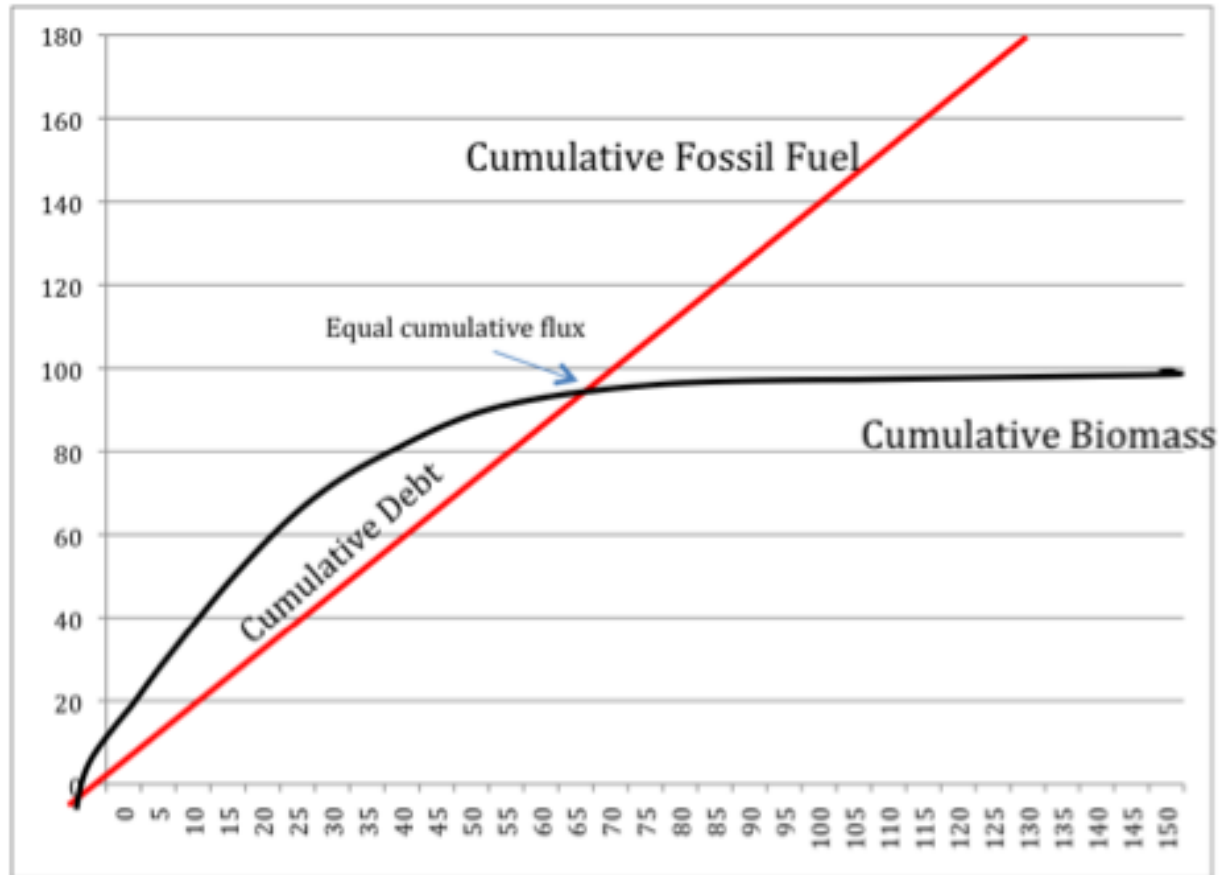
# 'Debt-Dividend' Model for GHG Emissions



# Spatial and Temporal Aggregation of Stand-Level Plots



# Landscape Scale Cumulative Carbon Debts & Dividends



# Massachusetts Carbon Recovery Summary

## Emissions from Continuous Operation

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

## Critiques of Manomet's Approach Choice of Time Period for Analysis

*Manomet inappropriately biased its analysis by choosing today as the beginning timeframe for carbon cycling instead of in the past when the forest began to uptake atmospheric CO<sub>2</sub>.*

- In Manomet's BAU vs. biomass comparisons, the starting point for the analysis does not affect the results. Had the starting point been 1910 instead of 2010, the forest growth in both the BAU and biomass scenarios would simply cancel each other out up to the point in time when biomass harvests are assumed to begin (2010).
- Whether forest carbon inventories have been rising or falling before 2010 is irrelevant to the analysis of GHG impacts of increasing biomass harvests for energy today and in the future.

# Critiques of Manomet's Approach Landscape vs. Stand Level Analyses

*Manomet's modeling of stand-level dynamics associated with biomass harvesting ignores carbon sequestration on the rest of the forest landscape.*

- Manomet agrees the landscape is the appropriate scale for modeling carbon impacts.
- Based on our analysis of forest products markets in Massachusetts, we estimate that increased demand for biomass is unlikely to affect carbon sequestration rates on acres until they are harvested. Thus, a spatial and temporal extrapolation approach that adds impacts across harvested acres adequately characterizes the landscape level effects in Massachusetts.
- In other regions, with differing ownership patterns and greater competition for wood, additional market impacts—for example the potential impact of higher prices on the amount of land in growing forests—should be taken into account when accounting for the net impacts of increased bioenergy on GHGs.

## **Critiques of Manomet's Approach Choice of Lifecycle Assessment Boundaries**

*Manomet erred in failing to include carbon sequestered in wood products that result from the timber harvest 'business as usual' scenario, and the avoided fossil fuel emissions from substitution for concrete and steel products*

- Manomet's economic analysis of Massachusetts forest products markets suggested that increased biomass harvests would not alter the level of sawtimber harvests in the state.
- Consequently, comparing the results of our BAU and biomass scenarios, there is no change in the amount of carbon sequestered in wood products or the amount of fossil use avoided through substitution of wood for concrete and steel.

## **Critiques of Manomet's Approach Choice of Baseline Assumptions**

*Manomet's BAU baseline is a highly uncertain projection of the future and should not be relied upon in setting biomass policies.*

- Baseline assumptions are important drivers of GHG outcomes, and because they are projections, inherently uncertain. This is simply the reality of policy models—they must rely on a vision of what happens in the future absent the implementation of a policy change.
- Because of the importance of baselines, careful attention should be given to their definition whenever biomass policy analyses are constructed. Sensitivity analyses can be very informative.

# Broader GHG Accounting Implications?

- Increases in biomass energy generation can lead to higher atmospheric GHG levels even when sustainable forestry is practiced.
- But from a GHG perspective, all biomass energy is not created equal as there can be substantial differences in the timing of biomass GHG benefits.
- These are attributable to differences in:
  - GHG efficiency (tons CO<sub>2</sub> per unit of energy) of different technologies in converting wood biomass to electric or thermal energy.
  - Type of fossil fuel and generation technology being displaced by the bioenergy system (coal, natural gas, oil).
  - Source of the woody biomass (waste wood vs. chipped roundwood).
  - Forest management and harvest approaches.
- GHG accounting approaches that rely only on changes in forest inventories relative to the present cannot fully account for these differences going forward.

# Translating GHG Accounting Insights into Policy

- Recognize differences between GHG accounting and GHG policy.
- Determine the appropriate timeframe for policy choices (e.g., Kyoto scale or shorter).
- To the extent feasible and practical, develop policies consistent with the chosen timeframe that:
  1. Reflect relative differences in GHG efficiency of bioenergy technologies and the fossil technologies they replace;
  2. Refine woody biomass definitions and begin to differentiate between the sources of the woody material being burned (e.g., waste wood, plantations, chipped roundwood).
  3. Promote forest management and harvest practices that speed the benefits of bioenergy.
- At regional level, find areas of current consensus—e.g., waste wood in the form of logging debris and material removed to reduce fire risks will generally be carbon friendly—and move ahead now on those.
- Where state-level differences may matter to the timing and magnitude of GHG benefits, allow state discretion to address the specifics of its energy and forestry context. Development of a general lifecycle approach might help states set their own policies.

# Questions?

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