Good News, FutureMetrics and Manomet Agree (sort of – and of course that is our opinion)

By William Strauss, PhD
President, FutureMetrics
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The debates over the conclusions of the Manomet Study have staked out territory that would appear to not overlap. On one side is the Manomet Study's lead author John Gunn's most recent reaffirmation of their point of view recently published in Renewable Energy World (REW)[1]. On the other side, as Dr. Gunn noted, is our work which was also published in REW[2].

We have good news: We think that the debate is over. For reasons explained below, we are perfectly willing to put aside the "dividend-then-benefit" story and follow Dr. Gunn's prescription for analysis. But our conclusions will still find carbon neutrality as long as one very important constraint is imposed on the system (and that constraint is one that we are sure the Manomet team would endorse as responsible and necessary).

As Dr. Gunn points out, "For greenhouse gas (GHG) emissions, the policy-relevant question was: What will the atmosphere 'see' if Massachusetts switched from fossil fuels to biomass energy?" Dr. Gunn may be surprised to know that we agree that the instant that biomass is used as fuel, the atmosphere will "see" more CO_2.

We still think that our original critique is valid and that our dividend-then-benefit story accurately reflects reality; but let's ignore that and proceed based on the initial conditions that Manomet has prescribed.

Dr. Gunn says in his recent REW article: "However, as forests grow back, this carbon 'debt' is reduced and eventually replaced with a carbon 'dividend' (relative to fossil fuels). The length of time to pay off the debt can vary from a decade to a century, depending on an array of factors outlined in our study."

We completely agree with the first part of that statement. Where we believe Dr. Gunn and the Manomet Study are in error is in their choice of scale. Our earth system is complex. When studying complex systems, multi-scale descriptions are needed. Fine scales influence large scale behavior (not the other way around). And therein lays the problem. The Manomet logic is based on large scale.

If we ignore our original critique (as we promised we would), then if we combust for example 3650 tons per year of biomass in a combined heat and power (CHP) plant, we can measure CO_2 being emitted. Simple chemistry tells us that the CO_2 emitted from biomass is about 57% greater per megawatt-hour than coal. That sounds bad and would be if that CO_2 were permanently being added to the atmosphere. But unlike coal (or other fossil based fuels), it is not.

[1] http://www.renewableenergyworld.com/rea/news/article/2011/10/the-biomass-carbon-debate-when-to-start-counting
[2] http://www.renewableenergyworld.com/rea/news/article/2011/05/how-manomet-got-it-backwards-challenging-the-debt-then-dividend-axiom

Dr. Gunn's REW discussion acknowledges this in the following sentence: "Furthermore, our evaluation did account for sequestration occurring elsewhere on the landscape. In our Massachusetts study, this landscape-level sequestration was not sufficient to overcome the short-term carbon debt."

The Manomet study centered on the timing of that sequestration and, as the statement above acknowledges, the timing is influenced by the balance of the rate of harvest and the rate of growth.

So let's follow that logic but let's take the scale from decades to days. In the example CHP facility above, 3650 tons per year are needed. That is 10 tons per day every day of the year. But suppose that we impose a very important constraint on the use of biomass for energy: all feedstock has to come from forests that are managed sustainably. Granted, the term "sustainable" is open to a range of interpretations. But in this case let's follow FSC or SFI[3] guidelines; amongst which is the requirement that that the net stock of biomass on the certified landscape is not depleted.

A rule of thumb is that a northeastern forest can sustainably produce about one ton of new growth per acre per year. That means that the 3650 tons per year of biomass needed to fuel our CHP plant will need 3650 acres of forestland if we require that the forest does not shrink over time. As FutureMetrics' partner Les Otten often points out, well managed forests under the FSC or SFI criteria can increase that yield per acre while maintaining soil nutrient levels, good habitat for wildlife, and the quality of the experience for people using the forests. But for this story we will keep the average yield per acre per year at one ton.

It is important to realize that our 3650 ton per year CHP plant does not receive 3650 tons in one delivery and does not release 3650 tons of wood's worth of carbon in one lump either. In fact, the forest products industry can be characterized as a just-in-time manufacturing system. For our CHP plant, 10 tons per day are sustainably harvested and delivered off of our 3650 acre FSC or SFI certified forest. So the carbon released into the atmosphere that day is from 10 tons of wood. The atmosphere "sees" new carbon. But during that same day on our 3650 acre plot, 10 new tons of wood grow and sequester the amount of carbon that was just released.

At this scale, following the Manomet logic, we wait one day for our dividend. In the Manomet Study, the large scale perspective yields a large scale result. But in this case, we have the same outcome but we do not have to wait 30 to 100 years.

Where Dr. Gunn and his associates and I completely agree are on the issues of atmospheric tipping points and the critical need to connect earth systems science to policy. We first overshot our planet's ability to sustain the use of resources in 1986[4]. That year it took almost 365 days before we crossed into deficit. Since then it has taken progressively fewer days. This year is took us 267 days (earth overshoot day[5] was September 25, 2011). The precision of that calculation is of course open to debate. But there is no debate on the unsustainability of business as usual.

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[3] See http://www.fsc.org/ or http://www.sfiprogram.org/

[4] A concept created by the New Economics Foundation which estimates how long it takes to use up the sustainable portion of our natural resources. In a given year, if we use more than the planet can regenerate, we go into deficit at some point in the year.

[5] "Put simply, earth overshoot day shows the day on which our total ecological footprint (measured in global hectares) is equal to the biocapacity (also measured in global hectares) that nature can regenerate in that year. For the rest of the year, we are accumulating debt by depleting our natural capital and letting waste accumulate." From Global Footprint Network.

So if we are going to use our forests as a fuel source, we have to care for the resource and make sure it is non-depleting. Otherwise the forest resource is no better than all the other finite resources that humankind is not only depleting but is depleting at an accelerating rate[6]. We are sure that Dr. Gunn and his team would agree.

The Manomet Study authors have been very clear in the report, in public presentations, and in the REW article by Dr. Gunn that the study was for the state of Massachusetts. It may very well be that Massachusetts does not have sufficient certified forest acreage to sustain any biomass power projects (we doubt that but we are not experts on Massachusetts forests). However in our state, Maine, the majority of landholdings, representing more than 10 million acres of forestlands, are FSC or SFI (or both) certified.

So as long as there is sufficient forest to sustainably supply the fuel, we continue to refute the Manomet Study's conclusion that the combustion of biomass is not carbon neutral relative to fossil fuel alternatives.[7]

Although gathering optimism for actually moving from business as usual in the US to a sustainable future is hard to find, at least we in the cold northern forested states can make fuel from our forests (and from dedicated energy crops) a part of the solution. As long as we need heat we will need combustion. Yes electricity can be made from hydro, solar, wind, and even nuclear with no carbon output. But electricity does not heat homes and does not make heat for industrial processes.

Perhaps someday all northern homes will have geothermal heat pumps and will "heat" with electricity. But currently for example only 5.1% of Maine homes use electricity (most of those are heating with resistance heating) and due to the predominance of hard rock ground in Maine, the cost of drilling the deep wells (about 175 feet of well per 500 square feet of heating space) makes geothermal heat pumps a very costly investment. And right now, most of the power for those pumps comes from fossil fuels.

Combined heat and power and just plain heat for homes and businesses from a sustainably managed renewable and carbon neutral fuel should be a part of our policy to promote energy independence, economic wellbeing, and environmental stewardship.

[6] For a comprehensive discussion of the catastrophic consequences of exponential growth, read Dr.Strauss's book, "The Myth of Endless Growth".

[7] This of course ignores the fossil fuel required to harvest and transport the material. But fossil fuels also require fossil fuel for drilling, mining, and extraction, pipelining, shipping, refining, and delivery. The accumulated footprint (not counting combustion) on petroleum heating products per unit of energy is higher than wood pellets and much higher than wood chips (53.1 lbs per MMBTU for pellets, 58.6 lbs per MMBTU for heating oil, and 13.4 MMBTU for chips). Data from analysis by de Haan and FutureMetrics, June, 2010.