## Phytosanitized Wood Chips for CHP

Exponential growth in demand for renewable energy sources such as biomass is derivative of global warming, climate change initiatives enacted across the European Union to reverse GHG emissions and reduce the global carbon footprint. Simultaneous to this expanding need, Maine experienced a calamitous loss of an equivalent 75 percent of its historic paper manufacturing base. The convergence of significant circumstances put the EU and Maine in the perfect storm of demand and supply. In April 2015, E=MC$^3$ was formed for the sole purpose of designing, developing and delivering a high-quality design mixture of biomass, with high energy values, high density properties to compete with ocean freight costs equivalent to wood pellets, and a below-market rate cost per gigajoule (GJ) delivered to cogeneration facilities.

A bankable, certificated and sustainable wood fiber supply originates from a select few landowners, each with more than of 1 million acres of managed forests. All fiber is low value and derived only from forest residuals, slash, trimmings and mill shavings. Between the ports of Searsport, Maine, and St. Johns, New Brunswick, the bankable fiber supply for biomass to the EU exceeds 1 million metric tons annually. Additional sources of fiber are under negotiations in Connecticut and would be shipped out of the Port of New Haven.

All 28 EU Members require an import treatment to sanitize any wood fiber originating from North America. Fumigation procedures have evolved dramatically since 2015, when the EU mandated the phasing out of chemical fumigant on board vessels. Methyl bromide and phosphine applications are either fully outlawed or will be terminated soon. The internationally recognized treatment for wood fiber imports to the EU is heat treatment, or phytosanitation, where all fiber must be heated to its core to a minimum temperature of 56 degrees Celsius (C) for a period of no less than 30 minutes. E=MC$^3$ wood chips will be produced at 60 degrees C for a minimum of 45 minutes to be ahead of anticipated requirement changes in the EU.

To make this biomass product effectively marketable, several key cost components were scrutinized to identify cost containment tasks while implementing low-carbon and efficient logistical operations and procedures. Traditional fiber harvest costs, inland transportation costs and ocean freight costs are the key variables to the supply chain success.

These three cost centers are dramatically mitigated by: sourcing only low-value fiber as mentioned above; collecting and transporting up to 70 percent of that fiber to the processing plant by rail (from and to St. John, Quebec, and Millinocket, Maine, direct to the E=MC$^3$ fiber hub yard at the Port of Searsport); establishing a meaningful alliance with a vessel owner-operator with the capacity to dedicate vessels for the E=MC$^3$ program; and by bundling and handling the fiber in a highly compacted or densified medium. As a result of the above cost containment measures, E=MC$^3$ biomass is a low-cost supplementary alternative to wood pellets.

By getting ahead of the curve with woody biomass cogeneration or combined-

heat-and-power (CHP), operators can substantiate their commitment to sourcing renewable energy products at the lowest carbon footprint cost available. A quick review of woody biomass versus wood pellets includes the following points:

• To produce 1 million metric tons (MT) of wood pellets requires roughly 2.2 million MT U.S. tons of wood chips.

• Production of 1 million MT of wood pellets requires approximately 21 acres of forest clearing per day.

• Wood pellets produce about 17 GJ of energy per MT while the E=MC$^3$ material is roughly 13 GJ per MT.

• The carbon footprint to process wood pellets is approximately three times the cost to phytosanitize wood chip residual.

• A 2020 forward looking FOB-NWE price for wood pellets from Northeast U.S. and Canada is projected to be approximately $160.00 per MT, or $9.41 per GJ, and for phytosanitized biomass wood chips, approximately $82 per MT, or $6.30 per GJ.

Our ocean freight owner operator will execute agreements direct with buyers to mitigate or remove any risk mark-ups, and thereby hold prices down. Stowage and ocean loading density is equivalent to wood pellets, so the ocean freight is no longer the upset factor in this supply chain.

High-energy, high-density, baled woody biomass does not require outside buildings or storage structures. The E=MC$^3$ material can be stored at the origination port for extended periods, waiting for will-calls or to provide a long-term, high-volume supply solutions for biomass that: do not degrade when moving; creates no dust particulate in handling or loading; has no off-gassing characteristics; eliminates combustible pile scenarios and the requirement for high-cost pellet storage facilities; extends life-cycle of the biomass, and is delivered in unitized quantities and sizes applicable to metric transportation requirements.

The above is a snapshot of the benefits to investigating how E=MC$^3$ woody biomass can become an essential part of any CHP plant's long-term environmental planning. E=MC$^3$ is not a replacement product for wood pellets, however. Rather, it is a supplementary alternative to any CHP plant's need for sustainable supplies—the addition of the E=MC$^3$ technology to the procurement mix will enhance the environmental credentials of the CHP plant, as well as bottom line margins by blending a low-cost product with pellets.

Several major CHP plants have begun the process of evaluating E=MC$^3$ as a viable woody biomass source. E=MC$^3$ is especially attractive to those CHP plants with their own receiving dock located at their plants. Currently, two major inland wood fiber production, processing and distribution yards are exploring the opportunity to import E=MC$^3$ to their facilities for subsequent inland distribution to plants in remote locations.

EMC$^3$ will present all of the above at the upcoming 2020 International Biomass Conference & Expo in Nashville, Tennessee, Feb. 3-5.

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