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May 10, 2010

TO: Interested parties

FR: EQC staff

RE: Biomass equipment demonstration

During the Environmental Quality Council's May 6th meeting, council members and the public were invited to view a biomass equipment demonstration. The demonstration took place at 1100 North Last Chance Gulch. Because the demonstration was outdoors, it was not recorded.

Steve Marks of Marks Lumber provided an overview of the Rotochopper that members saw in action. Tim West with John Deere provided an overview of the Energy Wood Harvester. Mr. West also provided a written copy of his testimony. An overview of the equipment, as well as several pictures, are included below.

Sonja Nowakowski, EQC staff

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Track B-66 Now Available With Transport Dolly



The track-mounted Rotochopper B-66 is now available with an optional transport dolly for highway transportation, eliminating the need for a trailer.

- SAME GROUND CLEARANCE AS A STANDARD LOWBOY TRAILER
- QUICK REMOVAL AND RE-COUPLING
- CAN BE CONFIGURED TO DIFFERENT TRANSPORT REGULATIONS AROUND THE WORLD

The transport dolly can be quickly uncoupled to go from transport to operation within minutes. Four hydraulically actuated locking pins secure the dolly for transport and quickly retract to allow fast dolly removal. To re-couple the dolly, the operator simply drives the B-66 over the dolly and extends the locking pins. Domed guide rails provide ease of alignment as the B-66 is moved in place above the dolly. Tapered ends on the locking pins allow proper coupling without exact alignment. Once secured, the dolly lifts the B-66 to achieve the same clearance as provided by a lowboy trailer. A track-mounted B-66 without this optional transport dolly can be transported on a standard lowboy trailer.



The B-66 is available with either 600 mm or 500 mm crawler tracks. Trailer lighting and bumpers can be configured to different transport regulations. The track-mounted B-66 and the standard axle-mounted B-66 can be equipped with several



Good morning. My name is Tim West, and I have the privilege of working for John Deere's Construction & Forestry Division. My areas of expertise include woody biomass energy in general, as well as the technologies and services John Deere provides to harvest woody biomass economically, safely, and sustainably. On behalf of John Deere, I would like to thank the Environmental Quality Council for the invitation to present our vision for the positive role woody biomass energy can play in Montana and elsewhere.

For my remarks, I would like to make two points. **First, woody biomass energy is needed - today.**

As the Council knows well, the forest products and logging industries in Montana have been ravaged by the economic recession. The recent closing of the Smurfit-Stone plant is one of the most significant and well known examples of this. The plant's closing cost the Missoula community more than 400 full-time plant jobs, not to mention the hundreds of supporting jobs lost or weakened as a result.ⁱ

Montana is not alone in this experience. According to the U.S. Bureau of Labor Statistics, the wood products industry has lost almost 150,000 jobs since the beginning of the economic recession in December 2007. That is almost 30 percent of the workforce gone in just over two years.

Loggers – such as those represented by the Montana Loggers Association – have suffered as well. Over the same period, almost 12,000 loggers lost their jobs across the Nation. This is almost 20 percent of the logging industry.

Woody biomass energy is one powerful way to regain and protect these jobs lost in Montana and elsewhere. Recent research performed by the University of Massachusetts' Political Economy Research Institute shows that a \$1 million investment in biomass energy creates significantly more jobs than identical investments in solar, wind, or conventional fossil fuel energy.ⁱⁱ Another study published by the National Renewable Energy Laboratory reveals that a biomass energy plant can generate total employment of almost 5 full-time jobs for each megawatt of net plant generating capacity.ⁱⁱⁱ These are local, family-wage jobs that our rural forest communities need now more than ever.

It is also critical for this Council to appreciate that woody biomass energy provides many additional benefits. It can meet renewable energy goals, such as those set forth in Montana's Renewable Power Production and Rural Economic Development Act, which requires public utilities and competitive electricity suppliers to obtain 15 percent of their retail electricity sales from renewable resources like woody biomass by 2015.

Also, if supported by sustainable forest practices, woody biomass energy has a far better carbon footprint than coal, which currently provides over 60 percent of Montana's net energy. That is why the Intergovernmental Panel on Climate Change – considered by many to be the world's leading body for the assessment of climate change – believes woody biomass energy can play a part in mitigating climate change and its risks.^{iv}

Finally, woody biomass energy facilities, if properly constructed and operated with widely available emissions controls, emit less other pollutants than coal.

Research performed by the National Renewable Energy Laboratory shows that biomass plants can emit less carbon monoxide, particulate matter, sulfur dioxide, and nitrogen oxides over their lifetimes than coal plants.^v Also, using woody biomass for energy, as opposed to the open-air burning of slash piles common in Montana and elsewhere, carries similar air quality benefits. Thus, woody biomass can help Montana meet its critical air quality goals and assure compliance with applicable Federal air quality standards.

Against the backdrop of these benefits, the second point that I would like to make is that woody biomass energy is ready today.

According to the Montana Department of Natural Resources and Conservation's recent study entitled, "An Assessment of Forest-based Woody Biomass Supply and Use in Montana," Montana produced 860,000 bone dry tons of logging residues alone in 2004, with almost 50 percent of that coming from Flathead, Lincoln, and Missoula Counties.^{vi} While not all of the logging residues are available for collection for practical and ecological reasons, a primary obstacle for its collection has been technological. In other words, there were no tools that could effectively harvest it. And, even if harvested, there was no market for it.

John Deere's biomass harvesting systems – including the 1490D Energy Wood Harvester that I will display for you today – in service of a woody biomass energy facility, can overcome these obstacles and help realize all of the benefits woody biomass energy could bring. The product manufactured from the Biomass Harvesting System is called a biomass bundle, bundles are the secret behind making a biomass operation possible.

The advantages of bundles are many. They allow for recovery of small amounts of biomass, whereas; a normal in the woods chipping operation needs several loads in one area before they can operate efficiently.

Bundles increase transportation efficiencies by utilizing the same trucks that haul logs, there is no need to build or rebuild roads in order to accommodate chip vans. A truck load of bundles contains approximately 15% more volume than a load of chips.

Bundles can be stored anywhere, anytime, reducing the need and cost of being stored in a mill yard where they may be taxed for inventory.

Bundles store without the fear of spontaneous combustion, as what is common with chip piles.

Bundles inventory like logs, which is very important for the mill to control its procurement of material to operate the plant.

Bundles increase grinder and chipper efficiencies by 10-50%! The solid material loads faster and makes the grinder work at full capacity, thus reducing expensive idle time.

Bundles can also air dry while being stored. Why is this important? **Because most biomass plants have to have their material at a certain moisture content before being burned.** The chips are normally put through a drying process to achieve the optimal moisture content for burning. By air drying, it **reduces** or even **eliminates** the need to go through this expensive process.

It has been shown that bundles which have been air dried have gained in value by **increasing btu's** and **decreasing the amount of material needed** to fuel a plant.

In addition to the advantages of bundles, John Deere's Biomass Harvesting Systems can be used in conjunction with most logging equipment currently being used in Montana.

This technology is available **NOW**, and it comes with the most experienced Biomass Team in North America, consisting of loggers, foresters, business developers, engineers, and attorneys from around the globe.

In conclusion, thanks again for the privilege of presenting to you. John Deere is confident in the ability of the Montana loggers we so proudly serve – armed with cutting-edge equipment – to provide Montana with an economical and sustainable source of renewable energy in the form of woody biomass that will help revitalize your forestry communities and do so much more. Montana has the workforce, the natural resources, and the forestry industry infrastructure ready for woody biomass energy. We are also confident that you and other policymakers – armed with information about the impact woody biomass energy can have – will champion policies supporting its development. I am happy to answer any questions that you have.

ⁱ See article available at: http://www.missoulian.com/news/local/article_9411ca4e-e8d2-11de-a2a0-001cc4c03286.html.

ⁱⁱ See research available at: http://adpartners.org/tables/Job_Creation_for_Investment_-_Garrett-Peltier.pdf.

ⁱⁱⁱ See research available at: <http://www.nrel.gov/docs/fy00osti/27541.pdf>.

^{iv} See research available at: <http://www.ipcc.ch/pdf/assessment-report/ar4/wg3/ar4-wg3-chapter9.pdf>.

^v See research available at: <http://cemendocino.ucdavis.edu/files/67669.pdf>.

^{vi} See research available at:
http://dnrc.mt.gov/forestry/Assistance/Biomass/Documents/MT_WoodyBiomassAssessment.pdf.



JOHN DEERE

BIOMASS HARVESTING SYSTEMS

HARVESTERS | FORWARDERS | ENERGY HARVESTER



FOREST HEALTH

Managing forest health is a massive job. Foresters and loggers along with other conscientious stewards of the forest work hard to promote and maintain a healthy forest. Yet they continue to face steep challenges and heavy pressures from stakeholders.

In North America, one of those challenges is the need to remove dead or dying timber, and to remove slash left over after harvesting. If left in the forest, slash and dead timber become hazardous fuels that can contribute to catastrophic forest fires. At times, the residual waste has been gathered and then open-air burned, which, while destroying the waste, releases harmful particulates into the air. However, regions are implementing no burn ordinances, thus increasing the need for biomass removal.

Fortunately, there is a solution: biomass harvesting. Biomass harvesting is an eco-friendly system of removing residual waste and overstocked, diseased and dying stands of trees and the resulting hazardous fuels. It offers an alternative to traditional methods of fuels reduction, and presents a new paradigm to the logging industry: how to make new money out of an old problem.





Slash burning (left) presents an additional problem: pollution. Overstocked timber stands encourage disease and insects (center) which destroy acres of forest every year. Beetles (far right) attack and kill large stands of pine annually.

Center image: James Everitt, Bugwood.org. Right image: Mark McGregor, USDA Forest Service, Bugwood.org.



A SIMPLE SOLUTION

John Deere Advanced Harvesting Systems offer an even better solution. The John Deere biomass harvesting system meets the need for fuels reduction and disease control in the forest, and allows loggers to get ahead at the same time. The John Deere Advanced Harvesting System has the potential to dramatically alter energy production — especially as non-renewable fuels like oil and gas become more costly.



The forwarder makes fast work of collecting the bundles of slash from throughout the forest and moving them near the road. Here, bundles are being stacked and prepared for transport.

“ The biomass bundles are an ideal renewable fuel. The advantage of this type of energy is that it is considered a waste in our economy, a cost, and has a negative impact on the environment by burning it in the slash pile — and we can change that. ”

Gary Callihan

Vice President, Business Development for Envio Energi, Troy, Montana

BIOMASS HARVESTING

Biomass harvesting directly addresses forest health. When adopting an active forest management strategy, biomass harvesting becomes pro-active.

The first step in biomass harvesting is selective thinning of unhealthy and at-risk timber. The second step is processing — where the felled timber is removed from the forest. This task is easily managed by environmentally friendly wheeled harvesters and forwarders.

The last step is considered revolutionary. An energy harvester collects the material, tightly compresses it and wraps it, creating an energy bale or “bundle.” The material is then removed to roadside by the forwarder ready to be transported to a processing facility (i.e. power plant, wood pellet plant, etc).

Here's how the process works:

1. A harvester enters the forest and fells specific trees, thinning the timber like a careful gardener.
2. The Energy Wood Harvester, Slash Bundler, follows later, gathering the slash, compressing it into manageable bundles which can then be transported and used as a biomass feedstock.
3. A forwarder follows the harvester and bundler, gathering the logs and bundles then moving them to roadside for transport.



LEADING THE WAY

Biomass harvesting starts with one of four eco-friendly harvester models: the 770D, 1070D, 1270D, or 1470D. John Deere Energy Harvesters are compatible with a variety of Waratah Harvesting Heads, giving the harvester unprecedented versatility regardless of timber size.

John Deere Energy Harvesters are:

- Productive on slopes in excess of 35%.
- Exert low ground pressure and minimal soil disturbance with or without Eco-tracks.
- Provide excellent operator visibility for working in over-stocked timber stands.

The John Deere Harvesters are powered by fuel-efficient John Deere engines and guided by the Timbermatic 300 management system with Total Machine Control™ (TMC) for optimum performance and precision. In addition, quiet engines reduce range of disturbance to wildlife and people.



MOVING FORWARD

The fuel-efficient John Deere D-Series Eco-III Forwarders come in five models: 810D, 1010D, 1110D, 1410D, and 1710D. Each model boasts excellent performance in all terrain, impressive fuel economy, and a variety of boom and bunk configurations to meet logger's specific needs.

The forwarders are also guided by TMC for precise operator machine control and increased productivity (available on the 1110D, 1410D, and 1710D). Excellent ground clearance, combined with large rubber tires and balanced bogies, make travel on rough ground unnoticeable.



ENERGY ON THE MOVE

John Deere's 1490D Eco-III Energy Harvester is the first machine of its kind, allowing the industry to turn waste into something both useful and profitable — and all with an environmental edge.

The 1490D is built with John Deere's B380 bundling unit. After gathering debris with its extended reach boom and purpose-designed grapple, the machine compresses the biomass material by approximately 80 percent — without crushing it. The unit pulls the compressed material forward and wraps it firmly with ordinary baling twine — creating a bundle. The bundle is dropped to the ground, where it is gathered by a forwarder. The bundles can then be transported and used as biomass fuel or feedstock.



HIGH EFFICIENCY

The John Deere 1490D Eco-III Energy Harvester is capable of producing in excess of 25 bundles per hour where the worksite has been properly prepared. The operator can adjust the length of the finished compressed bundle, but the most common lengths are between 8 to 12 ft (3 to 4 meters). The ability to adjust bundle lengths helps maximize loads for various trailer configurations.

Depending on the species and moisture content of the material collected, each biomass bundle produces about one thermal megawatt of energy.



The B380 bundling unit compresses a volume of biomass material by approximately 80 percent without crushing it. This adds to the bundles' rigidity and transportability.

The basic 1490D features the same properties that have made John Deere the preferred supplier of forestry professionals worldwide. The bundling process, as well as the other functions of the machine, are controlled via the Total Machine Control™ (TMC) system. The machine is powered by a fuel-efficient John Deere engine with low emission levels and high torque at low rpm.



PURPOSE-BUILT TO BE ENVIRONMENTALLY

John Deere's Wheeled D-Series Harvesters, D-Series Forwarder, and Energy Harvester take care of both biomass needs and the whole forest environment with purpose-built engineering details.

Environmental considerations include:

- A light footprint averaging less than 7 psi of ground pressure — equal to that of a person walking on the ground.
- Patented balanced bogie system significantly reduces ground impact by evenly distributing the weight of the machine.
- Removable eco-tracks lighten the ground pressure even more.
- Long-reaching booms provide for minimal movement in the area.
- Powerful Tier-III engines ensure fuel-efficient productivity is not compromised by emission standards.



“ Native grasslands are being encroached upon by juniper and it's reducing the forage base for wildlife and domestic livestock. One of the things we are doing is trying to remove the juniper and get these grasslands restored. With biomass harvesting efforts and programs, we can get that material off the mountains, out of the woods, off the prairies — get it someplace where it can be utilized to convert over to energy, heat or bio fuels... make it usable. It just doesn't feel right to leave it on the landscape. ”

Al Christophersen

Director of Habitat Stewardship Service, Rocky Mountain Elk Foundation

RESPONSIBLE



READY ENERGY

Bundled biomass is easy to process throughout the year. The compact slash logs can be conveniently stored in the forest or at a power plant in preparation for the peak seasons of energy production. The logs air-dry while they are piled up. As opposed to woodchips, a pile of slash logs will not ignite on its own.

John Deere wood energy technology is already widely used in Finland, Sweden, Spain, Italy, Switzerland, Czech Republic, and the U.S. In addition, the method has been successfully tested in Austria, France, Germany, and the UK, among others. Tests show that the bundling method is well-suited for North American species of trees and operating conditions.



OPPORTUNITY KNOCKS

Growing Prospects

Opportunities for loggers in biomass harvesting continue to grow, especially as the logging industry is just beginning to recognize the potential of biomass products, such as biofuels. Loggers have several prospects with a biomass harvesting system:

- Eco-friendly hazardous fuels reduction providing a clean, renewable energy source.
- Sell the energy bundles as an additional product.
- Bundles can be manufactured into biofuels, bio-chemicals, bio-wood products, erosion control material, wood pellets, and more.
- The bundles can be easily transported and stored until needed, without fear of spontaneous combustion.

John Deere has always taken the lead in educating about options and opportunities that exist within the forest industry, as well as in related industries like biofuels and energy production. John Deere's wood biomass harvesting demonstrations help to identify these opportunities, as well as to connect individuals who are eager to explore the possibilities.

“ We really appreciate this technology and the benefits it brings to wood-to-energy operations. Instead of leaving the money on the forest floor, this bundler is superb in collecting slash and treetops and putting them to use, rather than in a pile to be burned without revenue. ”

Richard Lepine

President, KMW Systems, London, Ontario



JOHN DEERE: COMMITTED TO FOREST

John Deere takes environmental responsibility very seriously. Throughout the years, we have made it a priority to produce equipment with a low-impact on the environment while meeting all the demands of logging and staying ahead of the competition.



HEALTH

We continue to look for new solutions to environmental concerns, new prospects for loggers, and have addressed forest health issues in several ways:

- Extensive research on the issues at hand.
- Educational materials.
- Engineering and design that promotes environmental health.
- Development of an effective biomass harvesting system.
- Educational demonstrations of a working biomass harvesting system.

For more information on biomass harvesting and John Deere, go to JohnDeere.com.





John Deere is the world's leading designer, manufacturer, and distributor of forest machines. Our range of purpose-built forestry equipment is without equal in the industry. From thinning to regeneration harvesting, for both cut-to-length and full-tree applications, John Deere builds woods-tough equipment with the logger in mind.

