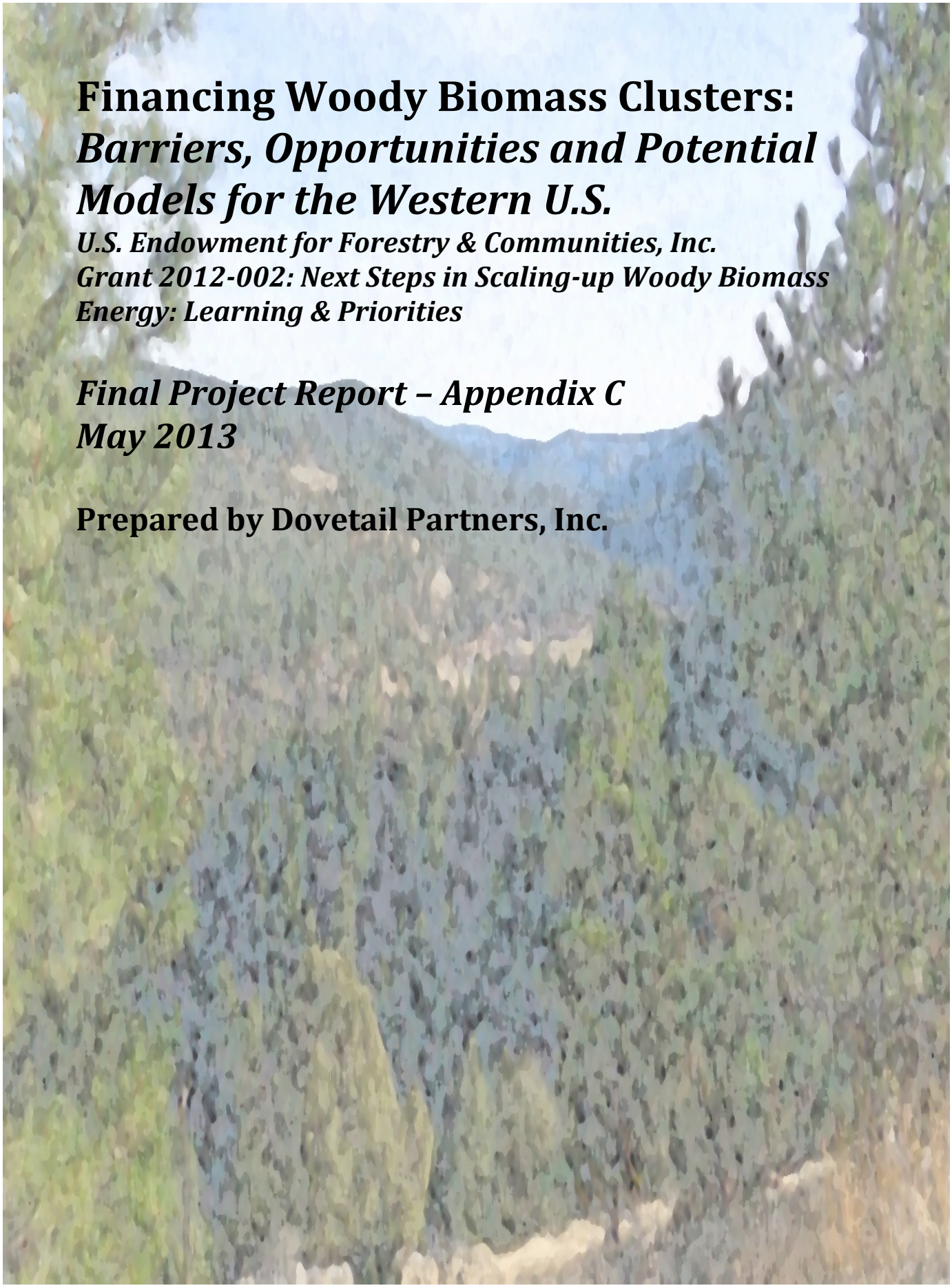

Financing Woody Biomass Clusters: *Barriers, Opportunities and Potential Models for the Western U.S.*

U.S. Endowment for Forestry & Communities, Inc.
Grant 2012-002: Next Steps in Scaling-up Woody Biomass Energy: Learning & Priorities

Final Project Report – Appendix C
May 2013

Prepared by Dovetail Partners, Inc.

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Appendix C. Site Visit Report

Site Visit Overview

In November 2012, Dovetail Partners carried out site visits to biomass facilities located in New England (New Hampshire, Maine, and Vermont) and Oregon. The goal of the site visits was to collect more detailed information about best practices and lessons learned, clustered or aggregated project development, project finance, and co-benefits of biomass energy that have been quantified or monetized. This information should help illustrate whether or not these projects are meeting expectations, working well, and are paying off.

Site visits during the week of November 12th

New Hampshire

- Concord Steam
- Crotched Mountain
- New England Wood Pellet
- Schiller Station

Vermont

- Camel's Hump School
- McNeil Generating Station
- A. Johnson Company

Maine

- Maine Energy Systems
- Regional School Unit #74
- Regional School Unit #18

Site visits during the week of November 26th

John Day, Oregon

- Malheur Lumber Company
- Grant County Regional Airport
- Blue Mountain Hospital
- Grant Union School
- Met with stakeholders involved with the biomass collaborative

Oregon National Guard

- Oregon National Guard facilities in Eastern and Central Oregon

Case Study Recommendations

Based on what Dovetail Partners has learned about the biomass facilities that were examined, we believe it would be most valuable to develop in depth case studies on the following biomass projects:

- John Day, Oregon Sites: Malheur Lumber, Grant Union School, Grant County regional Airport, and Blue Mountain Hospital.
- Oregon National Guard Sites
- Regional School Unit #74 in Maine: Carrabec High School, Carrabec Community School, Garret Schenck School, Solon Elementary School
- Summary report of the surveyed biomass fuel producers and distributors (if time permits)

Of the facilities we surveyed, these projects most directly related to the main goals of the research project:

- Clustered or aggregated project approaches to biomass development.
- Insights into best practices and lessons learned (i.e. factors associated with success as well as barriers to successful implementation).
- Important lessons related to project financing, capital as a limiting factor to biomass conversions, planning-to-implementation practices, quantification of biomass co-benefits, sustainable biomass supplies in a Western public lands environment.
- Details and strategies that can be translated into applications in other locations.

John Day, Oregon: Malheur Lumber, Grant Union School, Grant County Regional Airport, and Blue Mountain Hospital

The biomass sites in John Day, Oregon are geographically clustered within a high unemployment, rural county. As of October, Grant County had an unemployment rate of eleven percent. John Day is a very timber-reliant town and has experienced a great deal of economic stress because of restricted logging operations and mill closures.

The national forest land surrounding the town is in bad health, and it is believed that increased restoration projects will help improve forest conditions, benefit the local economy, create a sustainable biomass supply, and reduce wildfire threat. As a result, a collaborative has sprung up between the Forest Service, conservation groups, local mills, contractors, and local citizens. It is centered on the Malheur National Forest. The collaboration has been central to the success of the biomass cluster and has allowed generally adverse groups find common ground regarding restoration activities. This has given the Forest Service social license to carry out restoration projects in the national forest without fear of litigation, opening up a larger and more sustainable fuel supply for biomass energy utilization and other activities. During the site visits, the importance and benefits of the collaborative repeatedly came up with one of the interviewees stating, “John Day would be a ghost town with just firefighters and ranchers without the collaborative.”

Public land prominence has been a major factor in the cluster being created and sustained over time. Bioenergy development in John Day will highlight the issues and costs of

restoration efforts carried out in Western public lands and address the question whether biomass can help address forest management goals. The lessons from the sites, as well as the larger collaboration, could act as a model of sustainable clustered biomass energy development that could be implemented elsewhere.

Oregon National Guard

The Oregon National Guard is designing and installing pellet boilers at eight different National Guard facilities in Eastern and Central Oregon (for more detailed information about this project, please see the "Preliminary Results" report that was sent on 10/31/12). The boilers are not operational yet, but learning about their experience could provide important lessons regarding biomass project aggregation from a design-to-implementation perspective. Craig Volz, the Resource Efficiency Manager of Tetra Tech, has been our main contact regarding the project's progress. This aggregated project should demonstrate the benefits and tradeoffs of implementing multiple projects simultaneously versus individually. Volz has agreed to share detailed financial information regarding the project including detailed lifecycle analysis reports and other documents showing how the projects were looked at. He also shared some interesting suggestions regarding creative financing methods that could help promote biomass energy conversions.

Regional School Unit #74: Carrabec High School, Carrabec Community School, Garret Schenck School, Solon Elementary School

The schools in Maine that are a part of Regional School Unit #74 should help illustrate an aggregated approach to biomass conversion that is well suited to help understand the process of retrofitting existing facilities to biomass systems. The Superintendent of RSU #74 outlined what seems to be an especially systematic approach toward implementing district-wide biomass conversions focusing on minimizing capital costs and demand loads. The district implemented the biomass conversions based on what the Superintendent calls "a dramatic new approach that utilized and integrated multi-facility plan focusing on base-load heating and multiple smaller boiler units, combined with intensive conservation measures to reduce the facility heat load requirements." While the project was designed to be independently viable, it was also designed (where possible) to be compatible with statewide initiatives to promote energy conservation and wood-to-energy conversions.

Fuel Producer and Distributor Summary Report

Lastly, if time permits, it could be beneficial to write a separate summary report focused on the lessons learned, challenges, and opportunities of biomass fuel producers and

distributors. Specifically, the report would summarize the lessons learned from eight biomass fuel producers and distributors that we surveyed. Additional detail would be provided for Maine Energy Systems, which seems to be more in line with progressive lessons related to bulk pellet production and distribution and pellet boiler manufacturing and distribution.

Selection of the Sites for Final Case Studies

We wanted to visit a large mixture of sites during the trip to New England and Oregon to determine which sites would make the best case studies for deeper analysis and make the trips as valuable as possible. The visits provided a wide spectrum of biomass applications and it was interesting to learn about the challenges and opportunities that each facility faced. The biomass experts we interviewed previously recommended many of these sites. These experts suggested that these sites are key examples of successful U.S. woody biomass facilities that are operating profitably and/or have successfully overcome major obstacles or other issues.

We gained some valuable insights touring the biomass facilities in New Hampshire and were impressed by the level of success they have achieved. However, while most of these facilities are interesting and provide important lessons, we believe that the sites in Oregon and Maine have unique qualities that differentiate them as doing something new or innovative and demonstrate more valuable lessons learned in regards to biomass conversions. Overall, we feel that while there were many positive aspects about the sites in New Hampshire, the potential case studies in Oregon and Maine seem more related to the main goals of this project and would therefore be better candidates to further develop case studies. At this point, however, we are still open to further discussion, and other recommendations, for the final case study selection.

Discussion of Findings from Other Site Visits

New Hampshire Site Visits

The sites in New Hampshire included a pellet producer and distributor, a rehabilitation center, a district heating plant, and a large power plant.

Concord Steam

Concord Steam is a privately owned district heating facility that provides district heating to about five million square feet of buildings, including 100 customers (200 commercial and institutional buildings) in the town of Concord. The district heating plant has been operating since the 1930s and was retrofitted for wood use in the 1980s. Concord Steam is not currently profitable because its biomass fuel is being out-competed by natural gas and because thermal demand is so

seasonal. They are planning to retire the current plant and build a new combined heat and power facility in town that would primarily provide electricity. They believe that primarily providing electricity would lead to more consistent revenue, as they could be base loaded most of the time.

Biggest Lesson Learned: The most important lesson that they learned through utilizing biomass is not related to the mechanics of the equipment, but in understanding the logging industry and wood market. It is not just a commodity. It is a very complicated business on the logging side, so having a good working relationship with suppliers is key to for all of the parties involved.

New England Wood Pellet

This is a biomass fuel producer/distributor with twenty years of experience dealing primarily with bagged pellets (although they do have some bulk delivery). One of the biggest challenges the company has encountered is growing the market demand for their fuel so that they can operate their plants at full capacity and sell their entire product. They invested heavily in new capacity over the years anticipating that market demand would grow rapidly, but it hasn't grown as rapidly as they would have hoped. Unfortunately, the company has not been profitable for the past three years, but they believe they will make a profit this year.

Greatest Opportunity: There is opportunity in providing a fuel that can displace the use of natural gas, propane, or heating oil. In the northeast, heating oil and propane are very expensive to heat with. As consumers understand more about the economics of heating and the options they have, and as the technology becomes more automated and user-friendly, they will hopefully gravitate toward pellet fuel. If New England Wood Pellet could transition from a market that is predominately bagged fuel and pellet stoves to a market that has a higher percentage of central heating using boilers with bulk delivery/storage, they could even things out because they could take delivery in the summer months. If systems also produce domestic hot water, that is another fuel load that would need to be satisfied twelve months of the year. If they can expand the market into industrial processes as well as facilities like hospitals who have huge domestic hot water loads, this would be very helpful because they have twelve month demand curves. He thinks "the real growth potential in their market lies in central heating and not heating living rooms with pellet stoves."

Crotched Mountain Rehabilitation Center

Biomass provides the Center's heat, domestic hot water, and absorption cooling to all of the large buildings on the campus (totaling 365,000 square feet). Many of the facility functions utilize the biomass system (their swimming pool, for example). By utilizing biomass, the

Center has been able to save $500,000 in heating costs per year. There are three interesting features within their system: they have chip storage that utilizes a truck bridge, tandem wood boilers of different sizes with capacity for different burn settings resulting in better efficiency, and a bag house for improved emissions control.

Schiller Station

Schiller Station is a large, fifty-megawatt, regulated utility that burns coal, oil, and wood. They are one of the largest coal-to-biomass plants in the country. The main impetus for the plant's development was to expand their renewable portfolio. To keep biomass fuel economically viable, Schiller Station is relying heavily on renewable energy credits (RECs) as a source of revenue, which it sells to REC markets in Massachusetts, Rhode Island, New Hampshire, and Connecticut. "If not for the RPS and the REC revenue associated with it, we would not have converted the coal/oil unit to wood because it isn't a very efficient fuel." It was a seventy-five million dollar project, so they needed a return to make that investment. If they had relied only on the electricity market to recoup the investment, the biomass project would not have happened.

Biggest Lesson Learned: How to store, handle, and move the wood to keep it flowing continuously was the biggest lesson they learned. The one thing they would tell somebody who is converting to wood chips, is not to put a vertical pocket belt elevator as part of the conveying system. They had a bucket elevator that was vertical with pockets that would rapidly bring the fuel up to the next conveyor. They would never use this setup again. The vertical system plugged up all the time, but they have been able to get the bugs out of the system.

Vermont Site Visits

The Vermont Sites included a biomass fuel producer and distributor, a school, and a large power plant.

A. Johnson Company

This is a hardwood mill that sells bulk wood chips from their mill residue. They are entering their thirteenth year of chip production and supply some of the Fuels for Schools facilities in Vermont. Many of their customers have old systems that require very high quality fuel. They get more revenue from selling to heating customers than to the paper mills because paper mills are concerned with keeping costs down whereas heating customers are willing to pay a higher price when compensated for delivery costs (these heating customers have very high priced alternatives, so they are willing to pay a higher price because they are still saving money).

Challenge: Many of the smaller schools that they deliver to have storage that is too small (some of them that can barely hold a trailer full of chips if they are completely empty) for bulk delivery and scheduling deliveries has been a big issue.

Opportunity: A. Johnson Company is considering producing micro-chips as an alternative to pellets. Value would be added by drying, heat-treating, and producing, well sorted out chips so that they burn consistently and have a simpler combustion process. A. Johnson believes that micro-chips would be a more economical product to deliver over a longer distance because you can get more Btus after getting rid of excess moisture content. They would be marketed to customers with smaller demand (e.g. an apartment complex or a housing authority with interconnected buildings). Chips that are heat-treated with low moisture content are more storable and they would probably utilize a bulk distribution system. However, producing these smaller chips would be difficult because the company would need a much higher grade screening process.

McNeil Generating Station

McNeil is a large-scale, jointly-owned biomass power plant. They first started operating in 1984, and the site is something that other projects look to for guidance and to try to emulate (about 1,000 people come to see McNeil every year). There are 130 employees inside and outside of the plant. They put 300 million dollars into the local economy and power would have to be imported from outside of New England had it not been for McNeil. REC revenue has been critical to the plant's financial health and continued operation, but there is concern that the REC's value is too fickle and could disappear abruptly and for no good reason (e.g. one person making a clerical error). Right now, McNeil trades RECs for $55.00 per MWh and in 2007 RECs traded for $7.00 per MWh.

Biggest Challenge and Lesson Learned: Biomass is very volume intensive; it takes eleven times as much volume to get the same amount of heat versus coal, which means you need a lot of trucks, trains, barges to transport the fuel. McNeil is located right in the middle of the city of Burlington. As such, the city was worried that there would have too much traffic downtown because of McNeil's operations. McNeil had to go to the Vermont Public Service Board to obtain a Certificate of Public Good, which required them to get 75% of the fuel by train if they were to build in the city of Burlington. Unfortunately, this leads to double handling because wood starts off in a truck somewhere and the train requirement adds 20% cost to all fuel transported by train. The biggest lesson they have learned is to "put the plant where the trees are and not where the people are; it is a lot easier to transport electrons than it is wood."

Camel's Hump Middle School

Camel's Hump Middle has used biomass (wood chips) for eighteen years to heat its entire (89,000 square foot) school building. They heat the school for .31 cents per square foot and they save $45,525 in heating costs per year. Overall, the system has worked great over the years and the school has recently added a solar system, which has significantly reduced their electricity costs.

Lesson Learned: Our contact at the school stated that fuel handling is the most important factor when designing a biomass system like the one at Camel's Hump. One thing that they would have done differently is installed more storage capacity and also designed their storage area so that trucks could fully back up and dump the fuel. Right now their storage design has a very narrow access and is elevated, making it difficult for fuel deliveries.

Maine Site Visits

The Maine sites included a biomass producer and distributor and two regional school units that converted multiple schools to biomass systems.

Maine Energy Systems

This is a biomass fuel distributor and producer focusing on bulk delivery. Most of their customers are residential users that have 2-3 ton loads. They also have larger users (schools, municipal offices, commercial buildings) that will take full truckloads at a time (10-14 tons). Maine Energy Systems only does bulk pellet delivery--they don't do anything with bags—and is also the distributor and licensed manufacturer for the German pellet boiler company OkoFEN. The company has highly specialized pellet delivery trucks for delivering pellets. Because of low customer density for pellet fuel, Maine Energy Systems has to deliver the fuel over long distances (300 mile trips in some cases). They try to aggregate buyers who are located in the same areas and the company is still profitable because they charge enough per ton to make deliveries. Maine Energy Systems has been able to make a profit and is on a 2x growth curve. However, according to Dutch Dresser, the Executive Director of Maine Energy Systems, "The U.S. is 15-30 years behind Austria and

Germany in terms of where the industry is at. We've borrowed a lot of ideas from Austria, but U.S. policy related to biomass is still very young."
Dutch believes that more appliance incentives are needed and that the U.S. should follow the European model in tailoring incentives (e.g. incentives from 25-30% for boiler costs, residential and commercial, to force demand).

Regional School Unit #18

Regional School Unit #18 installed one of the largest wood chip heating systems in Maine to heat its three school buildings (the high school, middle school, and elementary school) totaling 240,000 square feet. Their project completed between September 2011 and May 2012 and they are in their first heating season. Based upon their projections, they are expecting to save around $250,000 per year on heating costs. The district has a great bread basket in the area (three different sources of wood supply within around three miles). There has been a big learning curve and hiccups (e.g. the auger system getting jammed) since the system is so new. Overall, they feel like the system is off to a good start, and it will be interesting to see how the system performs in its first heating season.

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