

## Woody Biomass

### Complementing Traditional Forest-based Industries

Nearly four centuries ago Europeans landed on the eastern shores of what was to become the United States to find towering forests that yielded a rich bounty of materials for homes, furnishings and a source of energy to weather harsh winters. Those same forests still provide a wide range of benefits and again are being looked to as a source of domestic energy to enhance national security while capturing wealth locally and serving to improve the health of the forests themselves.

Rarely do problems transform into opportunities as quickly as has the emerging uses for low-value wood and wood waste in locally-developed green heat and power production. Wood not suitable for traditional products such as paper, furniture, or lumber results from sound forest management and many manufacturing processes.

Increasingly, this “woody biomass” is replacing fossil fuels to provide greener heat to homes, institutions, and commercial facilities. Wood in the forms of raw chips, pellets, and processed bio-coal are used in electrical generation while fuels resembling natural gas can be derived from wood.

The development of appropriately-

scaled wood-to-energy opportunities contributes directly to Endowment goals by helping land owners retain and restore healthy working forests as well as capturing economic development benefits for local communities.

The Endowment is developing the potential for woody biomass by:

- Supporting commercial demonstrations of thermal, gas, and electric-based technologies to assess market preparedness (torrefied wood combined with coal; methane for transportation end uses; residential updraft gasification, etc.);
- Promoting combined heat and power (CHP) operations that partner with existing wood manufacturing facilities;
- Connecting consumers of woody biomass to forest owners, workers, and managers through new wood procurement or land management models that create reliable sources of woody biomass;
- Refining harvesting, gathering, pricing, and transport systems;
- Ensuring that woody biomass harvest is practiced sustainably; and
- Modeling socially and economically responsible financing instruments that hedge risks to both landowners and biomass users.

## The Woody Biomass Joint Venture Fund

The Endowment and the U.S. Forest Service have more in common than an interest in healthy forests. Both entities value the many environmental services provided by forests, the critical role they play in our economy and culture, and their importance to fish and wildlife. So, working together at every opportunity is natural.

With an initial \$4 million joint investment in 2010, the Endowment and Forest Service partnered to advance options for successful conversion of woody biomass to energy through a joint venture approach that more than triples the federal investment, supports projects not likely to be addressed under other grant programs, and captures learning for rapid dissemination.

The Joint Venture is focused on commercializing near-term technologies and on new procurement models by

seeding organizations with proven promise, stimulating a new set of networks and validating those technologies or models that prove successful.

*“Through the Woody Biomass Joint Venture the Forest Service and Endowment are able to leverage our limited funds to meet shared goals for determining which technologies are best suited for woody biomass in ways that best fit the needs of forests and rural communities.”*

**Jim Hubbard, Director State and Private Forestry, U. S. Forest Service**

The initial investment of \$4 million has already resulted in more than \$80 million impact. Eight projects are currently funded through either loans or grants. And both entities have agreed to add \$1 million for a second round of work.

---

## Following the Woody Biomass Bright Spots

Find what works and replicate it. The Endowment and its partners are applying this approach to woody biomass and its many forest benefits. With En-

*“Follow the bright spots. Investigate what’s working and clone it.”*

**Chip Heath and Dan Heath, from their bestseller *Switch***

dowment funding, the **Biomass Energy Resource Center** identified the “best in class” in community-scale thermal biomass technology applications around the world in the 2010 publication *Biomass Energy at Work*.

The research focused on technology that could be widely replicated, showcased innovation and efficiency as well as approaches that could be installed easily with minimal maintenance.

See the report at:

<http://www.biomasscenter.org/resources/case-studies.html>. *Biomass Resource Energy Center National Database of Community-Scale Facilities Using Biomass Energy*

## Torrefaction: Greener than Coal

Torrefaction, the old coffee bean roasting process, is being touted by some as verging on making woody biomass the next best alternative to coal.

Torrefied wood is superior to chips and pellets for use in electrical generation because it looks and acts much like coal. It has a similar Btu value (10,000/lb vs. an average 11,500/lb for coal), is easily pulverized and is water resistant.

Torrefaction removes moisture from raw biomass by charring the wood in the absence of oxygen at temperatures ranging from 390 to 650 degrees Fahrenheit. The lignin and cellulose become brittle, much like coal, while the remaining volatile organic compounds, like pinene and turpene, generate process heat. The yielded pellets or briquettes range from 66 to 75 percent of input wood.

Experts, including Luis Cerezo of Electric Power Research Institute (EPRI), estimate that upwards of 60 U.S. and European manufacturers are pursuing this technology with a few expected to turn success in the lab and small pilots into commercially viable “biocoal” in the next two-years. Hurdles include the cost, access to sustainable feedstocks, investment capital, and utility demand for product.

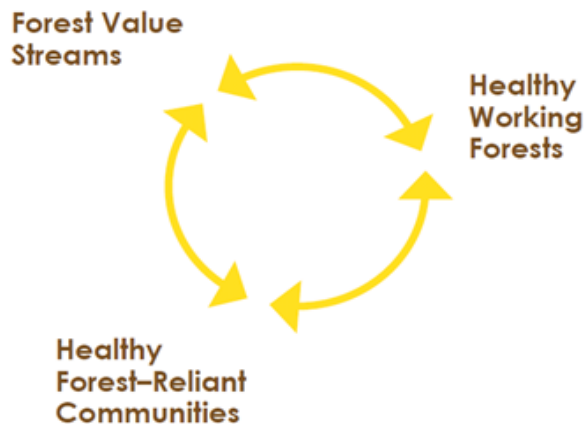
*“Investment in technologies that reduce emissions is growing. Utilities are changing more today than in the previous 100 years.”*

**Luis Cerezo, Electric Power Research Institute**

---

## Woody Biomass: Benefitting Multiple Objectives

Developing markets for woody biomass advances all aspects of the Endowment’s Theory of Change, which plots specific direction to the Endow-



ment’s mission “*to work collaboratively with partners in the public and private sectors to advance systemic, transformative, and sustainable change for the health and vitality of the nation’s working forests and forest-reliant communities.*”

**Healthy Working Forests**—Providing robust markets for trees and wood fiber through vibrant production facilities is the most important tool to promote forest retention and restoration. Successful wood-to-energy technologies will create new and expand existing markets.

**Forest Value Streams**—Without vibrant traditional markets most landowners cannot generate enough income to pay the costs of ownership. The Endowment is working to advance woody biomass and ecosystem service markets to supplement the traditional, high-value pulp and sawlog markets for forest landowners.

**Healthy, Forest-Reliant Communities**—Outlets for woody biomass support new jobs within existing industry sectors and create opportunity for entrepreneurs in the harvest, delivery, and operations for biomass. Moreover, by creating locally-owned wood energy markets, rural wealth is generated and captured within communities and regions while enhancing energy security.

**U.S. Endowment Programmatic Investments (through 8/31/2011)**

	Award Date/ Project Type	Objective/Grantee	Funding		
			Endowment	Matching Funds	Total
Completed	2008 Report	Community Scale Biomass Application/ <i>Biomass Energy Research Center</i>	\$99,500	\$7,500	\$107,000
	2010 Report	Wood2Energy Database/ <i>Univ. of TN Office of Bioenergy Programs</i>	\$199,638	\$58,000	\$257,638
In Progress	2010 Pilot/Demo	<b>Woody Biomass Joint Venture Fund</b>	\$2,000,000	\$8,609,784	\$10,609,784
	Subgrants:	<u>Agri-Tech Producers</u> , SC— torrefaction unit and materials for testing	\$125,000	\$878,109	\$1,003,109
		<u>Environmental Defense Fund</u> , NC — woody biomass procurement models	\$90,920	\$176,525	\$267,445
		<u>Greenwood Clean Energy</u> , WA — biomass gasification heating appliance	\$125,000	\$382,267	\$507,267
		<u>HM3 Energy</u> , OR — develop a torrefaction process	\$120,500	\$283,500	\$404,000
		<u>NC State University</u> , NC — in woods drying tactics	\$125,000	\$250,000	\$375,000
		<u>Phoenix Energy/Ortogonal Power</u> , CA — gasification for energy and Biochar	\$125,000	\$1,675,000	\$1,800,000
		<u>G4 Insights, Inc.</u> , BC, Canada — forestry residue into methane	\$125,000	\$2,337,223	\$2,462,223
		<u>North Star</u> , GA-wood-to-electricity facility with community ownership	\$2,000,000	\$68,000,000+	\$70,000,000
<b>TOTALS</b>			<b>\$2,299,138</b>	<b>\$8,675,284</b>	<b>\$10,974,422</b>
<b>Woody Biomass Joint Venture Fund II</b>			<b>\$1,000,000</b>	<b>\$2,000,000+</b>	<b>\$3,000,000+</b>

The U.S. Endowment for Forestry & Communities, Inc. (Endowment) is a not-for-profit corporation established in late 2006, at the request of the governments of the United States and Canada in accordance with the terms of the Softwood Lumber Agreement (SLA) between the two countries. The Endowment’s mission is to work collaboratively with partners in the public and private sectors to advance systemic, transformative, and sustainable change for the health and vitality of the nation’s working forests and forest-reliant communities.