Forests to Electrons

Costs and Benefits of Using Wildland Biomass to Generate Electrical Power

The Problem

California's wildlands and forests have accumulated an excess of small diameter woody material, or biomass. Fire suppression over the past century, combined with intensive forest management and a generally warmer and wetter climate, have led to increasingly dense vegetation. When wildfires occur, the heavy accumulation of biomass often makes those fires larger and more severe. The increase in forest biomass threatens public health and safety, watersheds, and wildlife habitat with unacceptable losses to wildfire.

Public land management agencies and local landowners are focusing their efforts on thinning forests to reduce wildfire risks and to make them more resilient to insects and diseases. These forest thinnings produce a significant volume of biomass as a waste product. Because this material currently has very little commercial value, most agencies and landowners are faced with the expense of disposal by burning, chipping and spreading, or hauling to a remote disposal site. Using forest biomass to generate electrical power is another disposal option. However, at this time, the costs of removing forest biomass to generate electrical power are generally higher than the costs of generating electricity from traditional sources, such as natural gas.

Modeling Potential Solutions

The social and environmental benefits of using forest biomass to generate electrical power are potentially very substantial. In 1999, a major study conservatively placed the value of environmental benefits associated with biomass energy production in the United States at 11.4 cents per kilowatt-hour over and above the retail value of the energy generated. While many studies have concluded that overall benefits of biomass energy production substantially outweigh costs, researchers face considerable challenges in quantifying the relevant economic values, particularly the benefits. One approach used to identify and quantify the costs and benefits of biomass energy production is through a life cycle assessment. A life cycle assessment, or LCA, models the environmental impacts and related economic values associated with a product, process, or activity by identifying energy and materials used and wastes released to the environment (Figure 1). Decision makers can use LCA models to evaluate opportunities to reduce negative environmental impacts and achieve economic efficiencies.

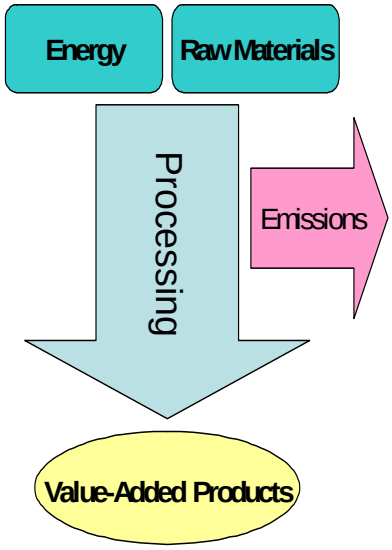

Figure 1. Schematic diagram of an LCA model.

1. Morris, Gregory, 1999. *The Value of the Benefits of U.S. Biomass Power*. Golden, CO: National Renewable Energy Laboratory.

A Comprehensive Approach

Many policy and decision makers agree that the social, economic, and environmental costs and benefits of biomass power need to be better understood. Public policy is hampered by lack of knowledge about the many costs and benefits associated with thinning forests and using the biomass from these treatments to generate electrical power. To support policy development in this area, the research branch of the USDA Forest Service is working with the California Energy Commission; the University of California at Davis; energy, forestry, and environmental consultants; and several State and Federal agencies to build an LCA model. This model will identify and analyze the social, economic, and environmental costs and benefits of using forest biomass to generate electrical power. In its most basic form, the LCA model will follow the transformation of forest biomass into electrical energy. Researchers will trace the path of biomass from forest thinning through transportation to an electrical power generation facility to electricity production and ultimately to the electric grid (Figure 2). The framework for the LCA will be a model through which policy makers will be able to run different scenarios to understand trade-offs between public and private costs and benefits.

The Biomass LCA Project

A team of modelers, ecologists, foresters, economists, and analysts will be involved in developing the LCA model, populating it with data, and conducting studies to develop and complete the model. Two advisory committees will provide guidance for this effort, one helping the team understand sensitive policy issues and the other providing technical advice.

The LCA project will be conducted in phases over a 3- to 5-year period. The ultimate product of this project will be a comprehensive model that policy and decision makers can use to support development of public policy for renewable energy and forest health.

For more information

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Figure 2. General biomass LCA system overview