

Biomass

An Integral Element for Future Energy Demands

Aspen Power, LLC

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Abstract

Interest in the development of alternative-renewable-energy sources has significantly increased across the nation producing support and incentives from local and state governments. Utilizing biomass, solar, wind and geothermal energy sources will create an extensive source of power and decrease our nation's dependence on electricity produced from fossil fuels.

Aspen Power, LLC is constructing the first biomass power plant facility in the State of Texas. Aspen leads the way in the State of Texas by utilizing cutting-edge technology in generating electricity and diversifying the State of Texas' energy supply utilizing a renewable, waste product. The project is located in Lufkin, Texas within the East Texas region. Aspen's project will positively impact local and state economy by providing employment opportunities and tax revenues while improving environmental health. This plant will provide the ultimate consumer with a renewable-energy source that is carbon neutral.

Energy Industry-Texas

Energy is one of the oldest and most diverse industries in Texas. Since the discovery of the Spindletop oilfield in 1901, Texas has embodied the production of Energy. In 2004, Gov. Rick Perry identified Energy as one of six industry clusters in his long-term, strategic job creation plan. Each cluster was selected because of its powerful potential for future economic growth.

The Energy cluster is made up of three sub-clusters: Oil and Gas Exploration and Production; Electric/Coal/Nuclear Power Generation; and Renewable and Sustainable Energy Generation. Texas' geography and natural resources, excellent transportation systems, and skilled labor force and leadership in environmental research give the state a Lone Star advantage in Energy.¹

An Integral Element

The State of Texas has experienced an increase of interest in the development and production of renewable energy to complement the production of nonrenewable fossil fuels. As we move forward, the State of Texas' population will increase dramatically and demand for electricity will rise exponentially. With so many benefits to the environment and economy, support to reach our state's and nation's renewable energy portfolio for the future has increased significantly. Texas is the nation's leader in the generation of wind power, and recently has increased support for the use of solar and geothermal power throughout the state. In addition, the current contribution of wind, solar, and renewable production cluster was estimated to be \$1.0 billion in total annual spending, \$456.8 million in output (gross product) each year, and 5,226 jobs². With the utilization of innovative technologies existing today, production of solar, wind, biomass, and

geothermal energy will all be vital components in reaching the state and national energy demands.

In order for our nation's energy demands to be met, biomass will inevitably play an important role in diversifying our energy supply. Power generation from biomass has recently experienced a rise in support and assistance from the states and federal government. Our state and national leaders are beginning to recognize the value of biomass and its potential for reducing carbon emissions, NOx's, particulates, and producing a wealth of economic benefits.

Biomass studies have demonstrated significant reduction in emissions from operating biomass facilities. Since the 1970's, several pieces of legislation have been passed, regarding incentives (tax, subsidies, educational, technological assistance) and regulations, related to the utilization of biomass. Assistance from local, state and federal governments facilitate the financial structure of these facilities in making their development more economically feasible. States across the nation are experiencing important economic returns from their investments in biomass facilities as they stimulate local economies, create vehicles for job growth, generate a source of revenue for local-taxing authorities and supply the energy market with a competitively-priced product. Key environmental benefits are obtained by reduction of pollutants. Employment opportunities created by biomass projects are not vulnerable to competition from overseas cheap labor, and offer extensive benefits.

The economics of a biomass facility are unique; nonetheless, these facilities will be able to generate thousands of megawatts in the future at a competitive price. Key conversion technologies exist and are readily available for biomass facilities to be a main-stream, electric generator. Since biomass harvest and transportation costs can be prohibitive, it is important to strategically locate these facilities regionally close to the feedstock source.

Renewable energy projects must overcome hurdles in the future to be an essential element to the energy mix. Studies involving renewable-energy projects analyze: if the project is economically feasible, if the resource is available and abundant, if the project is cost effective, if the impact on carbon emissions is significant.

500 MW Non-Wind Renewable Energy

The Public Utility Commission is currently considering amendments to §25.173 and §25.211 to provide incentives for non-wind renewable energy to permit the state to meet the 500 megawatt non-wind renewable energy target in PURA §39.904. The proposed renewable energy credits would provide needed incentives to support the development of solar, biomass and geothermal power industries just as similar credits were used to assist Texas in becoming the leader in wind energy. These proposed credits would provide start-up support to industries that will provide reliable power in quantities that eventually assure that Texas will meet its 2025 target of 10,000 MW of installed renewable energy capacity.

Biomass energy production struggles to compete at current low natural gas prices which sets the bar for electric rates. However, as the economy improves and demand for power and natural gas increases, natural gas-produced energy prices will rise at rates that will allow biomass-produced power to be more competitive and encourage the building of additional biomass plants.

Biomass power production in Texas will be fueled almost exclusively by the use of waste products that currently are burned in fields and forests, allowed to rot or reducing landfill capacity. Currently, there is over 22.7 billion pounds of waste wood – forest and urban – available each year in Texas. The availability of renewable energy credits will provide needed incentives to insure development of clean renewable energy production using waste products.

Aspen Power, LLC-Bio-Energy

This document will focus on Aspen Power’s, LLC utilization of woody-biomass for the use of boiler-fuel to generate high-pressured steam to ultimately generate electricity. There are two main components to the process Aspen Power will implement in reaching their goals:

1. Boiler Operations and 2. Fuel-Handling System.

The Aspen project will utilize stoker technology to generate 50 Megawatts (MW) of electricity from a direct-fired, biomass boiler. Aspen is located at 2000 Kurth Drive on a 67-acre tract of land in Lufkin, Texas, a relatively rural community north of Houston, Texas. The project will create 350-400 direct/indirect employment opportunities and generate well over \$286 million in total economic impact.

Environmental Sustainability

The Aspen Power project will employ a process to convert woody harvest debris, a material that has been left onsite, following harvest operations, to rot or burned in the past, into a renewable source of energy. Biomass is defined as any organic material that may be derived from plant and/or animal life. Aspen Power will utilize clean, woody biomass as their boiler fuel source and will not consume wood particles that have been chemically treated. The plant’s operations will complete the carbon cycle resulting in generation of clean, carbon-neutral power.

A 50 MW facility, such as the Aspen plant, reduces carbon emissions by 250,000 tons on an annual basis. The Environmental Protection Agency has set an emissions standard in which Carbon-Dioxide emissions may not exceed 1,000 units/cubic meter. Utilizing Aspen’s emissions reduction units, this project will be 63.3 times cleaner, clearing 15.1 units/cubic meter.

Boiler Operations

The Aspen power plant will produce steam utilizing a single pass membrane wall boiler with a moving grate, which is also known as “Stoker technology”. Stoker technology burns bio-energy feed stocks directly to produce steam which is expanded across a high efficiency steam turbine attached to an electrical generator that creates electricity. The Stoker combustor technology provides a moving grate which permits continuous ash collection, thus eliminating the cyclic operation characteristic of a pile burner technology. In addition, the fuel is spread evenly in a thinner layer in the combustion zone of the burner system, generating an efficient combustion of the wood fuel. With a basic Stoker design, the bottom of the furnace is a moving grate which is cooled by under-fire air. This process directs air-flow into the furnace to facilitate efficient combustion of the wood fuel. The under fire air rate defines the maximum temperature of the grate and thus the allowable feed moisture content.

Along with the utilization of Stoker Technology, the firm will implement Selective Catalytic Reduction (SCR) technology to achieve the lowest-achievable emissions rate possible for a wood-fired boiler. SCR technology focuses on the reduction of Nitrogen Oxide, enhancing the employment of electro-static precipitators, and decreasing Carbon Monoxide through catalytic oxidation.

The woody biomass employed as the boiler fuel will be supplied daily by Angelina Fuels, LLC.

Fuel Blend

The product provided is woody-biomass boiler fuel for direct use in wood-fired boilers to generate steam. Current and future operations will have the ability to secure and deliver material from each of the four major sources of biomass:

- Logging Debris – estimated at 109 million cubic feet (or 8.6 Billion pounds) annually slash burned or left to rot in the woods. Angelina Fuels is equipped with in-woods bundling and grinding capacity to capture this material and provide it with purpose.
- Urban Biomass – an estimated 660 pounds of woody biomass is generated per person each year in the United States equating to 14.4 Billion pounds annually. Angelina Fuels has established collection sites strategically located to capitalize on the flow of yard trimmings and clean debris from these sources.
- Mill Waste – there are 78 wood processing facilities within a 75-mile radius of the Aspen facility producing over 3,000 tons of wood-waste product daily. Angelina Fuels has developed contacts that allow tapping into the right waste products for applications without creating upset in the current market for these materials.
- In-woods Chipping –Forest stands that are not capable of harvest for sawtimber or pulpwood are designated as chip tracts. Angelina Fuels has relationships with several key logging outfits that are capable of producing up to 1,800 tons per day.

An established supply chain providing access to large volumes of clean, diverse materials enables Angelina Fuels to meet the specific needs of each customer by tailoring the incoming moisture content, heating value, and product cost to their specifications.

Pricing-Fuel

Pricing method is determined at the preference of the customer. Currently, contracts will include “cost plus a fixed margin” and “fixed price”³. In either case, pricing is protected by escalators tied to diesel fuel costs, consumer price index (CPI), and independent third party market valuation (T2M). Further, there is a percentage escalator based on the heating value of the material provided. The higher the heating value, the higher the price.

Future-Energy Supply

Along with the conventional use of coal, nuclear and natural gas, alternative energy sources (wind, solar, biomass, geothermal) will complete the compilation of energy supply needed to meet the projected demands of our nation's rapid population growth, while reducing the demand for foreign fossil fuel. The necessary infrastructure and innovative technology must continue to be developed and modified to see renewable-energy projects come to fruition.

