



CalRecycle/CARB  
Waste Management Sector Plan Workshops

**BIOMASS CONVERSION  
(June 18, 2013 draft)**

Supportive written copies prepared by Edgar & Associates, Inc. provided during the June 18, 2013 CalRecycle/CARB Waste Management Sector Plan Workshops.

This paper misses the distributed green energy initiative by the Governor and SB 1122 legislation, and the roll of biomass gasification to achieve those goals.

**Distributed Generation – 20,000 MW:**

California Governor Jerry Brown wants 12,000 megawatts of distributed generation (DG) to be part of the 20,000-plus megawatts of renewable capacity the state's utilities have been ordered to put in place by 2020. That's a lot of rooftop and ground-mounted solar, small and community wind, small biomass/biogas production, combined heat and power and other such local renewables

California has ambitious plans for renewable energy. 33% of electricity in the state must come from renewable energy by 2020. Governor Brown's "[Clean Energy Jobs Plan](#)" includes a goal of 12,000 megawatts of "distributed" or local renewable energy generation from smaller systems, of up to 20 megawatts capacity. Local renewable energy generation has the greatest value for the electric system when it is located in areas where capacity to meet existing electricity demand is constrained. The California Independent System Operator identifies these "Local Capacity Requirement Areas" and they are shown on [maps](#), under "Local Reliability Areas with Transmission Lines and Substations for 2011."

**SB 1122 – Small-scale bioenergy – 110 MW from urban wastes**

(2) By June 1, 2013, the commission shall, in addition to the 750 megawatts identified in paragraph (1), direct the electrical corporations to collectively procure at least 250 megawatts of cumulative rated generating capacity from developers of bioenergy

projects that commence operation on or after June 1, 2013. The commission shall, for each electrical corporation, allocate shares of the additional 250 megawatts based on the ratio of each electrical corporation's peak demand compared to the total statewide peak demand. In implementing this paragraph, the commission shall do all of the following:

(A) Allocate the 250 megawatts identified in this paragraph among the electrical corporations based on the following categories:

(i) For biogas from wastewater treatment, municipal organic waste diversion, food processing, and codigestion, 110 megawatts.

CalRecycle has adopted Strategic Directive No. 6 to divert 50% of organic material by 2020, and must prepare a Recycling Plan to reach a state wide goal to recycle 75% by 2020. Converting half of the 5.7 million tons of urban biomass (lumber) disposed of in landfills in 2008 could produce 2.85 million tons of wood chips, which could fuel 250 of these biomass gasification plants rated at 1 MW and generate 250 MW of distributed energy. Each plant would need to employ 2 workers per shift with 2.5 shifts per day, or 5 employees per facility and 2 wood grinder employees per day, and could create 1,750 direct jobs. The 2012 Bioenergy Action Plan projected that 4.82 million tons of biomass (from urban, agricultural, and forestry) could be utilized to install 500 MW of biopower, creating 2,500 direct jobs by 2020, where the urban sector would shoulder about half of the responsibility.

The 2012 Bioenergy Action Plan clearly intended to include urban biomass, we do not believe that SB 1122 intended to not include bioenergy from urban wood waste as the draft Report suggests.

California Compost Coalition (CCC) supports the detailed comments provided by the Bioenergy Association of California, as copied below. The draft report uses several different definitions and descriptions of waste categories, technologies and outputs that are at times inconsistent with each other and with the language of SB 1122. The differing and sometimes inaccurate definitions make it difficult to assess the report's accuracy about availability and allocation of different waste types. The report's definitions in the urban waste category are inconsistent with each other and with SB 1122 itself, which requires 110 megawatts from "biogas from wastewater treatment, municipal organic waste diversion, food processing, and co digestion." (SB 1122, Statutes of 2012, section 399.20(f)(2)(A)(i)).

In different sections of the report, this waste category is defined as "biogas from wastewater plants and green waste" (e.g., pages 1.1, 1.9, 1.10) or limited to wastewater treatment biogas and low solids green waste (e.g., pages 1.2, 3.1). In addition, the report misuses the term "green waste" which is limited to plant materials such as yard and agricultural waste and does not include food or food processing waste. The term "low solids green waste" is a misnomer altogether.

We urge the report authors to include a list of definitions that is consistent with CalRecycle's California waste regulations defining different waste types, as well as the categories set forth in SB 1122. Without consistent and accurate terminology, it is impossible to assess whether the report's findings on resource availability and costs are

accurate. We also urge the report authors to use one term – bioenergy – to encompass the different technologies and outputs that are eligible for SB 1122, rather than limit specific sectors to “biomass” or “biogas” as the draft report does. SB 1122 defines eligible waste categories and project size, but it does not limit eligible technologies or outputs. In fact, both the agricultural and forestry categories refer specifically to “bioenergy” and not to “biomass” or “biogas.” (SB 1122, section 399.20(f)(2)(A)(ii) and (iii)). The report should use the same terminology – bioenergy – as the statute to ensure that all eligible technologies and outputs are included.

### **Small-scale Biomass Conversion Facilities**

Phoenix Biomass Energy Inc. is a private label power company that builds, owns and operates on-site small-scale biomass plants in partnership with businesses in the agricultural, waste, and forestry industries. Phoenix helps its partners become their own energy provider. Where possible, they co-locate with available fuel, electricity demand, and heat demand. This allows partners to choose systems for their high returns on investment and internalizing their energy needs from generating their own carbon neutral biogenic energy instead of purchasing higher priced and higher carbon grid energy.

Phoenix is primarily a producer of distributed power generation solutions that generate renewable energy on-site with the ability to net-meter and sell excess electricity over the grid. They combine proven technologies to provide partners and customers with profitable on-site power. They use largely off-the-shelf equipment such as CAT or Cummins engines, Allen Bradley, and Siemens. This ensures that their equipment is reliable, replaceable, and easily fixed.

Phoenix takes their biomass plants to the fuel supply and the energy load, not the other way around, which makes it a great fit for a community scale project. They are successfully generating energy (heat and electricity) on-site instead of just selling electricity to a utility at wholesale rates. [Biochar](#), a byproduct of the gasification process, is a valuable commodity, and will increase investment returns to partners and clients. Phoenix’s approach to renewable energy production requires just 0.5 acres per megawatt — a fraction of land of what wind or solar requires. Furthermore, the small footprint of a Phoenix Biomass Energy Inc. plant helps to avoid local land use controversial issues and speeds the permitting process. Phoenix Biomass Energy Inc. and its joint venture partners create long-term power purchase agreements with local utilities and the on-site operating business. This creates sustainable and profitable businesses that are good for the environment and good for business.

Phoenix Biomass Energy Inc. is operating a 0.5 MW plant just north of the city of Merced. The project has received an Authority to Construct permit from the San Joaquin Valley Air Pollution Control District and has been certified by the California Energy Commission as being an eligible technology under the Renewable Portfolio Standard (RPS). Under California's RPS statutes, retail sellers of electricity in California were required to increase the amount of renewable energy they procure each year by at least one percent, until 20 percent of their retail sales are served with renewable energy by

December 31, 2010. The California Department of Resources Recycling and Recovery (CalRecycle) approved a Recycling Market Development Revolving Loan Program in an amount of \$1,125,000 to finance the purchase of equipment at the City Merced location in 2010. The project diverts approximately 3,900 tons per year of orchard trimmings, almond shells and waste wood pallets for the purpose of generating electricity for Pacific Gas and Electric (PG&E) Company on the electric grid. However, there were no plans to use the energy or the heat on-site, and the purchase of processed wood chips has been at a premium. Since the PG&E purchase of electricity averages 9 cents per kilowatt/hour, the Merced plant economics was based on just the sale of electricity. Unexpectedly, the sale of biochar, the residual ash material after the gasification of the wood chips, has yielded over 50 cents per pound on the spot market. The Merced plant is operating during the peak to supply renewable energy at the highest revenue during periods, and is ratcheting down the efficiencies to generate more biochar. Phoenix has learned that an on-site electricity demand, to off-set purchasing energy, and having an on-site fuel supply is critical to long-term economic feasibility. Having a heat demand on-site that would generate revenue would be even better for economics.

Phoenix is constructing 1.0 MW plant in Oakdale at the Central Valley Ag Grinding facility. The Project has on-site energy demand, on-site heat demand, and a ready supply of fuel from the agricultural sector. This project would be considered an agricultural scale renewable energy development project that could be replicated throughout the agricultural sector where there is a readily available supply of affordable fuel, on-site energy demand and on-site heat demand.

Phoenix has been advising the Placer County Biomass Program, whose elements are being implemented through federal funding and grants administered by the United States Forest Service (USFS), Placer County Air Pollution Control District, the Sierra Nevada Conservancy, and the US Department of Energy. The Placer County Biomass Program is proposing the Cabin Creek Biomass Facility Project to construct a 2.0 MW wood-to-energy facility in eastern Placer County. The fuel supply would be gathered from locations from USFS fuel reduction sites and primary project objectives are forest health based initiative and renewable energy development. The fuel supply would be locally available from forest thinning, and the energy would be sold to the grid, as on-site energy demand was not noted as a priority. The waste heat would have limited application of melting snow on paved and concrete areas. This project could be considered a forestry sector renewable energy development project that could be replicated within forested regions throughout the western states where there is a readily available supply of affordable fuel which is not common, on-site energy demand and on-site heat demand, rather than melting snow.

This type of biomass gasification plant is a replicable model for local and self-contained renewable energy sources and environmental sustainability throughout the state, and could be located at any one of the 60 material recovery facilities, 50 composting facilities, or the additional 100 planned facilities needed to meet state recycling laws. This type of Project fueling the development of recycling and composting technologies at other Resource Recovery Parks and Renewable Resources Projects will result in reduced impacts on the environment by increasing recycling and composting, reducing

contributions to global climate change, reducing reliance on oil and other fossil-fuel sources, helping to comply with statewide CalGreen solid waste reduction mandates and decreasing consumption of natural resources. This type of Project includes the installation and operation of a 50-foot tall biomass plant that would generate 1.0 MW of renewable energy for on-site operations, and for off-site community need. The plant would operate 24-hours a day, seven days per week, operating at 80% capacity, and utilize an average of 32 tons per day of clean wood chips that would be generated on-site at the MDF. A conveyor-fed hopper would deliver the wood chips into the biomass plant via the fuel hopper. The project would take advantage of locally-available renewable biomass resources that would otherwise be hauled to the Central Valley to fuel less efficient fluidized-bed biomass plants built in the 1980's. The local wood chip supply would be guaranteed through current historical feedstock supply at the local MRFs while additional biomass supply will increase as more urban wood waste is captured from construction and demolition debris recycling activities and agricultural burning of the vineyards is curtailed.

This type of Project uses gasification technologies that convert biomass into a synthesis natural gas ("syngas") through the process of thermo-chemical conversion, which "cooks" biomass in an oxygen starved environment. This syngas is then used to fuel a specially modified natural gas Genset (power generator) that provides renewable electricity and heat. As the biomass gives off the syngas, it is transformed into biochar and ash of approximately 9% to 16% of the volume of the biomass fuel, depending how the operator optimizes the production of electrical and biochar, based upon electricity pricing and biochar market value. The syngas is then captured, cleaned and cooled before being sent as fuel to the Genset. Installation of the biomass gasification system includes a conveyor system for fuel loading, syngas cleaning system, and power generation system with heat exchange system that includes a rotary drum dryer.

From the top down with the AB 32 Scoping Plan adopted measures and from the City level up with the development of Climate Action Plans and Sustainability Plan, every community in California will create policies and incentives to establish community scale renewable energy development projects that are within the urban interface. This research will enable all communities in California to create community scale renewable energy programs. The era of the long hauling urban waste will be over as GHG transportation emissions are reduced and distributed green energy facilities are right-sized in-town and co-located at community recycling and compost facilities. The communities will embrace the new value curve of responsible resource management as they become part of the solution and not part of the landfill and GHG problems. With long-haul inefficiencies and waste being squeezed from the system, collection and processing becomes more convenient while producing its own clean, green energy to run the system. With this research, the community will understand more than just waste and recycling and compost, but will become active participants in local solutions of creating their own renewable energy while promoting sustainable and local agricultural. The urban sector will be poised to implement community scale renewable energy to compost to farm programs: with the wider use of this research.