

EXECUTIVE SUMMARY: California Clean Tech Open 2006

Project: **BIOMASS ENERGY HARVEST TECHNOLOGY**

Company: **Phil Jergenson Design & Ed Burton Company**

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Executive Summary for: **BIOMASS ENERGY HARVEST TECHNOLOGY**

Opening Statement:

Of all sources of renewable energy, biomass is perhaps the most widespread, versatile and potentially valuable. Virtually every region of the country has biomass resources. This can provide a large amount of transportation fuel, electricity and heat and supply bio-based chemicals and materials, many of which could replace petroleum based products. With focused effort the early 21st century will see the rise of an expanded bio-industry.

Biomass must be harvested, gathered, bundled and delivered to a processing plant. Over 60% of the labor can go into handling and delivering this resource. Over the years our company has developed solar powered cutters, harvesters, bundlers and other technologies for collecting biomass with secondary results such as clearing the forest of fire danger. As we will show these solar powered tools are on the front line of biomass processing and associated products.

Description of the Offering:

Over the last 20 years we have developed built and field tested electric powered vehicles recharged by the sun. These work-vehicles with on-board batteries are capable of powering other electric tools such as electric chainsaws, spiral shears and branch clamp bundlers. These electric vehicles are capable of going into a forest and clear the branch and brush debris that represents a major fire hazard.

This solar powered equipment is then used to collect the biomass and deliver it to a biomass conversion processor where it is used to create wood coke, industrial heat, and other products such as *Ecoline* (an alcohol), and electricity. The biomass feedstock feeds a biomass conversion process which makes a range of products.

The scope of this business plan is to craft a fire risk reduction and biomass gathering business which can become a community enterprise in towns and counties all of the West. This will allow for the production of local energy and products that are not dependent on foreign fossil fuels. We need funding and management support to craft the business and make it into a success.

Concept and Product:

The product that we are selling is a “pipeline” of technologies made from GRIDBEAM™ which is a reuseable framing system that we manufacture.

The products made from GRIDBEAM™ are essentially electric vehicle chassis that can do a number of different jobs. A description of some of the machines and equipment that we use include:

1. SOLMAN: a mobile photovoltaic charging system for powering all of the solar tools. These come in 3 sizes.
2. J-BARROW: an electric motorized wheel barrow and branch bundler. 2 models.
3. INDUSTRIAL SOLAR WEED EATERS: electric weed eaters.
4. RAKERS: Industrial wide-toothed forest rakes.
5. SPIRAL SHEAR: an electric system for reducing branches into chunkettes.
6. BRANCH-CLAMP BUNDLERS: a third hand for cutting firewood and kindling with electric chain saws and a holder for making firewood bundles.
7. TORO™ Electric Vehicle: An electric vehicle with an articulated frame for steep forest conditions with built in inverter and 120 VAC outlet.
8. GB-TRAILERS: Gridbeam trailers for moving biomass out of the forest on 4 to 5 foot roads.
9. ELECTRIC CHAINSAWS: Huskaverna, Stihl, Emmerson, Ryobi brand chainsaws for cutting small diameter brush and branches.

What problem are we solving?

We have developed the tools for removing biomass safely and quietly out of the open and urban forests. We are making energy and products from this resource while reducing the risk of fire without significant damage to soil, water and air quality.

What are the strengths and weaknesses of our technology?

The tools are recharged by the sun, power grid or back-up generator. The tools are very quiet, produce no smoke and are inherently safe to use. They are the result through modification and refinement of hundreds of hours of use.

What are the key underlying technologies?

As mentioned, the underlying structural system is an aluminum space frame open source building system called GRIDBEAM™ which the team leader, Phil Jergenson, has developed in the last 30 years. Proprietary cutters and electric drives are mounted within the space frames. Certain technologies like the TORO electric vehicle and the electric chain saws were developed by private industry.

Feasibility:

We have presented our product line to:

1. The California Department of Forestry.
2. The State of California Bioenergy Action Plan and Consortia.
3. Small scale operators, residential customers and ranchers.
4. Watershed Training Centers, Trinity County.
5. The City of Fort Bragg and Willits.

All of them have responded positively confirming that.

- No major change will be required in the manufacture of the product.
- There were questions if the equipment could be leased as well as bought.

From this feasibility study, success will require that we:

- Create strategic partnerships with key manufacturers
- Network with CDF Fire Risk reduction units and their subcontractors.
- Define pricing structure and lease options.

Market:

An excellent market response is coming from the California Department of Forestry and Fire Protection. Apparently the CDF has been successfully suppressing forest fires for the last 50 years. The brush buildup is now at a dangerous level particularly in our urban forest. There is a need, and the need is now, to clear grass, brush and small diameter timber along all roads with a 100 ft setback. We have the tools to do the job. We need to approach the enterprises and community development organizations that will utilize our technologies.

There are over 9,000 MW of installed generating capacity in the U.S. that are fueled by forest product and agricultural residues, municipal solid waste and methane gas from decomposition of land fills. Our equipment can be used to gather feedstock for these enterprises.

Another pathway involves subjecting biomass to elevated temperatures, often in the presence of steam, to transform it into a gaseous state. This may be the technology best suited to woody feedstocks – forest residues collected to reduce wildfire risk or short-rotation trees, like poplar, grown specifically to make industrial and consumer products and energy. Gasifying feedstocks yields synthesis gas, or *Syngas*, rich in hydrogen and carbon monoxide, which can be used to produce a variety of outputs. Hydrogen from *Syngas* can be purified and used to operate fuel cells making electricity or powering vehicles. Our technology will provide the feedstock for the biomass and bio energy fuels.

We believe that we are perfectly positioned to market biomass harvesting technology. Our timing could not be better. The value of the biomass will be a bonus, an extra income stream to any operation that buys or leases our technology. Like solar and wind energy, the fuel is free, but technology and labor to gather and process the biomass, is not.

The benefits of expanding the U.S. bio-industry are potentially large. They include decreased dependence on petroleum imports, resulting in more security of supply, lower fuel prices, and a better foreign exchange balance, as well as carbon emissions reductions and rural economic development. Biomass is a 21st century industry and the demand is global.

A marketing example:

A study by the Renewable Energy Development Institute (REDI) determined that 12lbs of dry wood brush (13% moisture) has the energy equivalent of 1 gallon of gasoline. It is not untypical to have 45,000 lbs of biomass growing per one acre. This is equal to the energy contained in 3000 gallons of gasoline.

If we use this as a “high end” example we can predict that if the land owner paid \$2,000 to clear 1 acre of biomass and the energy value of this one acre is equal to 3,000 gallons of gasoline, then at \$3.00/gallon this would yield a biomass-harvest-enterprise a total of \$11,000 for that acre of biomass. 3 men earning \$25/hour for 2 eight hour days and utilizing our tools would cost \$ 1,200 for labor and produce a profit of \$ 9,800 for two day’s work to clear one acre. There is a need to clear hundreds of thousands of acres in California alone.

How to reach this market and how fast?

To be successful we require a multi-prong go-to-market strategy:

- Networking with State Agencies such as the Department of Forestry, Department of Corrections, State contractors and community development corporations.
- Production of a DVD which shows the operation of the Biomass Equipment.
- Demonstration projects with economic development enterprises.
- Strategic alliances with biomass processors and distributive power generators.
- Internationally connection with the U.S. Department of Commerce.

We are ready to go to market and are beginning to reach out through emails and other targeted and direct marketing efforts.

Financials and Profitability:

The previous marketing example is but one example where harvested biomass is burned to produce energy. Traditional biomass clearing practices chip the branches and leaves into piles. This is extremely energy intensive and the chips are used as a mulch, burned in the open, or worse, taken to the land fills (which costs money to drop off). No economic benefits are derived from the biomass harvest!

Our system is an alternative that generates value added products that are valuable at least for their energy content. This is the feedstock for distributive power generation. In all cases the biomass must be dry to be useable.

Our company is also profitable from the harvesting tools that we sell and lease. Since they are renewable energy tools they can be rapidly depreciated in 5 years.

Should this executive summary enter Round 2 of acceptability, we are prepared to offer spread-sheets and case studies that show definite profits for this enterprise.

The Team:

Team leader is **Phil Jergenson**, Industrial Designer, Principal of Phil Jergenson Designs, is also President and a founder of REDI, the Renewable Energy Development Institute, a 17 year old non-profit organization. Mr. Jergenson is an author and prototype designer and fabricator of the Gridbeam™ Systems, a framing system that allows rapid prototyping & production of forest equipment. He has developed proprietary manufacturing equipment and techniques for producing Gridbeam and other components. In the last 25 years he has built dozens of small-scale battery powered and solar recharged systems.

R. Edward Burton, B.S. Forestry, M.S. Forest Engineering U.C. Berkeley is principal of Ed Burton Company. Mr. Burton is an eminent researcher of forestry products and aquatic environments and solutions for wastewater treatment some of which are in use world-wide. With over 23 patents and several highly successful enterprises under his belt, solar powered biomass harvesting technology represents a final achievement that pulls together over half a century of work.

The team has been working together in a research and development environment on a daily basis for the last 7 years. The focus has been on vehicles and equipment for harvesting and processing brush. Since our R&D lab is located at an operating redwood sawmill, we understand and are familiar with industrial scale equipment and where and when to use them. Conventional industrial scale equipment is far too large to clear brush in an urban setting. We have developed a line of equipment that is small scale, light weight and quiet and very effective at removing and converting brush into a useable product. Our equipment runs primarily on solar power.

Environmental and Societal Impact:

Our company is like a 3 legged stool.

The first leg, represented by sustainability, makes sure that our projects become self-reliant and lead to self-sufficiency as a kind of proof of success.

The second leg, social justice, insures that our work also benefits the local community, our grand children, and society at large.

The third leg, financial performance, fulfills our commitment to our investors. It says that good performance needs to be rewarded with financial success.

