



TripleGreenEnergy.

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1. **Introduction:** Brief overview of project The BEST (Biomass Energy System Technologies Inc) Biomass Thermal Conversion System is an updraft, atmospheric pressure close-coupled 2 stage gasification-heating system. Typically our system is fired with post-harvest or swamp biomass containing silica. Biomass is the sequestered energy from the sun, or stored solar energy. Our silica trap removes boiler clogging silica that occurs naturally in cereal straw. Unless these salts are dealt with, they will foul up any boiler.

We are TripleGreenEnergy because

1. We efficiently convert any biomass to thermal energy with our patented silica removal inherent in straw
 2. We operate with low electrical to energy output ratio
 3. We meet Ontario Government guidelines for clean exhaust by having "1000 deg C combustion temperature for 1 second of retention time with a minimum residual oxygen concentration of 6% with an expected design range of approximately 6 to 8% oxygen."
2. Agricultural waste (straw) and forest waste (slash, and urban wood waste) is the cheapest available form of energy. Biomass combustion is CO₂ neutral. Bio-fuels are widely available. BEST believes that the ideal installation uses fuel originating in close proximity to the heating unit, and that the fuel requires minimal preparation.

Bio-fuel dollars remain in the local economy. The BEST heating unit is a gasifier/combuster controlled by a PLC. Our SmartFire technology consists of a computer monitoring temperature, vacuum and oxygen content at various points in the system. www.TripleGreenEnergy.com

3. Existing Approved Applications

a. Project Locations

- i. Manitoba: We are currently testing a prototype 6 – 9 million BTU/hr BEST system with funding provided in part by <http://www.sdte.ca/> The project description is posted at [http://biomassbest.com/bstNRG CHP Proposal.pdf](http://biomassbest.com/bstNRG_CHP_Proposal.pdf)
- ii. Alberta: An Alberta greenhouse has ordered a 3 million BTU/hr BEST system to be installed this summer. The system is almost ready for testing.
- iii. The original system was installed and operating at the Vidir Machine factory north of Arborg Manitoba for 10 years and was approved by CSA and Workplace Health and Safety.
- iv. A 6 million BTU/hr BEST system installed and operating in Estonia in a wood pelletizing plant to provide heat to dry the wood chips prior to pelletizing.

b. Regulatory Ministries

- i. List of ministries/agencies:
- ii. Standards required: CSA on electrical, Workplace Safety on the system and MOE
- iii. Documentation verifying process acceptance: The following documents can be accessed at <http://www.biomassbest.com/pdf/>

[2007-A-1262 bstNRG CA FINAL 11Aug-1.pdf](#)
[Combustion Gas Concentrations June 2005.PDF](#)
[Dillon Final Report March 2003.pdf](#)
[Dillon Final Report March 2003a.pdf](#)
[Emissions Straw with Cyclone Aug 2005.PDF](#)
[Emissions straw and manure Aug 2005.PDF](#)
[GrainDryers.pdf](#)
[Numerical Modeling of a Biomass Gasifier.pdf](#)
[Process Analysis of Oat straw 16.7% 20% 26%.xls](#)
[Process Analysis of wheat 20% 14% 26%.xls](#)

[Pyrolysis analysis.pdf](#)
[Thesis_Balcha.pdf](#)
[bstNRG_CHP_Proposal.pdf](#)

c. BioMass Plant Description

- i. Plant Bio make-up including root mass ratio
- ii. Thermal Value: BTU/metric tonne 7,000 BTU/lb or 15,400,000 BTU/tonne or 4.5 megawatts/tonne
- iii. Waste/hazardous material description & quantity/metric tonne approx 5% ash & silica

4. Bio-Management : South-Western Ontario Project Expansion

a. Chatham Kent – Phase One

- i. [Phragmites](#) (European common reed) Invasive *Phragmites* is a very aggressive plant that spreads rapidly and outcompetes native species for water and nutrients.
- ii. Typha (Cattails)
- iii. C4 grasses (warm season grasses, e.g. Switchgrass)

b. Chatham Kent Priority Projects

- i. Municipal drains and roadsides
- ii. Rondeau Bay (mngt of Phragmites & Cattails; Phosphorus removal and recovery)
- iii. Walpole Island First Nation (mngt of Phragmites & Cattails; Phosphorus removal and recovery)
- iv. DUC coastal impoundment wetlands (mngt of Phragmites and Cattails)

c. Chatham Kent – Phase Two

- i. Pulp from ethanol plant
- ii. Blue box waste plastic
- iii. Agricultural waste (organic and plastic)

d. Sustainable Development Benefits

- i. Nutrient removal: Harvesting Typha and Phragmites permanently removes phosphorus and other nutrients from aquatic ecosystems that are suffering from nutrient loading e.g. Rondeau Bay
- ii. Habitat improvement: Economical tool for management of large monoculture stands of Phragmites and Typha. Removal of dense accumulation of dead plants opens marsh to sunlight, encouraging new growth and renewing a bio diverse wildlife habitat.
- iii. Biomass market for Warm Season Grasses (WSG) helps support the use of WSG buffers and filter strips on agricultural landscape. These buffers help prevent soil erosion and sediment/nutrient loading of our water courses. Adding these WSG plantings to our agricultural landscape significantly increases the biodiversity.
- iv. Phosphorus recovery: ash from burning these biofuels has phosphorus, which can be recycled into fertilizer. Phosphorus is a scarce, strategic natural resource, critical to global food security. Char is also a valuable byproduct.
- v. Typha, Phragmites, and WSG can be burned in place of fossil fuels resulting in fewer in greenhouse gas emissions and generating profitable carbon credits
- vi. Utilization of dirty Plastics: Most household and agricultural plastics are dirty and are not recycled. They are discarded in landfills. Municipalities are charged a tipping fee to discard into landfill. These plastics and tipping fees could be better utilized in supporting a green program such as a Rondeau Bay Biomass Program to remove excess nutrients from the Bay.

5. Energy Use : South-Western Ontario Project Expansion

a. Chatham Kent – Phase One

- i. Heat for ethanol plants
 1. GreenField Ethanol Inc. is Canada's largest ethanol company – producing 600 million litres in fuel ethanol annually. They require \$12,000,000 worth of Natural Gas to provide the required heat to run their operations.
 2. One SIX million BTU/hr www.TripleGreenEnergy.com system will consume 4,500 tonnes of dry waste biomass per year to generate **67,439** Gigajoules of energy displacing 1.8 million M³ NG thereby earning 2,400 tonnes of carbon credits per year. Multiple units (and larger systems) could be set to provide a greater percentage of the required GREEN heat energy.
- ii. Heat for greenhouses. Post process GreenField plant heat will be used to heat 90 acres of greenhouse to grow tomatoes.
- iii. Electrical production from constant heat source

6. Complimentary Technologies : South-Western Ontario Project Expansion

- a. Marsh Harvester
- b. Product baler and transportation system
- c. Silica as a finished product
- d. Char, phosphorus Green Marketed bio products
- e. Laminar flow de-humidification process
- f. Waste Management

7. Job Creation Potential: SW Ontario

- a. Manufacturing: engineering and product development
- b. 1st Nations – crop harvesting and electrical power generation
- c. Local Farmers: crop expansion – harvest waste lands/ditches
- d. Electrical production: engineering/site management
- e. Carbon neutral green products; tomatoes, peppers etc sold at a premium price because they are green
- f. Green fertilizer products for large urban gardens

8. Expansion Potential

a. Canadian Markets

- i. Over-vegetated wet-lands throughout Canada
- ii. Remote communities lacking useable power or relying on diesel power
- iii. Municipal roadsides, drains and lagoons
- iv. Greenhouse industry
- v. Bio-diesel plants producing waste bio-products
- vi. General food production industry producing waste bio-products
- vii. Hydro and pipeline corridor

b. Identified Export Markets (provide “expression of interest” letters)

- i. United States – Great Lakes Region
- ii. Vietnam
- iii. Indonesia
- iv. India

9. Resources Required – funding for the following;

- a. **BioMassBEST**: process equipment
- b. **R&D location with environmental laboratory**
 - i. Elgin Innovation Centre

- ii. University of Guelph - to be confirmed
- iii. Ridgetown College – to be confirmed
- c. **Bio-products:** in large enough volumes for process testing and monitoring
- d. **Certification Oversight:**
 - i. University of Guelph – to be confirmed
 - ii. Ridgetown College – to be confirmed

10. Financial Analysis:

- a. Generate projected financial models for the BioMass processing
- b. Generate on-going financial analysis of projections compared to actual

11. Potential Participating Agencies and Businesses

Support Agencies:

- a. **Ministry of Natural Resources:**
Ron Ludolph
- b. **Ducks Unlimited:** Darrell Randell
- c. **IRAP:** Ron Evans – Mydlana ...
- d. **Chatham Kent:** Mayor Randy Hope
- e. **Ontario Nativescape:** (not for profit): Lindsay Buchanan

Businesses:

- a. **BioMassBEST:** Raymond Dueck
- b. **Elgin Innovation Centre:** Jack Baribeau
- c. **Cedarline Greenhouses:** David Vandamme
- d. GreenField Ethonal Inc

12. Energy savings calculation

Energy Source	BTU	Unit	Efficiency	Cost/unit	Cost per million BTU	Swamp grass Per million	With wheat straw you save	Annual unit Usage	Annual Cost	With swamp grass Annual Savings
Oil	36,175	Litre	75%	\$0.70	\$25.80	\$1.39	95%	300,000	\$75,000	\$62,402
Electric	3,409	Kwh	95%	\$0.09	\$27.79	\$1.39	95%			
Natural Gas	35,513	Cu meter	85%	\$0.25	\$8.28	\$1.39	83%			
Propane	23,595	Litre	95%	\$0.41	\$18.29	\$1.39	92%			
Hardwood	25,181,591	Cord 3000#	55%	\$150	\$10.83	\$1.39	87%			
Softwood	19,370,455	Cord 3000#	55%	\$100	\$9.39	\$1.39	85%			
Wood Pellets	12,913,636	Tonne	90%	\$200	\$17.21	\$1.39	92%			
Estevan Coal	14,498,570	Tonne	65%	\$45	\$4.78	\$1.39	71%			
Alberta Coal	22,017,750	Tonne	80%	\$65	\$3.69	\$1.39	62%			
Wheat straw	8,456,710	500 kg	85%	\$20	\$2.78	\$1.39	50%			
Swamp Grass	8,456,710	500 kg	85%	\$10	\$1.39	\$1.39	0%		\$12,598	
Flax straw	9,455,795	500 kg	85%	\$15	\$1.87	\$1.39	25%			



Biomass Energy System Technologies Inc located in St. Adolphe, Manitoba is keenly interested in partnering with an Ontario based greenhouse growing operation to use their high efficiency, clean burning automated biomass boiler. This system is very innovative since it requires little maintenance, can burn virtually any type of combustible without leaving silica residue.

As greenhouses expand and realize new efficiencies to capture greater markets, it is the philosophy of Biomass Best that our innovation in heating solutions can greatly assist today's grower by reducing heating costs while enabling facilities achieve carbon neutral status.

Since the technology developed by Biomass Best is innovative in nature and unique to the province of Ontario, funding opportunities for greenhouse growers could be available under the current provincial Growing Forward 2 program. This program encourages producers to evaluate their projects in terms of originality, benefits, level of risk, knowledge transfer and industry competitiveness.

Some key funding components of the Growing Forward 2 program offered in Ontario speak to environment and climate change, productivity enhancements and innovation. At Biomass Best we remain confident that the heating system that has been designed to offer large scale savings in heating would perform admirably in many greenhouse applications and funding criteria.

If you would be interested in learning more about our systems and working with us to access potential funding to enhance your operation contact us at www.TripleGreenEnergy.com.

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