

## Mascoma: Frontier Biorefinery Project

This project involves the development, construction and operation of a biorefinery producing ethanol and other co-products from cellulosic materials utilizing advanced consolidated bioprocessing

The Project would initially produce 20 million gallons per year of denatured ethanol from approximately 700 dry metric tonnes per day of cellulosic materials consisting of renewable woody biomass to demonstrate the technology.

[www.frontier-renewable.com](http://www.frontier-renewable.com)  
[www.mascoma.com](http://www.mascoma.com)

### Project Description

The proposed biorefinery would be located on a 50-acre portion of a 355-acre site near the Kinross Charter Township, Chippewa County, Michigan.

The feedstock for the facility would consist of hardwood pulpwood obtained from within a 150-mile radius of the Michigan site. Feedstock would be purchased through local timber suppliers under contract with the biorefinery or from additional commercially viable sources as available.

Hardwood pulpwood would be debarked, chipped, screened, stored in chip silos and conveyed to a biofuel pretreatment area. Once pretreated the feedstock would be subjected to Mascoma's proprietary Consolidated Bioprocessing which combines enzymatic hydrolysis to sugars and simultaneous fermentation to ethanol in one step. The ethanol/water mixtures would be sent to distillation



Company supplied pictures such as schematic of the Mascoma Facility or site picture.

Frontier Biorefinery Project site in Michigan.

and dehydration for final product purification. Lignin residues would be recovered from the distillation step, dewatered and used on-site in a solid boiler that would generate both steam and electricity. The ethanol would be denatured and loaded into trucks for off-site distribution and sale.

In order to finalize the design of the Frontier facility, intensive piloting work is being conducted at a Mascoma facility in Rome, New York. Extensive operation and analyses at 1,000 and 5,000 gallon scales have enabled a financeable engineering design of the final facility at Kinross.

### Potential Impacts

A biorefinery of this type creates long-term, high paying permanent jobs and

provides replacements for imported oil. The bioethanol produced displaces gasoline and, using life cycle models, clearly reduces net emissions of CO<sub>2</sub>.

### Other Participants

- Valero Energy Corporation
- Michigan Economic Development Corporation (MEDC)
- Oak Ridge National Laboratory (ORNL)
- Purdue University
- New York State Energy Research and Development Authority (NYSERDA)
- New York State Power Authority (NYPA)
- J.M. Longyear, LLC
- Frontier Renewable Resources, LLC

Prime	Mascoma Corporation
Location	Kinross Charter Township, Michigan
Feedstock (s)	Hardwood pulpwood
Size	700 tonnes per day, 20 million gal / yr. with long term potential for 1400 tonnes per day
Primary Products	Ethanol (lignin and bark to be used to produce heat and electricity)
Capacity	20 million gallons per year initially with long term potential for 40 million gallons per year of denatured cellulosic ethanol
Award Date	February 27, 2009
GHG Reduction	Greater than 60% reduction versus fossil product for E-15 to E-100
Anticipated Job Creation	Approximately 50 full-time permanent jobs; plus up to 150 jobs during peak construction and 500 spinoff jobs
Company Point of Contact	Steve Hicks 906-228-7960 <a href="mailto:stevehicks@frontier-renewable.com">stevehicks@frontier-renewable.com</a>