

December 15, 2008

Karlene Fine, Executive Director  
North Dakota Industrial Commission  
State Capital – 14<sup>th</sup> Floor  
600 East Boulevard Avenue, Department 405  
Bismarck, ND 58505-0840

RE: Commitment Letter “Phase I Biomass Enhanced Refined Lignite Demonstration Project”

ComPAKco, LLC is excited to partner with Great American Energy (GAE) to demonstrate proof of concept for production of a Biomass Enhanced Refined Lignite solid fuel product. This project will demonstrate the feasibility of blending North Dakota grown grasses with North Dakota refined lignite to produce a cost effective environmentally friendly fuel.

The project will be divided into two phases. The goal of Phase I of the Biomass Enhanced Refined Lignite Project (which is addressed in this grant request) is to produce a high value solid fuel for home and small commercial furnaces. The goal of Phase II is to perform a large scale demonstration of the technology and biomass product including production of product and full scale testing in a large heating boiler.

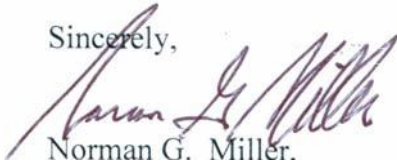
Biomass Enhanced Refined Lignite will be produced by mixing refined lignite and ground biomass in a ComPAKER. The product will be a refined lignite product enhanced with 10 to 20% biomass. In addition to production and optimization of the Biomass Enhanced Refined Lignite product, demonstration and performance testing of the product will be performed in a variety of home and small commercial furnaces.

ComPAKco has extensive experience in the production of biomass enhanced products. ComPAKco, LLC has developed technology that increases the density of biomass into a uniform size and shape final product. This technology is being commercially built for waste applications. ComPAKco and GAE desire to develop this technology with refined lignite fuel and biomass.

GAE is currently building a coal refining facility at Coal Creek Station that will produce lower moisture higher heating value lignite. The opportunity to partner with ComPAKco to produce a commercial product by combining refined lignite with biomass has the potential to produce a high value product by utilizing North Dakota products and producing North Dakota jobs.

ComPAKco and GAE are committing cash and in-kind services to the project and are requesting a matching Renewable Energy grant from the North Dakota Industrial Commission Renewable Energy Development Program.

Sincerely,



Norman G. Miller

Plant Superintendent, Federal Machine/ComPAKco, LLC  
(701) 282-8134 Fax (701) 282-8135

## **Title Page**

**Project Title:** Phase I Biomass Enhanced Refined Lignite Demonstration Project

**Lead Applicant:** ComPAKco, LLC

**Co-applicants:** Great American Energy

**Principal Investigator:** Norman Miller, Plant Superintendent, Federal Machine and Officer, ComPAKco, LLC

**Date of Application:** December 15, 2008

**Amount of the Request:** \$275,000

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## **ABSTRACT**

The Biomass Enhanced Refined Lignite Project will be divided into two phases. ComPAKco, LLC and Great American Energy are applying for a grant for Phase I.

Phase I will produce a high value solid fuel for home and commercial furnaces. The product(s) will then be tested in several home and small commercial furnaces. Testing and analysis will be performed to characterize the fuel and determine the product firing characteristics and emissions. Phase I will be conducted on the Federal Machine site in Fargo, North Dakota.

The goal of Phase II is to perform a large scale demonstration of the technology and biomass product. GAE will serve as the host site for Phase II. During Phase II, sufficient biomass enhanced refined lignite will be produced to perform a full scale test in a large heating boiler such as those found in North Dakota state institutions.

This project will optimize the design and operation of the ComPAKer in blending lignite with biomass to produce a high value solid fuel. A fuel specification will be developed to aid in establishing markets for the product. Emissions testing will be conducted to demonstrate the environmental performance of the product. A variety of biomass products may be tested to determine the optimum product to mix with lignite.

GAE is currently building a coal refining facility at Coal Creek Station that will produce lower moisture higher heating value lignite. The refined product is lower in moisture, minerals and metals than run-of-mine lignite. GAE will provide this material for blending with the biomass.

Total project cost is estimated to be \$550,000. Production and testing of the fuel will be completed in November 2009. Data analysis and project review will conclude by December 31, 2009.

## **Project Description**

### Design Work

ComPAKco is currently working on the design to PAK biomass and coal blends into user friendly PAK(s) for solid fuel. The design parameters will follow previous ComPAKer designs, technology that has been used to compact a variety of biomass, coal and waste products. This project will utilize a JMF300 to ComPAK 10 tons of biomass per hour. Production of parts for the ComPAKer has been modeled into Solid Works to feed the high end Mori Seiki Center. Blending and conveying technology design will address raw product feed to allow optimization of the final product. System design will be completed June 2009.

### Production and Preparation of Raw Product

The project is targeting a final product containing: 78% refined lignite, 18% biomass and 4% additive, but other mixes will be investigated. Research into recipes is ongoing including a variety of binders for the biomass, lignite blend. Products with hydrophilic and/or hydrophobic properties will be tested.

GAE is currently building a lignite refining facility; construction is scheduled to be complete in 2010. The lignite refining facility has been scaled up through pilot and prototype testing. GAE has refined small batches of customer coal in the pilot plant to allow the customers to evaluate the economic benefits of refined lignite in their facilities. GAE is proposing to provide refined lignite, from the Falkirk Mine and.

Lignite produced through the refining process will be a product that is lower in moisture and higher in heating value than nonrefined lignite. The refined coal will be similar in heating value to sub bituminous coal, a product that is currently shipped from Montana or Wyoming and is utilized in most North Dakota state institution's boilers. Smaller boilers and furnaces generally utilize stoker coal, a product that is larger in size than the GAE refined

lignite product. The opportunity to partner with ComPAKco to produce Biomass Enhanced Refined Lignite has the potential to produce a high value product by utilizing North Dakota products and producing North Dakota jobs.

Biomass for the project will be a blend of North Dakota grasses. Material has been secured for the project. A haybuster will be utilized to grind the hay to the desired fineness. The project will lease or purchase a Haybuster and appropriately sized electric motors.

### Marketing

The partners have begun working to arrange cooperative agreements with home and small furnace manufacturers. Cooperative agreements will secure furnaces for test burns at the Federal Machine/ComPAKco site. All agreements will be in place prior to the completion of process construction.

### Construction

ComPAKco will construct the ComPAKers on the Federal Machine/ComPAKco, LLC site in Fargo, North Dakota. It is envisioned that the test site will be enclosed allowing containment and security for the production equipment. Equipment will be leased as available. GAE will assist in securing equipment for the project. It is expected all required equipment will be on site during June 2009. It is estimated that construction of the ComPAKer will be completed by August 2009.

### Operation and Production

During August, 2009, production of the Biomass/Enhanced Refined Lignite will begin. The operation will involve a start-up and shakedown period to optimize the mix blends and the process. Blends will be tested for a number of physical characteristics during production. During September, or once sufficient product has been developed, test burns in home and small commercial furnaces will commence.

### Test Burns

Test burns will be conducted on several home and commercial furnaces that have been secured through cooperative agreements with the manufacturers. Data will be collected from the tests that will help develop and provide technical information to the home furnace and small commercial furnace market. Test burns will provide the baseline for Phase II of the project. Test burns will be completed by late November 2009.

### Performance Testing and Environmental Emissions Testing

Product testing on the Biomass Enhanced Refined Lignite product will be performed by Great River Energy. Testing will be ongoing during fuel production. Test parameters and protocols will be developed by June 2009.

During test burns, emissions testing will be performed to determine the environmental impacts of the product. It is anticipated that the fuel will be environmentally friendly with lower emissions than the already clean refined lignite product. A test protocol will be developed by August , 2009.

### Data Analysis & Economic Impacts

Data from test burns and product specifications will be analyzed through December 2009. All data will be reviewed with the furnace manufacturers. Preliminary impacts to the biomass market will be evaluated.

## **Standards of Success**

The project will be deemed successful if it meets the following criteria:

- **Innovation:** This new technology will utilize raw materials from two North Dakota core business sectors, energy and agriculture, to produce a new commercial product for the home furnace and small commercial furnace market. This product will have economic and environmental benefits greater than either sector can produce for this market. This is an innovative concept and has the potential for the equipment and the products to be exported from North Dakota. There is also the potential to examine the use of the product in large commercial boilers.
- **Education:** This project will develop a renewable energy technology and product not current used or produced. This project will provide the foundation and knowledge to manufacture Biomass Enhanced Refined Lignite for Phase II: Full Scale Demonstration of Biomass Enhanced Refined Lignite.

The project will demonstrate the product value and properties through testing in various home and small commercial furnaces. A specification for the fuel will be developed for education and marketing purposes. Public education on the value of the product will be developed so that the advantages of using Biomass enhanced Refined Lignite will be understood.

- **Economic development:** This project will provide multiple economic opportunities, including: production and sale of a new biomass solid fuel, sale of equipment for product production, economic value for farmers to produce biomass with low inputs, additional markets for lignite, and construction and other job opportunities .
- **Economic and technical feasibility:** This project will determine the economic and technical feasibility of producing and utilizing a solid waste fuel that is a blend of biomass and lignite.



## **Background**

ComPAKco, LLC entered into the biomass program several years ago. Norm Miller, principal investigator for the project, has extensive biomass experience. ComPAKco has performed due diligence and has determined the demand for the machinery and technology associated with the compaction of biomass. Staff committed to this project includes:

- Jim Flaherty senior is a Mechanical Engineer with a background at General Motors. Jim founded Federal Machine has kept it on the cutting edge of technology.
- Jim Flaherty, P.E. is a mechanical engineer and General Manager of Federal Machine
- Michael Flaherty – Engineer and MBA, Federal Machine Comptroller  
Mr. Flaherty currently teaches engineering at North Dakota State University. Previously he taught at Marquette University.
- Douglas Peterson – MBA, CPA and Financial Office
- Norm Miller, Federal Machine Plant Superintendent, ComPAKco Officer and Marketing Director
- Federal Machine machinists staff with over 100 years of combined experience.

GAE is currently building a coal refining facility; construction is scheduled to be complete in 2010. GAE has designed and developed lignite refining technology and has several patents pending on the process. Full scale production of refined lignite has been scaled up through pilot scale and prototype testing.

Lignite produced through the refining process will be a product that is lower in moisture and have a higher heating value than mined lignite. The refined coal will be similar

in heating value to sub bituminous coal, a product that is currently shipped from Montana or Wyoming to be utilized in most North Dakota state institution boilers. Smaller boilers and furnaces generally utilize stoker coal, a product that is larger in size than the GAE refined lignite product. The opportunity to partner with ComPAKco to produce biomass refined lignite with biomass has the potential to produce a high value product by utilizing North Dakota products and producing North Dakota jobs.

## **Qualifications**

ComPAKco, LLC, is a North Dakota company created by the owners and managers of Federal Machine, Fargo, ND. Federal Machine is an established metal parts manufacturing company in Fargo. Federal Machine's facilities incorporate a 40,000 square foot factory with some of the latest metalworking machinery and technology available in the world. Federal Machine practices 9 disciplines including: hard chrome plating, welding, induction heat treat grinding, bending large steel and paint, CNC machine and engineering. Nearly 90% of Federal Machines products are shipped out of state. Federal Machine designs and builds equipment to answer market demands.

Great American Energy (GRENAC, LLC) is a 50/50 joint venture of Great River Energy and The North American Coal Corporation that will develop, construct, own and operate a lignite refining plant located adjacent to both the mining operations of North American Coal and Great River Energy's Coal Creek Station electric generating plant (near Underwood, North Dakota). Through Great American Energy, lignite coal will be enhanced through various processes including drying, by utilizing waste heat from Coal Creek Station, air jigging, screening, and processing. The refining process will increase the heating value of the lignite while also reducing emissions. The first market for the refined coal product will be Great River Energy's Spiritwood Station, near Spiritwood, ND, in 2010.

Great River Energy is a not-for-profit wholesale electric cooperative, serving 28 distribution cooperative in Minnesota and covering 60% of the state geographically. It is the second largest power supplier in Minnesota. GRE owns and operates Stanton Station Generating Station located near Stanton, ND, Coal Creek Generating Station, located near Underwood ND and is constructing Spiritwood Station located near Jamestown, ND.

GRE has made important commitments to renewable energy development, including a waste-to-energy facility in Elk River, MN, a landfill gas project in Elk River, MN, anaerobic digestion projects in Princeton and St. Peter, MN, four wind projects in MN totaling 200 MW with plans for an additional 99MW, and hydroelectric power. GRE is currently evaluating the feasibility of utilizing biomass as a fuel for the Spiritwood Station located near Jamestown, ND.

The North American Coal Corporation is the nation's largest miner of lignite and the 7<sup>th</sup> largest coal producer nationwide. It operates six lignite mines in four states producing almost 35 million tons of lignite annually. It also operates several dragline operations in Florida that produce over 25 million cubic yards of limerock.

Ensuring employee safety is the number-one priority at each of North American's mines which have consistently maintained a lost-time accident rate well below the national average. North American Coal believes that its commitment to safety, strong employee relations and technology innovation improves productivity thereby reducing costs to its customers. In addition North American has a long history of successful reclamation and commitment to the environment.

North American Coal's parent company NACCO Industries, Inc, has annual revenues of over \$3.1 billion. In addition to North American Coal other NACCO Industries subsidiaries include NACCO Material Handling Group-manufacturer of Yale and Hyster

forklifts, Hamilton Beach/Proctor Silex-a leading manufacturer of housewares and Kitchen Collection – a leading retailer of kitchenware.

## Management

ComPAKco, LLC will host the demonstration site at the Federal Machine site in Fargo, ND. ComPAKco will provide design, in-kind and cash to the project. GAE will provide in-kind services and support to the project.

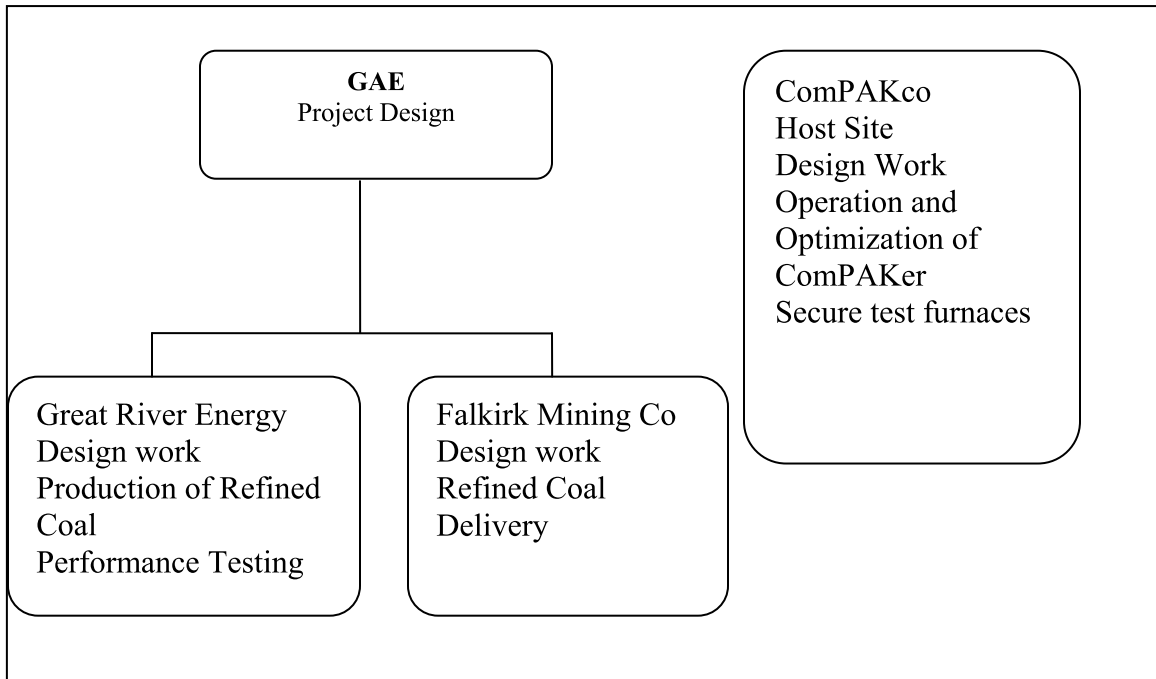


Figure 1: Management Responsibilities

## **Phase I Time Table**

Design – <ul style="list-style-type: none"><li>• Process Design June 1, 2009</li><li>• Product Testing Design and Protocol – June 1, 2009</li><li>• Test Burn Protocol – August 1, 2009</li></ul>
Secure Raw Materials – July 15, 2009
Marketing – February 1, 2009 to July 15, 2009
Construction – <ul style="list-style-type: none"><li>• Equipment Construction - August 1, 2009</li><li>• Equipment ordered and/or leased - June 30, 2009</li></ul>
Test Burns –November 3, 2009
Data Analysis and Project Review – December 31, 2009

## Budget

<u>In – Kind Services</u> <ul style="list-style-type: none"> <li>• Project Design</li> <li>• Equipment Design</li> <li>• Project Management</li> <li>• Construction</li> <li>• Operation</li> <li>• Testing and Specifications of Biomass Refined Product</li> </ul>	\$155,000
<u>In Kind Product</u> <ul style="list-style-type: none"> <li>• Test Stoves</li> <li>• Fork Lift(s)</li> <li>• Conveyors</li> <li>• Refined Lignite</li> <li>• Biomass</li> <li>• Additive</li> </ul>	\$115,000
Equipment Purchase or Lease <ul style="list-style-type: none"> <li>• Hay Buster</li> <li>• Electrical motor and Electrical Service installation</li> <li>• ComPAKer</li> <li>• Conveyors</li> <li>• Temporary Building</li> </ul>	\$280,000
Total	\$550,000
Funding sought from NDREC	\$275,000

## **Tax Liability**

Please See Attached

## **Confidential Information**

The lignite refining process is confidential with numerous patents pending. It is the intellectual property of Great River Energy and no disclosure of the process will be publicly disclosed.

ComPAKco has applied for patents on compacting technology. The technology is the intellectual property of ComPAKco, LLC and no disclosure of the process will be publicly disclosed.

ComPAKco, LLC, and Great American Energy wish to reserve the right to patent any intellectual property coming out of this study.

## **Appendices**

None



# GREAT AMERICAN ENERGY

Beneficiated Lignite Powering America's Independence

December 10, 2008

TO WHOM IT MAY CONCERN:

GRENAC, LLC, d/b/a Great American Energy, does not have any outstanding tax liens or liabilities, and is current with all Federal and State tax reporting agencies.

If you have any questions, please contact the undersigned or Staci D. Shewmake, Tax Director (Corp.) as provided below:

The North American Coal Corporation  
14785 Preston Road, Suite 1100  
Dallas, TX 75254  
(972) 239-2625

Sincerely,

William C. Thompson  
Business Manager





**FEDERAL MACHINE COMPANY, INC.**

725 25<sup>th</sup> Street North – Fargo, ND 58102  
Phone: (701) 282-8134 Fax: (701) 282-8135

• CNC Machining • Heat Treating • Hard Chrome Plating  
• Shot Peening • Precision Grinding • Tube & Bar Bending

December 9, 2008

To whom it may concern:

Federal Machine Company does not currently have any past-due taxes owed to the state of North Dakota.

A handwritten signature in black ink, appearing to read "Michael Flaherty". The signature is written in a cursive, somewhat stylized script.

Michael Flaherty  
Secretary/Treasurer  
Federal Machine Co.



Coal Creek Station • 2875 Third Street SW • Underwood, North Dakota 58576-8858 • 701-442-3211 • Fax 701-442-3726

January 14, 2009

Mr. Norm Miller  
Federal Machine/ComPAK Co., L.L.C.  
725 25<sup>th</sup> Street North  
Fargo, ND 58102

Dear Mr. Miller,

Great River Energy is pleased to endorse and support the proposed Biomass Enhanced Lignite Demonstration Project.

This project combines the newly proven process of enhancing lignite with the use of North Dakota grown agricultural products to produce a superior fuel that can be used on small to large commercial applications. This fuel will be environmentally sound by having a smaller carbon footprint and presents an economic advantage for North Dakota small businesses and institutions.

We support this work and the goals of the project. We look forward to the successful demonstration of the ComPAKer technology in phase one and full scale commercialization in the future.

Sincerely,

A handwritten signature in black ink that reads 'John Weeda'.

John Weeda  
Plant Manager  
(701) 442-7000  
jweeda@GREnergy.com

File: Biomass Project

A Touchstone Energy Partner



January 2009: Page 1

**North Dakota Department of Commerce,  
Attention: Andrea Holl Pfennig.**

**Re: Phase I Biomass Enhanced Refined Lignite Demonstration Project.**

**It is certainly the intention of ComPAKco llc. to join with Great American Energy  
and Falkirk Mines to follow the project through to completion.**

**We have the staff and facilities and know how to accomplish the task.**

**We will work closely with G.A.E. and Falkirk to complete the project.**

**Norm Miller / Federal Machine / ComPAKco has been working with G.A.E.  
and Falkirk Mine on almost a daily basis to drive the project forward.**

**We have the list of the items needed to achieve our goals.**

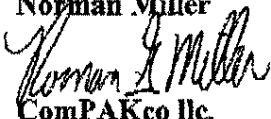
**This project is already creating employment and will create many good jobs,  
long term.**

**Jim Flaherty Engineer**



**ComPAKco llc.**

**Norman Miller**



**ComPAKco llc.**

**Project Coordinator**

Page 2:

Attached drawing shows layout of PAK making functional building.

There will be several disciplines running in concert to reach the goal of product in quantity being made by 8/1/2009.

A. Design and development of the series 300 ComPAKer by 4/15/2009.

Build ComPAKer by 7/15/2009

“Shake Down” of model 300, complete by 7/31/2009.

B. Order Building (Fabric and Steel crushed asphalt base)

C. Begin advertising for Co op biomass producers

D. Order support material and raw materials (Draw prints to flame cut)

E. Shift 2 more staff to ComPAKco full time 2-1-2009

F. BioPAK research ongoing for years to come.

(Norman Miller has a dramatic recipe for the (Coal / Biomass / Additive)

This PAK will evolve for years. (We have 42 PAK recipes to date)

G. Bring in Biofurnaces and BioGasifier Furnace (2200 degree downdraft unit)

H. Bring in Haybuster – Loader – Bins – Conveyers etc.

All phases of the “Phase One Project” will culminate 8/1/2009 pre-PAK production in quantity.

Norman Miller – ComPAKco Officer and Engineer / Industrialist Jack John

will over see the coordination on the project. The Team of Miller – Johnson –

Flaherty – Flaherty – Flaherty – Huss (the 5 engineers) and the staff meet every

Tuesday at 10:30 A.M. and each break out pod meets almost daily and as needed.

If this project is partially funded by NDREC it will slow it down, I do not believe it

will stop the project. However, our team is on the cutting edge of the industry and

slowing would be a dramatic loss.

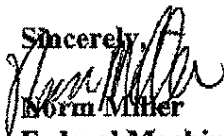
Page 3.

Agencies of the Federal Government state that, "Biocoal is the future," indeed we firmly believe that Clean Biocoal is ~~THE~~ vehicle that can drive the U.S. economy to recovery. Creating thousands good jobs and American Fuel, impacting the GNP in a very positive manner.

Great American Energy, ComPAKco, Falkirk Mines and others we work with believe this is the way to go. We have a team of Engineers and 4 Universities that work with us and advise us continuously. The Phase I project is a project that must happen. My team and I all vow to make it work.

There will be issues, but we are well down the road.

Sincerely,



Norm Miller  
Federal Machine – G.O.M / HR / Marketing  
ComPAKco – G.O.M. / HR / Marketing  
InvenTus llc. CEO.



THE FALKIRK MINING COMPANY  
2801 1st St. SW  
P.O. Box 1087  
Underwood, ND 58576-1087  
(701) 442-5751 • Fax (701) 250-2473

January 14, 2009

Mr. Norm Miller  
Federal Machine/ComPAK Co., L.L.C.  
725 25<sup>th</sup> Street North  
Fargo, ND 58102

Mr. Miller:

The Falkirk Mining Company is pleased to endorse and show our support for the proposed Biomass enhanced Lignite Demonstration project.

This project directly addresses political and economic hurdles facing the lignite industry. It also combines the new proven process of enhancing lignite with the use of North Dakota grown agricultural products to provide a superior fuel that can be used on small to very large scale applications. The fuel will have a smaller carbon footprint which will help address the current and future mandates to minimize carbon emissions associated with heating and electrical generation. We see broad opportunities for North Dakota lignite to maintain its competitiveness in the future.

We confirm our interest in this work and fully support the goals of the project. We look forward to the successful demonstration of the ComPAKer technology in phase one and full scale commercialization in the future.

Sincerely,

THE FALKIRK MINING COMPANY

E. Brett Schafer  
Vice President



**GREAT AMERICAN ENERGY**

Powerful. Natural. Energy. Powering America. To Benefit It.

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Mr. Norm Miller  
Federal Machine/ComPAKco,LLc  
725 25th Street North  
Fargo ND 58102

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Mr. Miller

The Great American Energy Company is pleased to be a partner in the proposed Biomass Enhanced Lignite Demonstration project.

The approach of combining North Dakota grown grasses and other available biomass with enhanced lignite is innovative and has potentially significant application to lignite coals burned for residential and commercial applications. This project is a focused on enhancing the value and marketability of two important North Dakota products while reducing the overall level of carbon introduced into our environment.

We confirm our interest in this work and fully support the goals of the project. We look forward to the successful demonstration of the ComPAKer technology in phase one and the full scale commercialization in the future.

Sincerely

---

Carroll Dewing  
General Manager  
Great American Energy  
1/14/2009

**Phase I Biomass Enhanced Refined Lignite Demonstration Project**

Testing and Specifications of Biomass

*ComPAker*

In - Kind Services

Project Design	Equipment Design	Project Management	Construction	Operation	Refined Product
\$28,000.00	\$16,000.00	\$44,000.00	\$35,000.00	\$30,000.00	\$12,000.00
3 Engineers	Layout of Project Equipment	5 Person Team 3 Person Build Team	Factory Labor	Operate Equipment	

*ComPAker*

In - Kind Product

Test Stoves	Fork Lifts	Conveyers	Refined Lignite	Biomass	Additive
\$18,000.00	\$30,000.00	\$16,000.00	\$28,500.00	\$10,000.00	\$7,500.00
4	1 Used	4		1 Ton Bales	3 Types
Gasifier Furnace					
Bio Furnace					
PAK Furnace					

Equipment Purchase

Hay Buster      Electrical Motor and Electrical Service Installation      ComPAker      Motor      Project Building

\$55,000.00	\$45,000.00	\$75,000.00	\$35,000.00	\$65,000.00	
Cost		300 Series	ComPAker		

*Industrial Commission*