

# **Business Plan for Electric Power Production and Manufacturing for the Turtle Mountain Chippewa Band, Belcourt, North Dakota**

20 MWe (net electric output) Coal and Biomass Fired Steam Plant, 90%+  
Emissions Capture Capability with Chemical Byproducts Co-Production, Using  
Pipeline Natural Gas for Co-Product Manufacture Only



Representative facility: Twin 24 MWe Delano Biomass Power Plant, California

(Image copyright 2010 and courtesy of "Coal Power Magazine," a McGraw-Hill publication)

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ESTIMATES AND GENERAL SPECIFICATIONS



**ESTIMATES AND GENERAL SPECIFICATIONS**

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## **I. Executive Summary**

There are several million tonnes of deciduous and evergreen tree trimming and timber waste harvested and repositioned at most municipal landfills in North Dakota which are suitable for power plant fuel utilization. This proposed power plant, intended to be ultimately a complex of (5) 20 MWe power modules, shall co-fire coal and biomass in the appropriate ratio to achieve the following goals to support Turtle Mountain Chippewa economic growth and independence.

1. Provide electrical power to the grid using the business model of the public-private partnership;
2. Provide steam to industrial clients at neighboring independent sites;
3. Co-produce using carbon capture technology and conventional chemical refinery practice such products as plastics for injection molding manufacturing feedstock, synthetic Diesel fuel and synthetic natural gas for transportation fleet service, methanol, ethanol, fly ash for road construction, gypsum for wallboard manufacture, ammonium sulfate fertilizer, and a range of other products exclusively for sale to industrial enterprises or for government use in reducing its fuel use bill;
4. Provide all of the above while maintaining a 90+ % rate of GHG emissions sequestration of flue gas emissions into the manufactured commodities as listed in Item 3.
5. With growth, this facility will also serve as a processing and marketing facility for CO<sub>2</sub> delivered from other sites which have captured CO<sub>2</sub>.

Supplementary environmental projects which would support community development should include the following:

1. Establishment of a well-paid trades apprenticeship program in conjunction with the unions and utilities for the training of boiler and steam turbine operator and repair/maintenance technicians, solid fuel boiler specialist technicians, and hydrocarbon refinery repair and operations technicians.

## **II. General Enterprise Description**

**Mission Statement:** This proposed public-private partnership provides electric power, chemical byproduct, consulting services, and technical apprenticeship training in an environmentally-sound manner which likewise meets and exceeds client expectations for price, delivery, specifications compliance and quality.

**III. PRODUCTS AND SERVICES**

Electric power shall be supplied to the grid in accordance with NERC, FERC, APPA or NRECA, IEEE and other technical and regulatory specifications, terms and conditions in modules of 20 MWe to match the appropriate line voltage, phase, frequency and signal quality specified.

The principal chemical products manufactured from this flue gas emissions-based co-production manufacturing regime shall be the following:

- A. Ammonium sulfate using the Marsulex method and technology
- B. Gypsum from fly ash using the Marsulex method and technology.
- C. Urea, ammonia, synthetic Diesel fuel, ethanol, methanol, and synthetic natural gas in either liquid or prilled form using licenced technology from either Linde Gases, Selas Liquid Processing Division, Uhde gmbH of Germany or Stamicarbon.
- D. Product lines fine-tuned to the needs of the plastics, coatings and other liquid hydrocarbon needs of pertinent manufacturers.

Please see attached standards compliance documents describing the finished business to business industrial feedstock products to be supplied by the proposed flue gas emission-based manufacturing facility and power plant.

Respecting marketing advantages inherent in this business model, the proposed plant has electrical sales to offset the cost of chemical manufacture and vice versa. This is why the plant is referred to as a "co-production" plant. This gives the facility the ability to track cost-effectively fluctuations in commodity market conditions and prices. As well, no activity shall be engaged in at this facility which does not reflect the highest standards in insurance standard-regulated compliance for both environmental and safety standards, making of this a genuinely sustainable enterprise. As a consulting and training tool, the proposed facility provides hands-on operational equipment and functional industrial examples for both the consultant and the apprentice to reference and quantify, both for the benefit of the client and for the benefit of the apprentice.

It would be the height of dishonesty and naivete to state that the need for supplementary natural gas usage is not going to be a significant economic factor. That being said, the "killer" cost in chemical plant operations has always been the cost of making steam, as the heat generation amounts to a dead write-off in one's pro forma manufacturing spreadsheet unless one is co-generating electric power and selling steam to another facility and unless the fuel used for the steam generation phase is very cheap, which in both instances we are doing here in combining functions of electric and steam generation for off-site end-users while making chemical byproducts. All of the

natural gas will be used solely for hydrocarbon feedstock for catalytic steam reforming, not steam generation, and thus those hydrocarbon molecules are fully monetized.

While the majority of the alternative and renewables industry are scratching their heads as to where to sell electricity and biodiesel-based byproduct at an indexed-commodity derivatives trader-friendly basis, this plant will address the practical realities of the needs and requests of the market place in both electrical power and in commodities supply. The three key elements of the facility's marketing strategy are as follows:

1. to provide electric power on a cost plus fixed percentage basis into the grid, allowing the distribution and transmission provider to set the rates to the retail and wholesale market as they choose;
2. to provide chemical co-production commodities at a cost plus fixed percentage basis to all indexed-supply side distributors on an equal footing for marketing by them in accordance with their derivative-trader-based yield expectations; and
3. to provide both of the above with a committed view to meld such activities into the individual corporate growth plans of local enterprise with the view to maximize living-wage sustainable employment while helping participating firms to maximize their shareholders' stock yield expectations.

This strategy gives this project the ultimate in market flexibility while preserving a competitive cost edge over all other suppliers, and likewise while successfully meeting facility cash flow needs and conservative shareholder expectations. In other words, marketing is based not on what we tell the customer it will cost for our goods, but rather on what our customer wants and needs to maintain their edge in the wholesale distribution arena of competition. By maintaining our course in the cost plus fixed-percentage mode and refusing the derivatives traders' back-door commission, the co-production plant will be insulated from the vagaries of commodity speculation regardless of the condition of the American industrial economy.

The other principal market advantage is a product of accepting that underground carbon sequestration is not economically viable, and the only alternative is one that will yield a conventional profit. The monetization of carbon dioxide and other flue gas emission chemicals, fortunately, enjoys a chemical industrial tradition of conventionally profitable efficacy which dates back to well before the First World War, both in North America and in Europe.

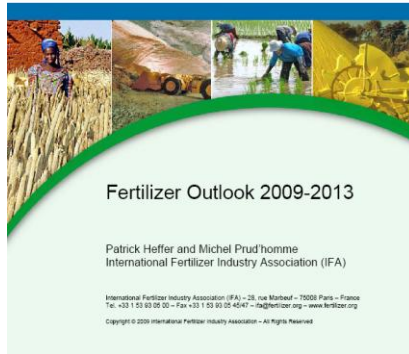
There is nothing unique nor radically innovative in the design of the basic plant module array. All aspects of this operation's array can be viewed in operation at the Bismarck, ND Dakota Gasification plant, of which this is little more than a





AGRISET  
June 2009

77<sup>th</sup> IFA Annual Conference  
Shanghai (China P.R.), 25-27 May 2009



## THE MARKET

### FERTILIZER NEWS AND ANALYSIS FROM ICIS

NITROGEN	PHOSPHATES	AMMONIA	SULPHUR	POTASH	NEWS	PRICES
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##### OVERVIEW

The latest dip in the urea market has bottomed out this week at \$228-230/tonne FOB Yachay. The surprise announcement of a new Indian tender on 3 September prompted a move to cover short sales. Traders stepped in and bought tonnage in Yachay in mid week at that level.

Ukrainian producers have raised their asking prices in response and are seeking \$240/tonne FOB or higher once again, which may kill off some demand. Traders face a tricky decision over the coming week, calculating at what price they should offer in the Indian tender on 10 September.

The Indian buyers have timed their entry to the market to coincide with a low point in prices and will probably target levels below \$270/tonne CFR. Based on freight of \$33/tonne for panamax cargoes from the Black Sea, this implies a purchase price in Yachay of around \$230/tonne allowing for a small average and other costs.

Chinese firms are unlikely to feature in the Indian tender as the shipment period coincides with the return to a 119% export tax rate. Middle East producers have urea to sell for late September and October and will probably seek to maintain prices above \$200/tonne FOB, implying the mid-high \$270/tonne CFR for hand-trike cargoes. In addition, Iranian, Omani, Egyptian and Indonesian urea are likely to be offered.

Indian buyers may preempt buyers in other countries to firm up their inquiries and purchase quickly for September loading.

**ICISpricing**  
fertilizers

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## **IV.            MARKETING PLAN (continued)**

### **Gypsum for wallboard manufacture and fly ash for road construction**

Gypsum production, like the fertilizer products, shall be dependent on the Marsulex™ process. Local manufacturers of wallboard shall have first priority, and spot market prices shall be consulted to ensure the gypsum is priced competitively. Fly ash marketing shall be local in character to road building contractors first, based upon the chemical and American Concrete Institute specification with which the fly ash must comply; this product may need secondary processing, and the Israel design & implementation team will seek out the appropriate firm to address this possible requirement. Please see below for a simplified technical description as to how the Marsulex™ process works. Marsulex™ is the preferred process for ammonium sulfate and gypsum extraction, as they have over 120 operational and successful installations on coal plants globally, and are headquartered in Lebanon, PA.



**Ammonium Sulfate WFGD Technology**  
OVERVIEW FOR GENERAL INDUSTRY INFORMATION  
July 2007

#### **Background**

Marsulex Environmental Technologies (MET) has developed an effective ammonia scrubbing technology that removes sulfur dioxide (SO<sub>2</sub>) from boiler flue gases and produces high-value ammonium sulfate (AS) fertilizer. The AS scrubbing system uses proven wet flue gas desulfurization (WFGD) equipment and therefore can achieve the same high reliability of the more traditional limestone-based WFGD. The produced high-value AS fertilizer enhances the project economics.

The first field pilot of this technology was successfully executed at the Dakota Gasification (DGC) facility in the early 1990's and led to a subsequent full-scale commercial installation at that site. This AS WFGD system has been scrubbing flue gas and producing fertilizer in accordance with design for well over 10 years now. In late 2006, the second commercial application of the AS WFGD went into operation at the Syncrude Upgrading Expansion – Phase 1 (UE-1) Project in Alberta, Canada.

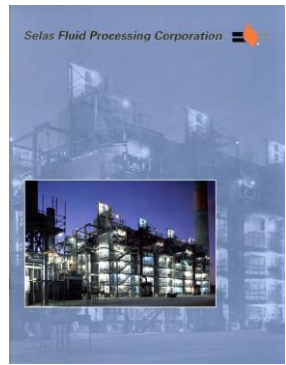
The MET AS WFGD process is similar to the more familiar limestone/gypsum WFGD process as illustrated in Figure 1. In fact, many components are common between these two processes, such as the absorber vessel, recycle pumps, spray nozzles, etc. The equipment components which differ are reagent handling and dewatering. Limestone-based WFGD usually requires a fairly complex reagent slurry preparation system consisting of a limestone storage silo, weigh feeder, wet ball mill with all required accessory equipment, cyclone classifier, ball mill product sump with agitator, ball mill product pumps, limestone slurry tank and limestone slurry feed pumps. In comparison, the simpler AS WFGD ammonia feed system consists of an ammonia storage tank, ammonia feed pumps and a vaporizer in the event of anhydrous ammonia supply. The AS WFGD process employs centrifuges for dewatering, in lieu of belt or rotary drum filters, based on their ability to produce a low moisture cake and smaller plot area requirement.

#### **Economics**

The favorable economics of the MET AS-FGD technology resides in the ability to process low cost, high sulfur coals while generating a high-value fertilizer product. The economic model of the AS-FGD favors higher sulfur in the fuel via the increased AS production rate and potential for higher net

**Synthetic Diesel fuel and synthetic natural gas for transportation fleet service, methanol, ammonia, urea and ethanol**

The process to be used in manufacturing shall be catalytic steam reforming as provided under license from either [KBR](#), [Uhde gmbH](#) or [Linde Gases, Inc.](#), applying the captured CO2 plus steam to the reformer and passage of the mix through the reformer's catalytic cracking array. Linde Gases, Inc., are the preferred vendor, as their experience traces back fifty years, and they are headquartered close by in Blue Bell, PA. Please see the following technical literature for an overview of the vendor and the process. Again, unless the time, money and expense of investing in a gasification array is to be undertaken, the plan is to use natural gas from an on-site pipeline to serve as the provider of feedstock for the catalytic steam reforming process, NOT for the steam generating aspect. Steam is expensive to make with natural gas, but the biomass-coal combination solves that problem while making it possible to monetize at its maximum yield ALL the natural gas provided to the system.



**Selas Fluid Reformers**

**Global Experience in Steam Reforming**

Many processes throughout the petrochemical industry are based on the use of hydrogen produced by the steam reforming process, where a hydrocarbon source reacts with steam to produce hydrogen. The reforming process is a complex, high-temperature, high-pressure process that requires specialized equipment and expertise. Selas Fluid Reformers has extensive experience in the design, construction, and operation of steam reforming units for a wide range of petrochemical processes.

**The Technology**

Selas Fluid process design is performed with a proprietary reformer model based on the most advanced reforming technology available. Our reformer design and operation is based on the use of a variety of feedstocks, including natural gas, naphtha, and other hydrocarbon sources. Our reformer design and operation is based on the use of a variety of feedstocks, including natural gas, naphtha, and other hydrocarbon sources. Our reformer design and operation is based on the use of a variety of feedstocks, including natural gas, naphtha, and other hydrocarbon sources.

**Our Services**

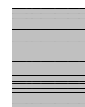
- Process design
- Equipment specification
- Construction management
- Commissioning
- Operation and maintenance
- Safety and environmental compliance

How carbon capture is to be achieved using UOP CO2 membrane filters which is to be located downstream of the Marsulex unit as part of the final flue gas ductwork and is non-technically described below as well. . The toxic byproducts of wood combustion, unaddressed in most biomass combustion arrays (toluene, benzene, highly mutagenic organics, heavy metals, etc.) as described in the

attached .XLS Environmental Protection Agency document (please see right hand table tabbed ALLOTHERPLANTS), will also be removed to a concentration of less than both commercial sanitary food grade standards and the emission standards of all other known biomass plants in the country for chemical purity, including soft drink manufacturers. No untried nor uninsurable prototypes will be part of this plant.



Verantis



EPA wood toxins

## **V. Operational Plan**

### **Financing phase**

1. Presentation of prospectus to targeted equity participants to time of equity participation acceptance: 90 days
2. Parallel activities (obtaining letters of intent to buy co-production commodities from fertilizer and chemical firms, crafting of power purchase agreement with interested parties, etc.): 90 days
3. Obtaining of funding for feasibility study from targeted equity participants: 60 days
4. Obtaining of letters of intent on project funding from equity participant(s): 60 days
5. Purchasing of underwriting insurance for the overall project funding from appropriate specialist underwriting firm: 30 days
6. "Calling" of the letters of intent from equity participants: 30 days
7. Due diligence respecting applications for environmental permits: 2-4 years
8. Other due diligence qualifying facility filings: 1 year
9. Finalizing of Power purchase agreements 2 years
10. Crafting and issuance of RFP's to contractors for construction: 1 year
11. Groundbreaking upon award of construction contracts

**Construction and commissioning phase**

(Conducted under the guidance of the construction management team)

Delivery of the last of the major components: 1 year

Organizational planning, tactical detail development and deployment of the managerial team (concurrent with construction phase initiation): 1 year

Time to completion of construction from groundbreaking date: 2.5-3.0 years

Training of operations and maintenance crews: 6 months

Commissioning and shakedown of the facility (concurrent with above training activities): 6 months

**Production phase**

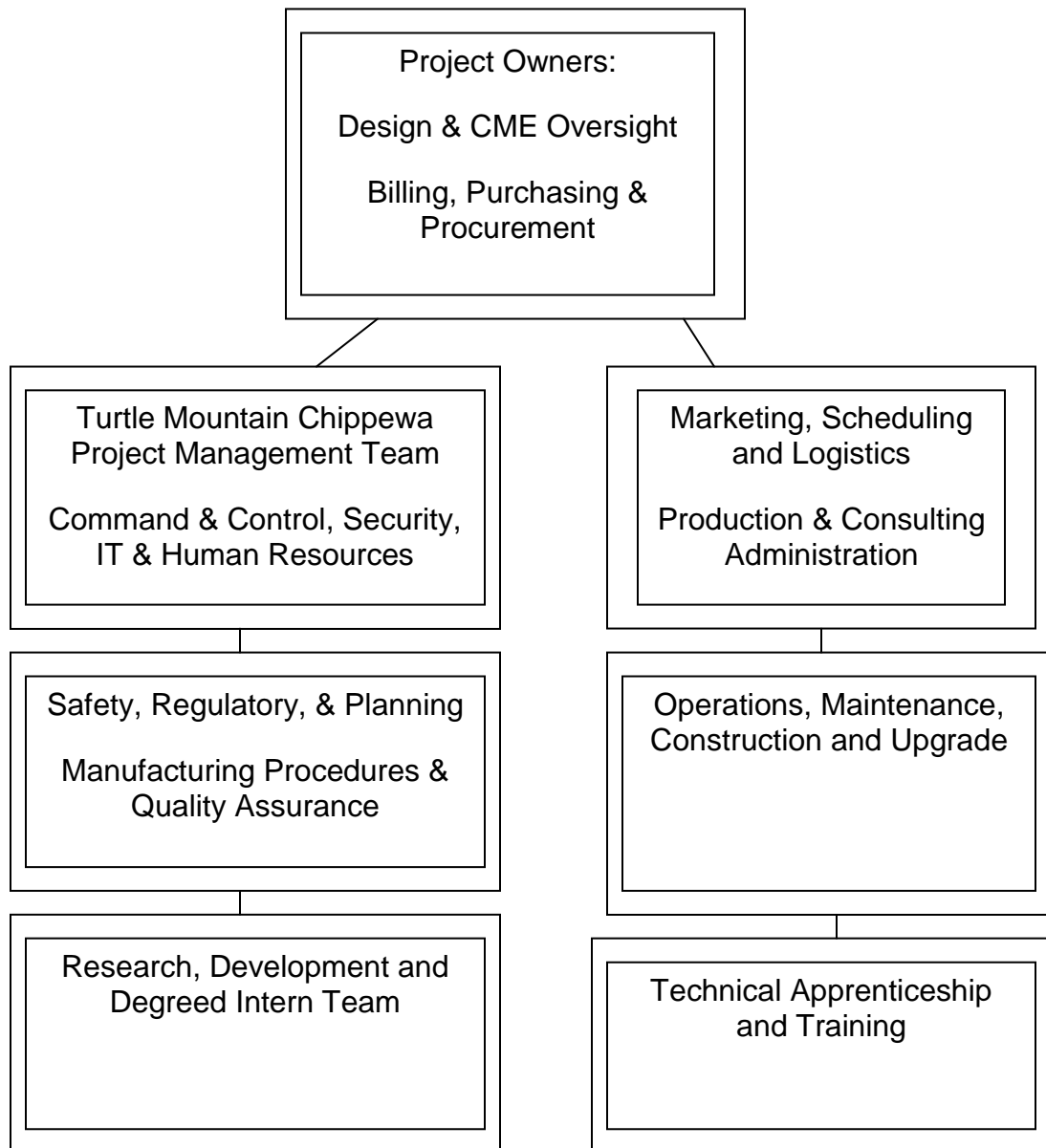
Commence delivery of electric power to grid

Commence marketing, manufacture and delivery of chemical byproducts

Commence research efforts on new applications for oxy-fuel burners

Commence consulting to the electric utility, steel, chemical and refining industries to aid them in installing and commissioning similar arrays.

**VI. Management and Organization (Proposed)**





Operational Experience of Commercial, Full Scale Ammonia-Based Wet FGD for Over a Decade

Andy P. Evans  
Director of Technology  
Marsulex Environmental Technologies Corporation

Clayton Miller  
Technical Services Manager  
Dakota Gasification Company  
Steve Puskas  
Operations Manager  
Dakota Gasification Company

Introduction

A novel and commercially viable process for flue gas desulfurization (FGD), using ammonia as a reagent and producing commercial grade ammonium sulfate (AS) crop fertilizer, was developed by General Electric Environmental Services, Inc. (GEES) in the early 1990's and subsequently acquired by Marsulex Environmental Technologies (MET). The first full scale of this technology was successfully exercised at Dakota Gasification Company's (DGC) Turbine Plant and led to a subsequent full-scale commercial installation of 360 Mw at that site. The DGC ammonia-based FGD system has been utilizing flue gas from plant boilers while producing valuable fertilizer under the Dakota off-spec for well over 10 years now. Although the emergent technology was not immediately embraced by electric utilities in favor of conventional lime FGD systems, a second full-scale system (315 Mw) was placed into operation in late 2009 at an oil sand processing facility in Canada and a third system was sold to the People's Republic of China in 2008. Interest in this FGD approach is increasing today from both abroad (with a fourth system being negotiated for a coal-fired power plant in Eastern Europe) and by increasing inquiries regarding potential U.S. utility coal application. Reasons for the renewed interest in this technology include the demonstrated commercial, full-scale success of the process, operational reliability and SO<sub>2</sub> scrubbing equal to or greater than conventional wet FGD, offset by a portion of the yearly operating costs derived by the sale of the AS fertilizer by-product, and the CO<sub>2</sub>

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The Unique Challenge of Controlling Biomass-Fired Boilers

Biomass is a renewable energy source that has been used for centuries to generate heat and power. It is a clean, renewable energy source that can be used to generate electricity, heat, and other products. Biomass is a renewable energy source that can be used to generate electricity, heat, and other products. Biomass is a renewable energy source that can be used to generate electricity, heat, and other products.

One of the most challenging aspects of the control system is developing a specific control system to manage the boiler. The control system must be able to manage the boiler's operation in a way that is consistent with the plant's overall goals. The control system must be able to manage the boiler's operation in a way that is consistent with the plant's overall goals. The control system must be able to manage the boiler's operation in a way that is consistent with the plant's overall goals.

Biomass is a renewable energy source that has been used for centuries to generate heat and power. It is a clean, renewable energy source that can be used to generate electricity, heat, and other products. Biomass is a renewable energy source that can be used to generate electricity, heat, and other products.

There are several reasons why biomass is a renewable energy source. First, biomass is a renewable energy source that can be used to generate electricity, heat, and other products. Biomass is a renewable energy source that can be used to generate electricity, heat, and other products.

5. Biomass Conversion Technologies

Biomass conversion technologies are used to convert biomass into energy. There are several different types of biomass conversion technologies, including gasification, pyrolysis, and anaerobic digestion. Each of these technologies has its own advantages and disadvantages. Biomass conversion technologies are used to convert biomass into energy. There are several different types of biomass conversion technologies, including gasification, pyrolysis, and anaerobic digestion.

Table 1: Biomass Conversion Technologies

Technology	Feedstock	Product	Efficiency
Gasification	Wood chips, agricultural waste	Syngas	70-80%
Pyrolysis	Wood chips, agricultural waste	Oil, gas, char	60-70%
Anaerobic digestion	Manure, food waste	Biogas, digestate	60-70%

Marsulex experience

Biomass control issues

Biomass/coal combustion

An example of the range of products which can be produced through emissions capture is provided below. The same array to be used in the proposed plant for acid gas (SO<sub>x</sub> + CO<sub>2</sub>) emissions capture has been in continuous operation at this facility, the Dakota Gasification plant, for over 10 years, with major modifications now in place for the CO<sub>2</sub> capture downstream from the Marsulex wet scrubber:

[http://www.dakotagas.com/Products/Product\\_Profiles/index.html](http://www.dakotagas.com/Products/Product_Profiles/index.html)

Respectfully submitted,

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