October 1 , 2009

State of North Dakota

The Industrial Commission

State Capitol

Bismark, North Dakota 58505

ATTN: Lignite Research Program

Ladies and Gentlemen:

Enclosed please find the Application (the "Application") of GreatPoint Energy, Inc. ("GreatPoint") in connection with the Commission's Lignite Research Program.

This letter confirms the commitment of GreatPoint's management to complete the project as described in the Application if the Commission makes the grant requested.

Very truly yours,

GREATPOINT ENERGY, INC.

By: ______________________________

Daniel P. Goldman

Executive Vice President and Chief Financial Officer

Hereunto Duly Authorized

Applicant: GreatPoint Energy

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Principal Investigator: Pattabhi Raman, SVP of R&D

Date of Application: October 1, 2009

GreatPoint Energy

Lignite Catalytic Hydromethanation Development Project

Grant Requested from the

North Dakota Lignite Research Council

Project Expenses: $7,847,769

Amount Requested: $3,923,884

Grant Deadline: October 1, 2009

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1.0 Abstract

GreatPoint Energy ("GreatPoint") is proposing to advance catalytic hydromethanation of North Dakota lignite to the point of commercial readiness. Hydromethanation, a proprietary development of GreatPoint, is a highly-efficient process for converting coal, petroleum coke ("petcoke") and biomass directly into high-value, pipeline-quality natural gas or hydrogen while capturing, and making available for sequestration or enhanced oil recovery ("EOR") nearly all of the carbon dioxide ("CO_2").

GreatPoint has successfully advanced the catalytic hydromethanation process for both petroleum coke and Wyoming PRB sub-bituminous coal in previous laboratory and pilot-scale tests and confirmed commercial techno-economic feasibility. Preliminary laboratory tests indicate that North Dakota lignite should be as good, if not a better feedstock for hydromethanation. GreatPoint plans to leverage this extensive prior work and over $100 million in investments, to optimize the process application for lignite.

The proposed project is divided into four major phases, laboratory process optimization, pilot-scale demonstration, economic evaluation and project management. The initial laboratory work, to be conducted at GreatPoint's laboratory facility in Chicago, Illinois, will focus on determining optimal operating conditions for the process. Based on the results of the lab work, a pilot-scale demonstration will be conducted at GreatPoint's Mayflower feedstock testing facility in Somerset, Massachusetts. The economic evaluation will be the final step in establishing commercial readiness and will consist of preliminary engineering, process optimization and costs studies in order to quantify the plant's financial and environmental performance. Meanwhile, throughout the project, the team will manage scope, schedule and cost while providing reporting on project status to the Lignite Research Council.

GreatPoint's funding request is for a 17 month program running from February 1, 2010 to July 1, 2011. The total budget for the late stage research and development project described in this grant request is $7,847,769, of which $3,923,884 is requested from the Lignite Research Council. GreatPoint will be working with the Energy & Environmental Research Center (EERC) at the University of North Dakota and SGS.

2.0 Project Summary

The mission of the Lignite Research Council is to enhance the development of North Dakota lignite resources. GreatPoint's program, outlined in this grant request, is an effective way for the Council to accomplish this mission. Research and development hold the key to expanding North Dakota lignite's economic benefits. Concentrating on ways to convert lignite into natural gas, electricity and other high value products while increasing efficiency and environmental compatibly are of critical importance to the future of the North Dakota lignite industry.

As described in section 4.0, the development of new lignite-based coal conversion projects will create additional jobs, tax revenue and business volume and would require the production of additional coal all the while capturing, and making available for sequestration or EOR, nearly 100% of the CO_2. Funding from the Lignite Research Council is critical to accelerating this research and will enable GreatPoint to advance its plans for a commercial-scale facility in North Dakota. Successful completion of this feedstock testing program will provide a technology platform for optimizing lignite resources, reducing greenhouse gas emissions and providing long-term economic growth to the State.

GreatPoint has developed a technology potentially capable of harnessing the chemical energy content of coal in a catalytic hydromethanation process while capturing and sequestrating nearly all of the CO_2. This process uses a proprietary catalyst formulation that is specifically designed to convert a carbon source into pipeline-grade natural gas that can be easily transported by existing natural gas pipelines and used in transportation, industry, home heating, and power generation applications. Hydromethanation process promises to be substantially less expensive, more efficient, and more reliable than conventional gasification technologies.

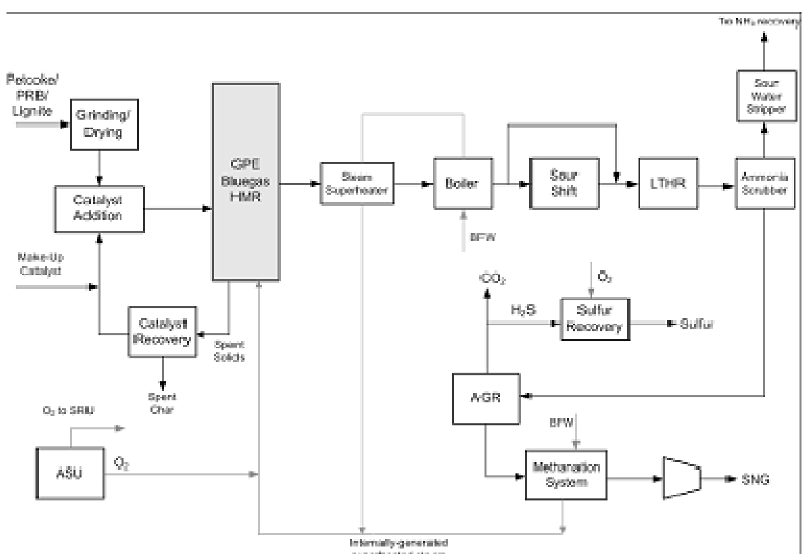
An innovative technology to accomplish the vision. GreatPoint's catalytic hydromethanation process is unlike any process or technology currently being pursued by other known approaches. The carbon in lignite can be reacted with steam in the presence of GreatPoint's catalyst formulation to form equal amounts of methane and carbon dioxide.

$$2C_{lignite} + 2H_2O \rightarrow CH_4 + CO_2 \downarrow_{sequestration}$$

Converting lignite into methane in the hydromethanation process allows for sequestration of the CO_2 produced in a more economic and facile manner than with a combustion or traditional gasification process. The hydromethanation reaction itself is near-thermally neutral and the catalyst enables the reaction to proceed at relatively low temperatures (600-700^{o}C) where methane formation is thermodynamically favored.

The general process consists of the feedstock receiving and preparation section, **bluegas**^{TM} HMR which includes a catalyst loading and recovery plant looped into the reactor, followed by a feed/effluent superheater, gas cooling/steam generation, water gas shift, acid gas clean up and methanation unit. A methane compressor is included for boosting the product pressure to pipeline operating pressure, assumed to be 1000psig. Optional oxygen injection into the HMR will also be assessed, as this has the potential to simplify the process (removal of recycle syngas) and improve thermal efficiency based on current modeling studies. The simple block flow diagram is depicted in figure 1 below:

Figure 1: bluegas^{TM} catalytic hydromethanation process



The thermodynamics of hydromethanation are fully described by the set of three reactions illustrated in table 1, the sum of the three reactions being the hydromethanation reaction. The highly endothermic steam-carbon gasification reaction is essentially balanced by the highly exothermic methanation reaction resulting in a highly efficient thermally neutral overall process. A small amount of oxygen is added to the reactor via GreatPoint's innovative direct oxygen injection technology ("DO-IT") to partially oxidize some of the carbon and offset heat losses in addition to generating steam. GreatPoint's catalyst, formulated from abundant, naturally-occurring minerals, is impregnated onto the feedstock. The catalyzed feedstock is then fed into the hydromethanation reactor ("HMR") and fluidized with pressurized steam to ensure optimal heat and mass transfer between the gas and solid phases. This process demonstrates a thermodynamically efficient reaction to convert carbon to natural gas. Under the reducing conditions of the HMR, sulfur and nitrogen that may be present in coal are converted to H_2S and NH_3, ultimately recovered as elemental sulfur and ammonia.

Table 1 - Bluegas™ Hydromethanation Process: One Catalyst — Three Reactions

Steam/Carbon	$C + H_2O \rightarrow CO + H_2$	Endothermic
Water Gas Shift	$CO + H_2O \rightarrow H_2 + CO_2$	Exothermic
Methanation	$CO + 3\ H_2 \rightarrow CH_4$ (Methane) $+ H_2O$	Exothermic
Overall	$2C + 2H_2O \rightarrow CH_4 + CO_2$	Net

GreatPoint's **bluegas**™ process combines several operations into a single step to improve overall efficiency, reduce maintenance and equipment requirements, lower capital costs and minimize environmental impact. The key advantages to hydromethanation over conventional gasification and alternative SNG processes.:

(1) Overall conversion efficiency is significantly higher than conventional processes, due to the direct "capture and utilization" of the exothermic heat of methanation inside the reactor;

(2) Hydromethanation occurs at much lower temperatures than conventional non-catalytic processes, resulting in lower maintenance and capital costs in the reactor, gas cooling and heat recovery systems;

(3) Hydromethanation yields no waste residues such as tars or oils, and the residual ash and silica can be marketed as soil supplements or fertilizer;

(4) Hydromethanation is a catalytic process that does not rely on combustion and therefore does not produce the nitrogen oxide (NOx), sulfur oxide (SOx) and particulate emissions typically associated with the burning of carbon feedstock;

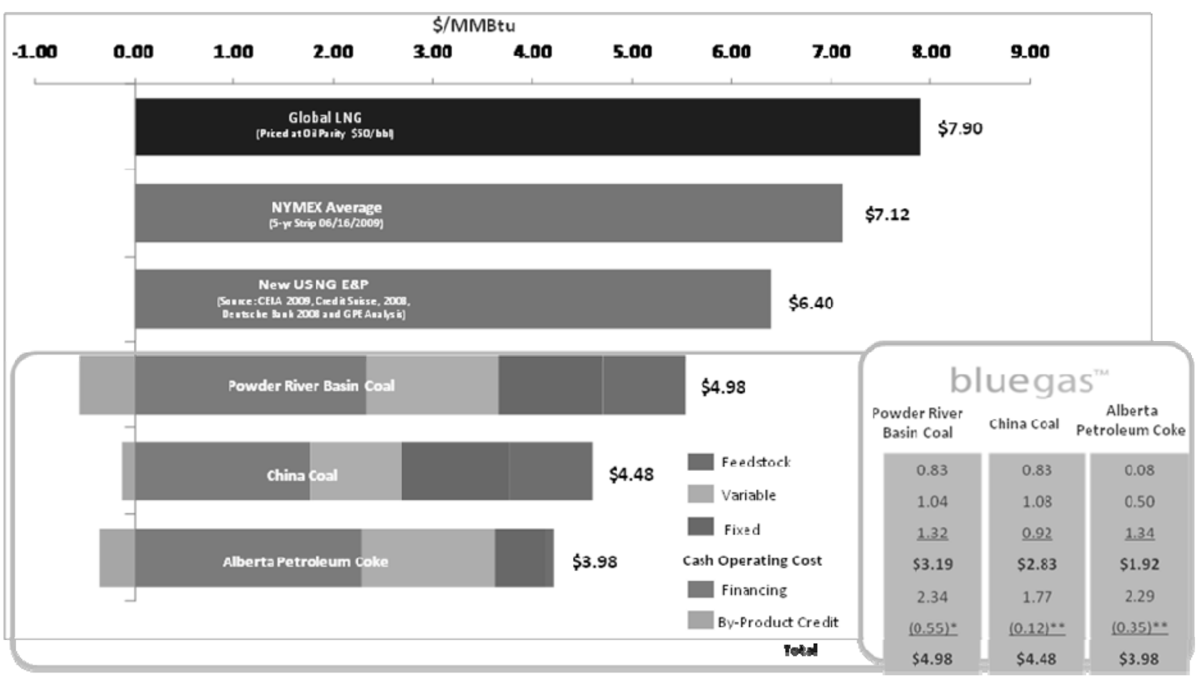
(5) Hydromethanation produces a capture-ready stream of high purity CO_2 which can be compressed and transported by pipeline to be sold for use in enhanced oil recovery ("EOR"), geological sequestration, or for other commercial applications.

The technology works. GreatPoint has successfully demonstrated hydromethanation on relatively unreactive carbon in coal and petroleum coke at a 1 ton per day ("tpd") pilot scale. Laboratory-scale experiments have shown the process works even better on "younger", more reactive coals. A significant challenge in exploiting lignite in most fuel conversion processes is the higher inherent moisture content. DO-IT releases this water as superheated steam in the reactor, supplying a significant portion of the steam reactant required for catalytic hydromethanation, minimizing the water demand of the process.

A significant amount of bench scale work has been done in GreatPoint R&D lab to study the hydromethanation of ND lignite. In terms of carbon conversion, the catalyst clearly accelerates the reaction based on indicative laboratory results. In comparing the relative reactivity of different feed stocks to hydromethanation, there is significant advantage for catalyzed lignite compared to PRB and petcoke.

<u>For a details of GreatPoint's Preliminary Lignite Tests see Appendix 12.1.1 (Confidential)</u>

Fig.2: Natural Gas Cost of Production



The technology will be commercially viable. Based on GreatPoint's extensive engineering and economic assessments of coal and petroleum coke hydromethanation, we estimate a lignite-based commercial plant could produce SNG at $4-$5/MMBTU production cost (see Figure 2).

2.2 *An R&D plan to advance the technology.* Given that ND lignite has different chemical compositions and physical characteristics, ascertaining the catalyst application and recovery techniques, reactor operating conditions, reaction rates, product and byproduct yields will be critical to applying this technology at large scale. Accordingly, a detailed understanding of lignite-based hydromethanation is necessary and requires a thorough multiphase R&D program to validate and advance the process to the point of commercial readiness.

Based on GreatPoint's five year experience in developing coal and petcoke applications to commercial readiness and the bench scale R&D work already done, we have developed an 17 month comprehensive work plan, budget and schedule of bench-scale process optimization and pilot-scale testing . The focus of the R&D program is to generate the additional process information necessary for conducting the pilot scale evaluation of ND lignite in the HMR process. The total R&D bench-scale program and associated modeling will take approximately nine months to complete and will be conducted at GreatPoint's laboratory facility in Chicago, Illinois. Pilot-scale work will take approximately 14 months to complete, including eight months of overlap with the bench-scale program. Techno-economic modeling and risk analysis require approximately two months to complete, including one month of overlap with the pilot-scale testing. The tasks deliberately overlap so that initial positive test results for certain activities will enable commencement of the next task to accelerate the schedule without taking any undue capital exposure risks in the process. Pilot-scale testing will utilize GreatPoint's Mayflower feedstock testing facility in Somerset, Massachusetts.

Results from these tests will enable optimized designs for full-scale commercial hydromethanation facilities. GreatPoint will also conduct economic studies to assess the viability and attractiveness of commercial scale lignite hydromethanation.

Funding from the Lignite Research Council is critical to accelerating this research and will enable

GreatPoint to advance its plans for a commercial-scale facility in North Dakota. Successful completion of this feedstock testing program will provide a technology platform for optimizing lignite resources, reducing greenhouse gas emissions and providing long-term economic growth to the State.

The R&D program consists of two major tasks in the laboratory with each task set with specific objectives and deliverables. The laboratory work will be followed by pilot scale testing and economic model development. Please see the Budget Summary below for full cost details. The major tasks are as follows:

1. **Hydromethanation Process Parameters Development** - Conduct additional laboratory scale experiments on selected ND lignites using existing GreatPoint equipment, to optimize process information necessary for conducting the pilot scale testing.
2. **ND Lignite Hydromethanation Process Modeling** - Optimize existing GreatPoint reactor and catalyst recovery models to match laboratory-measured performance characteristics of lignite. Perform rigorous mathematical modeling incorporating hydrodynamics and chemical kinetics to simulate and predict pilot scale and commercial scale reactor performance. This work will form the foundation of the pilot scale testing effort.
3. **Mayflower Retrofit** - Modify GreatPoint's $40 million Mayflower pilot testing facility with enhanced fines and char handling, feed and consumable gas delivery systems to handle the unique operating conditions generated by North Dakota lignite hydromethanation.
4. **Mayflower Pilot-Scale Demonstration** - Conduct pilot scale tests to prove the performance of lignite in the hydromethanation process and provide data suitable for engineering of a commercial-scale facility. Testing will validate the design models and confirm environmental impacts including emissions, effluents, and solid waste.
5. **Economic Evaluation** - Perform preliminary engineering, process optimization studies, and estimate capital and operating costs for a commercial scale plant in order to quantify the plant's financial and environmental performance.

6. **Project Management** - Manage project scope, schedule and cost within planned objectives while providing thorough and timely reporting on project status to both the Lignite Research Council and GreatPoint executive team.

3.0 Project Description

3.1 Hydromethanation Process Parameters Development

Conduct laboratory scale experiments using existing* GreatPoint *equipment and understanding gained from preliminary laboratory testing, to determine catalyst performance, yields, selectivity, and kinetics over a range of proven catalyst compositions, impregnation methods, pressure, temperatures, residence times and particle size distributions.

The next step in developing a lignite-based hydromethanation process would be additional bench-scale testing to generate process parameters and performance data for models, model the pilot plant scale-up, test catalyst recoverability, and identify the feedstock for pilot-scale and large-scale development. This task will generate a package of process data and operational parameters for detailed planning of the pilot-scale activities.

3.1.1 Technical Objectives

Utilizing extensive experience in bench-scale development of coal and petcoke feed materials, develop the hydromethanation process parameters with ND lignite feed. Operational knowledge, process parameter range finding, and performance evaluation will be accomplished from the bench-scale test program. A summary of the information developed in this task follows:

i. Process parameters and the effects on product yields and selectivity
ii. Validation of kinetics
iii. Effects of pressure, temperatures, residence times and particle size distributions and the impact on operations of a HMR
iv. Operation and maintaining a fluidized bed of catalyzed lignite in the HMR while minimizing fines generation
v. Char characteristics, particularly to assist in catalyst recoverability from chars.

3.1.2 Technical plan

As described in the previous section the testing program will principally involve the evaluation of one or two representative ND lignite seam samples. The selected ND lignites will be fully characterized for the hydromethanation process using GreatPoint Energy's standard suite of analyses for feed materials. These analyses include proximate and ultimate analyses, elemental composition of the ash, heating values, material density, hardness, and surface area. The data will provide guidance for developing and optimizing catalyst loading, catalyst recoverability, hydromethanation process conditions, process economics, and inputs for process models.

The bench scale testing program that comprises this task has been subdivided into several key sub tasks. Bench scale experiments will be designed in such a way that the results can be used to satisfy multiple tasks simultaneously. The key objectives of this task are to optimize key parameters necessary for conducting the pilot scale work, validating the mathematical developed for the process, assessment of catalyst recovery, and for completing the preliminary process heat and mass balance for a large scale commercial scale unit. Parameters such as the effect of catalyst type, catalyst loading, , and particle size will also be studied as part of this task. Additionally, operational knowledge on building and maintaining fluidized beds, and minimizing fines generation, will be gained.

In this task, catalyzed ND lignites will be tested under hydromethanation process conditions in bench scale fixed bed and batch fluidized bed reactors. In addition to batch fluidized tests, a short duration continuous fluidized bed test will be conducted at an outside laboratory (EERC) to assess the impact of process conditions on catalyst as well as to generate adequate amount of char to perform preliminary catalyst recoverability assessment. These tests will also simulate the operations of the continuous feed, similar to the pilot scale unit. The goal is to establish process conditions for achieving acceptable carbon conversion and the expected methane yield per pound of feed in the pilot scale test. In addition, char generated from EERC will be evaluated in the bench scale reactors to confirm that the catalyst activity is preserved under the continuous process conditions.

Another critical issue to the economics of the **bluegas**™ process is recovering a high portion of the catalyst used in the hydromethanation process. The presence of high amount of ash in lignite poses some special challenges to the catalyst recovery step and they will be addressed. This task will make a preliminary assessment of the extractability of catalyst from the lignite char in bench-scale testing. This information will guide any modification necessary for the catalyst recovery process and data will be used to validate the catalyst recovery model.

<u>3.1.3 Resources</u>

Internal

- Personnel
    - Pat Raman, Nelson Yee, Andy Wu, Vince Reiling, Alkis Rappas
- Equipment
    - Feed preparation and catalyst loading work for bench-scale testing will be performed in GreatPoint's laboratory
    - The existing bench scale fixed bed and fluidized bed units in the GreatPoint laboratory will be used for evaluating the different catalyst loading methods and catalyst compositions. The fluidized bed units will be used to study catalyst mobility. These units may be modified as necessary to handle the process conditions..
    - GreatPoint's existing lab-scale cold-flow model and associated equipment and models will be used to understand feeding, fluidization, and fines generation of prepared lignite feeds and chars in the bench scale units.
    - Analytical instruments in the GreatPoint Chicago laboratory will be used for measuring particle size distribution, catalyst level, and proximate and ultimate analyses.
    - Feed material preparation, particularly catalyst addition, will be performed internally. New equipment will be required for the in-house catalyst recoverability assessment work.

External Consultants and Vendors

- Consultants
    - Robert Spitz

- Vendors
  - GTI
  - Consol
  - SGS-Lakefield
  - EERC

3.2 Hydromethanation Process Modeling

Optimize existing GreatPoint ***reactor and catalyst recovery models to match laboratory-measured performance characteristics of ND lignite. Perform rigorous mathematical modeling incorporating hydrodynamics and chemical kinetics to simulate and predict pilot and commercial reactor performance.***

A complete modeling package for the ND lignite hydromethanation process will be validated based on bench-scale data. The package will allow for predictions of performance, catalyst recoverability, exotherms, and heat and mass balances of a pilot-scale unit as well as provide a basis for the development of commercial-scale models.

GreatPoint's approach for HMR process scale up revolves around a proprietary mathematical model that it has developed. This model incorporates the reaction kinetics and the hydrodynamics of a fluidized bed. GreatPoint has significant experience with this model with sub-bituminous PRB coal and petcoke as feed stocks and it has been validated with data from two different pilot plants. We will use the bench scale data to validate GreatPoint's chemical kinetics model for the lignite based HMR process. The validated mathematical model developed for the reactor will be used to predict the performance of the selected feed in the pilot unit. In subsequent tasks, the pilot scale test results will be compared with the model predictions to further validate the model.

GreatPoint also has developed a model for catalyst recovery process. The bench scale work done at SGS will be used to validate the catalyst recovery model for ND lignites and their higher inherent ash content than the sub-bituminous Wyoming PRB coals. Computational fluid dynamics (CFD) will be used to assess the extent of exotherm that can develop in the pilot scale reactor In addition, a Hysis software based model will be used for completing the heat and mass balance of the process. The information generated by the modelss will be validated during the pilot scale work. These models will also be tused to generate catalyst recoverability, reactor exotherm, and heat and mass balance information for a commercial scale unit.

3.2.1 Technical Objectives

This task will focus on validating the HMR kinetics and Catalyst Recovery models using the data generated in the previous task. Additionally, the models for predicting process exotherms and heat and energy balances will also be developed. The modeling package developed to allow for prediction and analysis of pilot- and commercial-reactor performance will include the following components:

i. Based on bench-scale data for the hydromethanation of ND lignite, optimize and validate the HMR kinetic models for use in analysis of scale-up activities and commercial scale unit performance and economics.

ii. Optimize and validate the catalyst recovery model.

    a. Identification of ND lignite-specific modifications to commercial scale catalyst recovery units.

    b. Economic impact of the catalyst recoverability from lignite chars.

iii. Optimize and validate a CFD model to predict reactor exotherms for process conditions.

iv. Optimize and validate a Hysis model to provide heat and mass balance predictions for the lignite hydromethanation process.

3.2.2 Technical Plan

GreatPoint has previously developed a proprietary kinetic model for sub-bituminous Wyoming PRB coal and petcoke hydromethanation. In this task, data collected from bench scale-testing will be used to validate and refine the model for lignite feedstocks.

The proprietary GreatPoint model incorporates these reactions and also the hydrodynamics of the fluidized bed. Additional data from bench scale experiments with fixed and fluidized bed reactors will be used to verify the GreatPoint model. The fit between model prediction and actual data will be investigated.

Because the amount of ash formed with ND lignites are relatively high, the catalyst withdrawal rate from the HMR will also be higher than with PRB coals and petcokes. The catalyst recovery plan will focus on estimating the catalyst amount we can recover from the higher ash lignite chars. GreatPoint's proprietary mathematical catalyst recovery model will be used to determine if the catalyst can be extracted in an economical way based on data from a bench scale study at SGS-Lakefield. Based on the model we will develop a complete material and energy balance for the pilot and commercial process units. In addition, we will use CFD modeling work to confirm that no excessive exotherm is formed at the bottom of the pilot plant or commercial reactors This completed modeling package will allow for technical and economic analysis of the lignite hydromethanation process at the pilot and commercial scales.

3.2.3 Resources

Internal

- Personnel
    - Alkis Rappas, Vince Reiling, Veeraya Jiradilok, Avinash Sirdeshpande
- Equipment
    - GreatPoint's existing laboratory facility, equipment and models External Consultants and Vendors

External Consultants and Vendors

- Consultants
    - Jeff Smith
    - CFD Consultant TBD

Phase 1 Deliverable: A report summarizing the bench scale work done to generate hydromethanation process parameters will be written. This report will include the assessment of the hydromethanation model validation and a summary of the predictions from catalyst recovery

and the HYSIS models for lignite. Based on the work done a testing plan for scaling up the lignite hydromethanation process in the pilot plant will also be developed.

3.3 Mayflower Retrofit

Modify GreatPoint's $40 million Mayflower pilot testing facility with enhanced grinding, fines and char handling, feed and consumable gas delivery systems to handle the unique operating conditions generated by North Dakota lignite hydromethanation.

Mayflower is home to GreatPoint Energy's demonstration scale HMR. Using lignite, the HMR is designed to process between 100 and 250 pounds per hour of feedstock. The HMR replicates the full height, pressure and temperature of our commercial scale reactor by design to minimize the extrapolation of the results to commercial applications. The facility demonstrates the complete catalytic gasification process from feedstock preparation and catalyst loading, to catalyst recovery from the spent char removed from the HMR. As is the case with other demonstration plants, most equipment was procured "off the shelf" to demonstrate the minimal technological risk represented by this process allowing the batch-wise operation of the feed prep and catalyst recovery systems.

Mayflower was designed and built in 18 months, based on the first potentially commercial process flow sheet, and to support feedstock demonstrations under this process design. The original Mayflower specification did not contemplate the potential use of high moisture lignites as feedstock for the HMR, and therefore does not have the appropriate equipment to handle, size and prepare the lignite for use. As part of the initial scoping studies, opportunities to collaborate with vendors and consultants who have processed similar feedstocks in the past will be explored, to lever their knowledge and available equipment to prepare the feedstocks for the HMR. Moisture and the large percentage of volatiles are the specific areas of concern in preparing the lignite for use in the bubbling fluid bed of the HMR; as well as when the feedstock is pressurized and injected into the bed. In this task, the findings of the previous tasks will be implemented at the demonstration scale suitable to support continuous operations at Mayflower.

Process changes due to the use of lignite will include different methods of preparing and pressurizing the feedstock for injection into the process, as well as, different injection points for the feedstock due to the fluidization properties of the bed materials, all of which will have been understood at the bench scale in the previous tasks. There are significant technical issues associated with feeding higher moisture lignites into the HMR, and Mayflower would be building on the experience of our vendors in dealing with this material.

Additionally, in the intervening two years since Mayflower's specifications were frozen, the commercial **bluegas**™ process design has evolved to incorporate further technological improvements (valves, coolers, feeders) for greater reliability and lower cost. Many of the improvements will be demonstrated at Mayflower as part of this work focused on the proper control of bed materials to assure maximum efficiency and the highest possible carbon conversion values.

3.3.1 Technical Objectives

Update Mayflower to:

- handle and process the proposed lignite feedstock
- demonstrate technology to improve reliability and controllability of the HMR

3.3.2 Technical Plan

Through literature and industry surveys, vendors will be selected to provide the appropriate equipment to interface lignite with the existing plant, leveraging the design from previous work to assure the highest reliability. One of the advantages of the bubbling fluid bed gasifiers is the increased time after the loss of fuel feed before a response is required to avoid an upset, so perfect reliability in the lignite feeder package is not a requirement.

The HMR is a bubbling fluid bed design, and is fluidized by the reactant gases. The addition of the catalyst allows effective operation at temperatures shown to polymerize volatile hydrocarbons released by the lignites by quickly cracking those hydrocarbons. By operating at the lower temperatures, the HMR should avoid the sodium eutectics that plague other gasifier and combustor designs. In addition to the fluidization properties of the prepared feedstock, size and shape contributions to the off-gassing of volatiles will have to be considered in the final specification. The higher moisture presents both a challenge and an opportunity, as the moisture could be a partial source of the water needed for the hydromethanation process. Based on the studies in task 2, the catalyst application systems at Mayflower may have to be enhanced to properly pretreat the lignite feedstock prior to injection into the HMR. As is the case with coals and pet cokes, the catalyst application may require very specific processes to meet the requirements of the HMR.

The lignite feeder package will be specified, design reviewed for compliance with specifications and integration issues, procured, installed, commissioned and tested against a cold pressurized reactor operating under similar conditions as would be experienced at temperature to the extent possible. The commissioning and cold operational testing will use prepared feedstocks, starting with sized flexicoke and coals that have been used in other feeder packages at the Mayflower site, before testing the feeder's operation with prepared lignite. After the feeder package has acceptably passed the cold pressurized operational testing, then it will be ready for testing under full operational conditions.

The equipment installation will be coordinated to minimize the disruption to on-going Mayflower operations and to expedite the sequential commissioning effort that will begin as the installation work on specific systems is completed.

3.3.3 Resources

Internal

- Personnel
  - Charles Powell
  - Mayflower Plant Engineering team
- Equipment
  - GreatPoint's existing Mayflower facility.

External Contractors and Vendors

- Contractors
  - Design Engineering firm TBD
  - Haz-op Consultant TBD

        - Construction Contractors for the installations TBD
    - Vendors
        - Equipment and Material Suppliers TBD

<u>3.4 Mayflower Pilot-Scale Demonstration</u>

Conduct pilot scale tests to validate the design models and confirm environmental impacts including emissions, effluents, and solid waste.

The mission of Mayflower is to demonstrate the performance of the HMR with many different feedstocks and confirm the modeling predictions of the HMR's performance and the speciation of the effluent stream. The facility is staffed by a combination of capable plant operations personnel recruited from local boiler plants and power generation facilities, and research level process engineers. The use of prototypical plant operators illustrates the commercialization focus of the facility in developing processes and applications that are effectively ready for commercial implementation without requiring excessive technical expertise of the operations team. The process engineering corps is focused on data collection and presentation for use in future commercial designs and proposals, including the exploration of additional by-product utilization. In most, if not all cases, all of the outlet streams will be marketable, and the testing at Mayflower will confirm this assumption.

This task is the continuation of the Mayflower's mission in demonstrating both an expanded feedstock envelope of the HMR by the inclusion of lignite, and a technological evolution of the HMR's support systems. As such, the demonstration will follow the existing protocols for a successful test at Mayflower to assure the quality of the resulting data for use in techno-economic analyses in evaluating potential commercialization opportunities.

Building on the results of the cold-flow and bench scale mini fluidized bed unit (MBU) testing, as well as the computational modeling, the test plan will explore the predicted optimum operating point and enough variation around that operating point to understand the performance of the unit using lignite. Additional testing of the product stream to confirm the predictions of the computational modeling as well as evaluate for any potential environmental impacts will also be completed. Mayflower has several different full-time gas analysis technologies in service, including Fourier Transform Infra Red (FTIR), gas chromatography (GC), and GC-mass spectroscopy. Mayflower also has more off-line analysis equipment to fully characterize the gaseous product stream of the HMR. There is a similar level of technology to analyze the bed materials extracted directly from the HMR, and the spent solids before and after catalyst recovery. The Plant Information (PI) system currently captures and catalogs nearly 2000 data points for analysis and long-term storage, in addition to the myriad applications that have been developed by GreatPoint staff to quickly analyze and evaluate the plant's performance for use by the operations team and by the commercial process design team.

3.4.1 Technical Objectives

3.4.1.1 - Demonstrate the hydromethanation process using lignite as the feedstock

3.4.1.2 - Demonstrate catalyst recovery of the spent char and investigate the potential market opportunities for this leached, high percentage carbon bearing material

3.4.1.3 - Demonstrate the reliability improvements at the pilot scale

3.4.2 Technical Plan

The demonstration testing of the lignite-fed HMR will be at commercially relevant conditions that were prototyped by testing in the MBUs in task 2. Using the MBU results to map a Mayflower operating envelope assures much greater probability of a successful and reliable test run. The Mayflower plant will be operated around the clock for several weeks at a time to demonstrate long-term steady-state operations of the integrated catalytic gasification process, including the catalyst recovery of the spent bed materials. The unit is capable of operating up at the predicted commercial conditions for an HMR.

3.4.3 Milestone

Completion of the modified HMR commissioning test on lignite of at least 200 hours on syngas

3.4.4 Resources

Internal

- Personnel

        - Charles Powell
        - Mayflower Plant Safety, Engineering, Data Analysis, Operations, and Lab teams
    - Equipment
        - GreatPoint's existing Mayflower facility.

External Contractors and Vendors

- Contractors
    - Operations and Maintenance Contractors for the site TBD
- Vendors
    - Feedstock Suppliers TBD

<u>**Phase 2 Deliverable**</u>

Test run of the modified HMR using lignite as the feedstock of between 200 and 600 hours, and a report of the results presented with the appropriate details.

<u>**3.5 Economic Evaluation**</u>

Perform preliminary engineering, process optimization studies, and estimate capital and operating costs for a commercial scale plant in order to quantify the plant's financial and environmental performance.

The Economic Evaluation includes the performance of preliminary engineering, costing, process optimization studies, and economic modeling for a commercial scale plant, including: energy and material balances, capital cost estimate (i.e. equipment and total installed costs), operating cost estimate including utilities, chemicals, water, maintenance costs, etc, environmental performance including carbon balance and CO_2 capture.

This analysis will incorporate design changes necessary to optimize the lignite to SNG process and will assess cost sensitivity to carbon conversion, feedstock cost, plant size and other relevant inputs. This information will provide a comprehensive view of the cost and environmental performance of commercial scale plant.

3.5.1 Technical Objectives

Identify scale, scope and configuration of commercial facility that produces attractive investor returns given a reasonable range of input assumptions. Generate reasonable and defensible assumptions for all aspects of the proposed commercial facility necessary to source investment capital for Pre-FEED and FEED engineering.

3.5.2 Technical Plan

GreatPoint has extensive experience evaluating the trade-offs between capital costs and operating conditions at its proposed commercial-scale petcoke and coal-fed facilities. This expertise will be brought to bear on the issue of finding the most attractive commercial scale facility size and operating conditions for a SNG hydromethanation facility.

At the conclusion of pilot scale testing, GreatPoint personnel will utilize the results of testing completed at both the lab and pilot scale to produce an initial engineering design for a proposed commercial-scale SNG facility. This design will provide the basic assumptions concerning plant layout and scale as well as process design to inform the Economic Evaluation, including feed preparation, catalyst application, hydromethanation, and gas cleanup.

GreatPoint evaluate the process configuration and develop capital and operating costs for the **bluegas**™ commercial plant using lignite as a feedstock. A model of a conceptual lignite-to-methane plant will be developed using HYSYS or similar simulation software. The primary goal of the model is to develop a detailed material and energy balance necessary in order to develop the capital and operating cost estimates.

The capital cost, or plant total installed cost, will be estimated using a combination of cost estimating software, vendors' quotes and/or in-house cost database from previous gasification studies.

3.5.3 Milestone

Produce an economic evaluation of a commercial scale facility within two months of the end of pilot testing at the Mayflower Center

3.5.4 Resources

Internal

- Personnel
    - Luke Johnson, Charles Powell, Pat Raman, Tom Robinson, Carrie Thompson, Paul Wallace, Alkis Rappas, Nelson Yee, Vince Reiling

External Consultants and Vendors

- Consultants
    - Nexant, Inc

Phase 3 Deliverables

Economic evaluation of production revenues, costs and profitability at the plant and ownership levels, highlighting the potential financeability of a commercial project and the attractiveness of that project to an equity investor

3.6 Project Management

Manage project scope, schedule and cost within planned objectives while providing thorough and timely reporting on project status to both the Lignite Research Council and GreatPoint executive team.

To successfully manage the proposed scope of work, GreatPoint will allocate appropriate personnel to perform critical project management activities. These activities will lie outside of the scope of the technical objectives of the project and will involve managing project scope, schedule, cost, reporting and communication. Key members of the Integrated Project Management Team as well as the members of the Project Steering Committee will coordinate and perform the project management activities.

3.6.1 Technical Objectives

3.6.1.1 Successfully manage overall project to both schedule and budget

3.6.1.2 Provide thorough, timely and consistent reporting on project status and results to the Lignite Research Council and GreatPoint executive team

3.6.2 Technical plan

The project management activities associated with this task are described in detail in the Management Plan. GreatPoint has substantial experience conducting high-value research and development in its own and external testing facilities. GreatPoint also has a successful track record designing, constructing and operating projects involving its **bluegas**™ process and technology. These successes were achieved in part thanks to proper structure and procedures concerning project activity. GreatPoint will organize an Integrated Project Management Team to manage the overall scope of the project and provide oversight of external consultants and service providers. The IPMT will report to the Project Steering Committee, chaired by Donald Anthony, GreatPoint's Chief Technology Officer. An additional technical advisory committee will support the Project Steering Committee.

As part of the application process, GreatPoint has developed a master schedule based on the major project milestones and deliverables. During the project, IPMT members will update the status of the project schedule regularly on the basis of inputs from the team members. The team will monitor and address critical path items on a regular basis. The timing profile of the budget is developed from the schedule baseline. Expenses will be reported on a monthly basis and each project area will be responsible for performance to its budget, with the Project Manager responsible for the execution of the overall project within the overall project budget. The requirements for project communications will be clearly established at the start of the project. The IPMT will use these requirements to ensure a seamless and problem free transition to subsequent phases with minimum effort and delay.

3.6.3 Deliverables

3.6.3.1 Quarterly technical and financial report for Lignite Research Council Program Manager.

3.6.3..2 Final project report describing technical achievements and adhering to all requirements outlined in Article 43-03.

3.6.4 Milestones

Project completion, marked by delivery of Final Project Report

3.6.5 Resources

Internal Personnel on IPMT: Charles Powell, Pat Raman, Tom Robinson, Nelson Yee, Alkis Rappas, Vincent Reiling Internal Personnel on Project Steering Committee: Renus Kelfkens, Carrie Thompson, Paul Wallace, Don Anthony and Bill Preston

4.0 Standards of Success

1: Bench scale work and Modeling

Successful batch fluidization tests which generate parameters for use in GreatPoint's proprietary model to predict the performance of ND lignite in the pilot scale unit. Successful demonstration of carbon conversion and data reproducibility.

Phase 2: Pilot plant scale up

Demonstrate a continuous test of the high sodium lignite feedstock in the pilot plant exceeding 200 hours to confirm satisfactory operations in the HMR. Adequate information generated to confirm the recoverability of catalyst from char.

Phase 3: Economic Evaluation

Using data generated from the Mayflower demonstration testing, complete the economic analysis of a commercial scale plant to confirm the economic potential of the baseline concept of synthetic natural gas from high sodium lignite.

5.0 Background and Qualifications

GreatPoint Energy's hydromethanation technology is the result of 30 years of industry research and development, originally funded by the U.S. Department of Energy (DOE). The Company's catalytic hydromethanation process promises to be substantially less expensive, more efficient and more reliable than conventional gasification. This conclusion is supported by analysis of industry experts such as Nexant and The Dow Chemical Company, which participated in GreatPoint's tests at GTI's pilot plant and reviewed data from such runs to further validate the company's results.

Since its founding in 2005, the company has grown from a small, research-focused entity to a broader technology, project development and facility ownership-operations company. GreatPoint has recruited a highly experienced engineering and R&D group from companies such as ExxonMobil, Sasol, Bechtel, BP, UOP, and the Gas Technology Institute. The company has also assembled a world-class team of executives; industry veterans with a broad range of experience in project development, financing, coal gasification, refining, catalytic cracking, chemical manufacturing, feedstock procurement, process scale-up, and industrial plant design.

Realizing the significance of working with partners in all stages of project development, GreatPoint Energy has developed relationships with several institutions and organizations including Shaw Group, Particulate Solids Research Institute (PSRI), University of North Dakota EERC, Gas Technology Institute (GTI) and Jacobs Consultancy. Working with these development partners is crucial to the execution and control of a project as it moves through the processes of project identification to commercial operation. Furthermore, 20 student interns from the University of Massachusetts and Mass Maritime will support GreatPoint Energy's pilot plant facility in a variety of lab, maintenance and operations activities and tasks.

Pattabhi K. Raman, PhD, G GreatPoint PE's Senior Vice President of Research, Development, and Technology will serve as Senior Project Manager. Dr. Raman is responsible for leading process development, pilot plant scale up, technology development including catalysts, and Intellectual Property development for GreatPoint. He brings over 25 years of leadership experience in developing and scaling up new technologies and processes in the Chemical and Hydrocarbon industries. As a member of GreatPoint's senior leadership team, he has overseen all of the firm's R&D projects over the 2+ years he has been with the firm, including the comprehensive evaluation of all potential process feedstocks. Dr. Raman also directed the preliminary bench-scale lignite feasibility studies referenced earlier in this proposal. His deep R&D background, as well as his history with GreatPoint and familiarity with the hydromethanation process make Dr. Raman the ideal person to manage the proposed R&D project.

Immediately prior to GreatPoint energy, Dr. Raman served as R&D Director for Dow's multibillion dollar global Epoxy business. He has held several leadership positions in Dow including Process R&D Director for Specialty Chemicals & Polymers, and Vice president of R&D for its subsidiary ANGUS Chemical Company. As s a member of the business leadership team, he has developed and implemented R&D programs for achieving growth through new products and process development in businesses that serve Electronics, Coatings, Engineering Composites, Pharmaceutical and Aerospace industries. Prior to working at Dow Dr. Raman was employed at UOP for about 11 years in several technology development and management roles. Dr. Raman holds a Ph.D. in Chemical Engineering from Kansas State University and an M.B.A. from the University of Chicago Booth School of Business.

Dr. Raman has managed several new product development and process development projects, involving bench to commercial scale-up at Dow and UOP. The following are some specific examples:

- Development and scale up of a process for the production of 1,3 Aminopropane diol at Dow
- Development and commercialization of a high pressure hydrogenation process for the
- production of isopropylhydroxylamine at Dow
- Development and scale up of a propone nitration process to make nitroparaffins at Dow

<u>For a detailed description of GreatPoint's Laboratory and Pilot Facilities see Appendix 12.1.2 (Confidential)</u>

6.0 Value for North Dakota

GreatPoint Energy's hydromethanation technology has been demonstrated to effectively process lignite samples from North Dakota into synthetic natural gas in our first screening stage of bench top test cells. The HMR is uniquely capable of processing the refuse high sodium loaded lignite that is unusable in conventional pulverized coal power plants or in other gasifier technologies. This capability stems from the unique operating conditions of catalytic gasification that is the heart of hydromethanation, primarily due to the significantly lower operating temperature of the HMR when compared to other gasification or combustion technologies. The concept of using what is otherwise waste carbonaceous feedstock is central to GreatPoint Energy's business plan, converting low or no value material into high value products, including synthetic natural gas, Hydrogen, Ammonia, Urea, fertilizers, alcohols, and efficient low-carbon electricity.

The state's economy would benefit from additional lignite-based facilities. For instance, a new commercial scale hydromethanation plant built in North Dakota would result in:

- Helps provide marketing strategies for increased use of lignite;
- More low-cost natural gas or hydrogen to meet growing industrial or residential needs;
- Production of additional million of tons of coal annually;
- Creation of both direct and indirect lignite jobs in North Dakota;
- Generation of additional millions of dollars in business volume and annual tax revenue.
- The capture and permanent sequestration of millions of tons of CO_2 annually

Initially, the GreatPoint **bluegas**™ plants could be co-located with existing lignite fueled facilities to gain ready access to the refuse high sodium lignite. These first plants would be expanding the local labor demands, while producing products that are economically transported to the east and west coast markets. As demonstrated by the success of Dakota Gasification, synthetic natural gas is more efficiently transmitted than electricity over long distances, and has the additional option of large-scale storage that electricity does not, allowing an SNG plant to operate at higher load factors for longer periods than an electric generation plant. Several east coast states have recognized the advantages of GreatPoint's **bluegas**™ in the classification as a "renewable" energy source, to underscore the economic opportunity in producing "renewable" SNG in the Dakotas and piping it east.

In the case that carbon standards are enacted, the loose association of a **bluegas**™ plant and several high efficiency SNG-fired Combined Cycle Power Plants would have a lower heat rate than the current generation of lignite-fueled Rankine cycle power generating stations before carbon capture systems are added. Taking a **bluegas**™ plant that separates all the CO_2 co-produced with the SNG, and has a cold gas efficiency of at least 70% and feeding one of the latest generation ("G" or "H") combined cycle plants with an efficiency of approximately 60% nets a process efficiency of 42% or a heat rate of approximately 8200 BTU/kWh, while capturing more than 50% of the carbon in the lignite for sequestration. As the current fleet of lignite fueled thermo-electric plants are retired due to carbon-related economics; **bluegas**™ plants could be built on those brown field sites close to the mines, transporting the SNG to combined cycle generation plants closer to electric loads in several cities on the continent.

7.0 Management

GreatPoint has substantial experience conducting high-value research and development in its own and external testing facilities. GreatPoint has a successful track record designing, constructing, developing, and operating projects involving its **bluegas**™ process and technology. GreatPoint successfully designed and built its Mayflower facility, a feedstock testing facility in Somerset, MA, designed to process 1-3 stpd of catalyzed feedstock to produce **bluegas**™. Mayflower accomplished several goals, including a rapid 18-month concept-to commissioning process, with only 12 months from groundbreaking to consolidated operations, while receiving a strong construction safety rating of 4.0 against a 5.4 national average, with reliable feeder operations at 500 psig achieved early in the commissioning cycle.

Project Team Structure: GreatPoint will manage the overall scope of the project through the establishment of an Integrated Project Management Team ("IPMT") and provide oversight of consultants and service providers selected for the project. The IPMT will be led by Pat Raman as the senior project manager and be composed of GreatPoint personnel. GreatPoint's in-house team members include experienced research, technology development, engineering, project controls, operations and other personnel from the energy industry. The project team will feature the following GreatPoint personnel:

- Alkis Rappas, Director of Catalyst Recovery
- Charles Powell, Mayflower Plant Manager
- Nelson Yee, Senior Research Chemist
- Pat Raman, SVP of Research, Development and Technology
- Tom Robinson, VP of Project Development
- Vincent Reiling, Director of Process Modeling

The IPMT will report to the Project Steering Committee, Chaired by Donald B. Anthony, the firm's Chief Technology Officer. The Project Steering Committee will meet quarterly, or more frequently as needed. An additional technical advisory committee will be established to support the steering committee.

The technical advisory committee will include invited experts from vendors and industry companies collaborating with GreatPoint. The IPMT's primary objective is to execute the project objectives in accordance with proposed schedule and budget.

The Mayflower facility is GreatPoint's working pilot/demonstration scale facility that is focused on GreatPoint's core catalytic gasification technology – hydromethanation. This facility includes Operations, Maintenance, Process Engineering, and Plant/Project Engineering functions. GreatPoint employees and contractors staff the plant in an effort to maintain flexibility and to develop personnel for GreatPoint's future commercial plants. As is the case for most plant retrofits and modifications, most of the design and installation work will be managed by the Project Engineering function. The plant engineers will develop project and equipment specifications (with the input from the Harrison Lab staff) contract with a process design engineering firm for the detailed design work, supervise the procurement activities, and coordinate the equipment modification and installation work by plant O&M personnel and/or outside contractors. The project engineers will team with the Operations and Process functions to commission the modifications prior to turning the plant back to Operations to run the actual demonstration tests.

Schedule and Budget Compliance: As part of the Lignite Research Council application process, GreatPoint has developed a master milestone schedule based on the major project milestones and deliverables. From this master schedule IPMT members will develop detailed schedules outlining the specific activities required to achieve the project goals and milestones. These detailed schedules will be combined into an integrated schedule with the addition of any appropriate cross-area dependencies, in order that any schedule conflicts affecting project milestones may be highlighted early to allow alternative plans to be developed and implemented. The status of the schedule will be updated regularly on the basis of inputs from the team members. The team will review float time and critical path to determine if any changes have occurred that would adversely impact the project milestones and deliverables. Special attention will be given to activities that are (i) long-lead, (ii) behind, on or near the critical path, or (iii) dependent upon activities with schedule risk. To allow the project to remain on schedule, the team will develop work-around and recovery plans as needed.

The timing profile of the budget is developed from the schedule baseline. Accounts will be set up to track costs based on the reporting needs of the project, and expenses will be reported on a monthly basis using appropriate business system software. Each project area will be responsible for performance to its budget, and the Project Manager will be responsible for the execution of the project within the overall project budget. The Project Manager will review costs and will take action as necessary to keep the project's expense within budget, including through any required intervention or re-planning.

Discussions of project scope will accompany the team collaboration and regular review of budget and schedule performance. The Project Manager will be responsible for ensuring that the required scope is accomplished. If additional effort must be incorporated outside of the scope of the project, the baseline will be formally changed to incorporate the added task and budget after appropriate consultation with and approval from the Lignite Research Council.

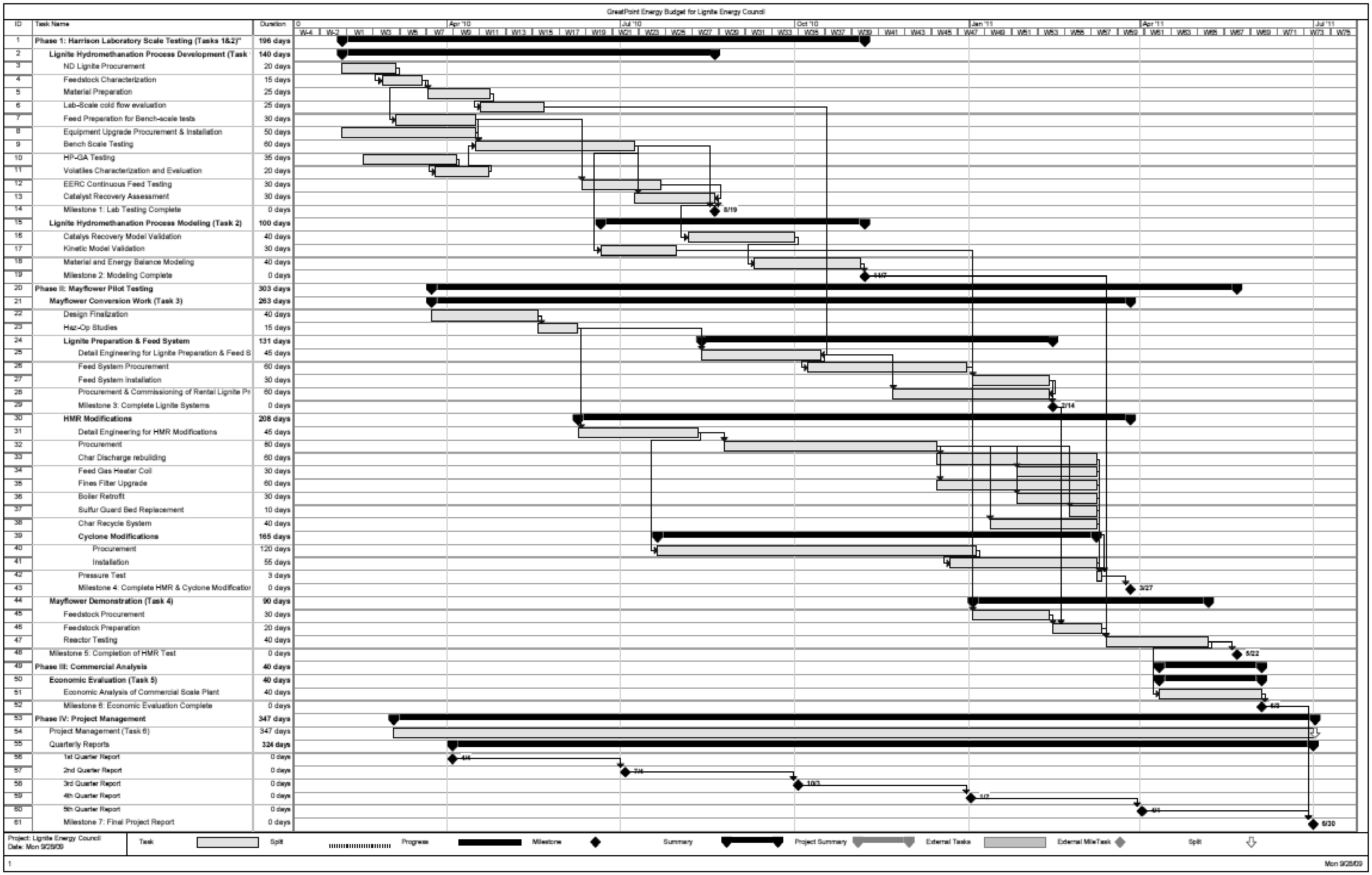
Project Communication: Information needs to be administered efficiently and communicated to team members, vendors and other project stakeholders in a timely manner. The requirements for project communications will be clearly established at the start of the project. These requirements will address information content, format and timing and will be based on communication protocol within GreatPoint from projects of a similar character. The compilation and communication of all information in all Phases will be managed centrally by the IPMT to ensure a seamless and problem free transition to subsequent phases with minimum effort and delay. For all formal correspondence on the Project, a contacts list will be prepared and made available to IPMT members.

Communication with the Lignite Research Council: A primary responsibility of the Project Manager is to maintain regular and informative contact with the Lignite Research Council. It is GreatPoint's intention to keep the Council fully up-to-date on project related developments of both a technical and financial nature. The primary vehicle for this communication will be regular written reports on a quarterly basis, or a different timeframe as set-out in the funding contract. In addition to planning for routine communications and required interim and final reporting, GreatPoint has budgeted resources to attend in-person briefing with the Council as needed. As a placeholder, these meetings are assumed to take place at the end of each phase of the project.

8.0 Timetable

As discussed in section 2.0, GreatPoint's Lignite Catalytic Hydromethanation Development Project, as described in this grant request, runs from February 1, 2010 to July 1, 2011, divided into three distinct research and development phases. The first phase, laboratory and bench-scale testing will take approximately nine months to complete. The second phase, pilot-scale demonstration, will take approximately 14 months to complete, beginning April 1, 2010, including eight months of overlap with the bench-scale program. Phase three, techno-economic modeling and risk analysis require approximately two months to complete, beginning in April 1, 2011, including one month of overlap with the pilot-scale testing. The tasks deliberately overlap so that initial positive test results for certain activities will enable commencement of the next task to accelerate the schedule without taking any undue capital exposure risks in the process. Phase four, project management, lies outside of the scope of the technical objectives of the project and will involve managing project scope, schedule, cost, reporting and communication. For a detailed rundown of the project schedule please see Figure 3.

Figure 3: Project Schedule



9.0 Budget

GreatPoint Energy, Inc. Proposal Budget to North Dakota Lignite Research Council	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 5	Qtr 6	Total
Phase 1: Harrison Laboratory Scale Testing	**159,783**	**449,849**	**100,882**	**-**	**-**	**-**	**710,514**
Task 1: Hydromethanation Process Development	159,783	429,750	33,456	-	-	-	622,989
Task 2: Process Modelling	-	20,099	67,426	-	-	-	87,525
Phase 2: Mayflower Pilot Testing	**85,897**	**894,114**	**808,229**	**787,179**	**1,182,972**	**1,075,280**	**4,833,673**
Task 3: Mayflower Conversion and Retrofit	85,897	894,114	808,229	787,179	107,692	-	2,683,112
Task 4: Mayflower Pilot Scale Testing	-	-	-	-	1,075,280	1,075,280	2,150,560
Phase 3: Commercial Analysis	**-**	**-**	**-**	**-**	**-**	**134,412**	**134,412**
Task 5: Economic and Risk Evaluation	-	-	-	-	-	134,412	134,412
Phase 4: Project Management	**39,253**	**49,621**	**39,253**	**39,716**	**46,676**	**46,676**	**261,194**
Task 6: Project Management	39,253	49,621	39,253	39,716	46,676	46,676	261,194
Total Direct Costs	**284,933**	**1,393,584**	**948,364**	**826,896**	**1,229,648**	**1,256,368**	**5,939,793**
Indirect Costs	149,902	249,339	180,320	114,819	664,752	596,233	1,955,366
TOTAL COSTS	**434,835**	**1,642,924**	**1,128,684**	**941,715**	**1,894,400**	**1,852,601**	**7,895,158**
GreatPoint Cost Share @ 50%	217,417	821,462	564,342	470,857	947,200	926,300	3,947,579
Lignite Research Council Funding	217,417	821,462	564,342	470,857	947,200	926,300	3,947,579

The table above shows the total project budget broken down into the phases and tasks discussed in the technical narrative. The total project budget is $7.9MM and GreatPoint proposes that the Lignite Research Council provide 50% of the total program, or $3.9MM. The detail behind these figures in provided below with itemized lists of the project's capital, operating and indirect costs. This budget contains all the expenses, and only those expenses, that are necessary to complete the defined scope of work. GreatPoint proposes that all project costs be split 50% by the Lignite Research Council and 50% by GreatPoint and other funders (i.e. the cost share). However, if the Council has a preference for funding certain items to a higher degree and others to a lesser degree, while maintaining the 50% overall cost share, GreatPoint is more than willing to comply with that preference. The division of cost share on individual items does not change the scope of activity necessary to complete the proposed project.

The requested funding is critical to successfully complete the project's objectives and to demonstrate the commercial viability of ND lignite in the **bluegas**™ process. Although GreatPoint is aware of Lignite's substantial potential as a feedstock for hydromethanation, without a commercial partner, we do not have the financial support to further test the feedstock. From the results and deliverables from this project, GreatPoint will have a strong package of materials with which to recruit a commercial partner who would help fund the engineering and design work necessary to begin construction of a commercial scale **bluegas**™ facility in North Dakota.

If less funding is available than proposed, the objectives of the project will be compromised. However, GreatPoint has two reasonable alternative paths that provide valuable but less optimal outcomes. In the first, GreatPoint could run a shorter demonstration test at Mayflower, perhaps only a 24 or 48-hour test period. While providing valuable data, this abridged demonstration would not be sufficient to inform Pre-FEED engineering for a commercial project. As a result, a longer run would be required at a future date before a commercial project could proceed to engineering.

A second alternative is to run only the laboratory portion of the proposed project. In this case, GreatPoint would only be able to model commercial conditions. While this information would be useful, it would not be sufficient to attract private capital to be interested in a potential commercial project. As in the first alternative option, substantial additional pilot scale testing would remain.

<u>For a detailed description of GreatPoint's Project Budget Detail see Appendix 12.1.3 (Confidential)</u>

INDIRECT COSTS

Attached to this narrative is an indirect cost rate proposal that identifies GreatPoint's major base and pool groupings by line item and dollar amount. This analysis provides a 128.1% indirect rate for General and Administrative costs, as measured by Allowable Indirect Costs divided by Total "Modified Direct" Personnel Costs.

Total proposed indirect cost for this proposal is $1,689,944 using the indirect rate of 128.1%, with Modified Total Direct Personnel Costs as the allocation base. Modified Total Direct Personnel Costs are $1,319,385 in this proposal. It is anticipated the Lignite Research Council would either approve the rate below or negotiate a new overhead expense rate for use during this performance period.

10.0 Matching Funds

GreatPoint Energy is prepared to provide all matching funds in the proposed project. A letter confirming the company's commitment is attached to this application.

GreatPoint is currently seeking funding from the Department of Energy, through the ARPA-E program for a hydromethanation testing and demonstration program. If GreatPoint is successful in obtaining this DOE award, it could provide approximately $375,000 in matching funds for the proposed Lignite Research Council program.

In Phase 1 of this proposal, GreatPoint has proposed a demonstration of hydromethanation using facilities at the University of North Dakota's Energy and Environmental Research Center ("EERC"). GreatPoint is proposing our work be done under the EERC's Jointly Sponsored Research Programs initiative, which provides up to 34.8% co-funding through the U.S. Department of Energy National Energy Technology Laboratory ("NETL") for work conducted at the EERC. If accepted, NETL would provide approximately $84,000 in cost share on behalf of GreatPoint for the proposed project.

12.1 Letter of Support

1. Energy & Environmental Research Center – University of North Dakota

EERC
Energy & Environmental Research Center
UNIVERSITY OF NORTH DAKOTA
15 North 23rd Street — Stop 9018 / Grand Forks, ND 58202-9018 / Phone: (701) 777-5000 Fax: 777-5181
Web Site: www.undeerc.org

September 29, 2009

Ms. Karlene Fine
Executive Director
North Dakota Industrial Commission
State Capitol
600 East Boulevard Avenue, Department 405
Bismarck, ND 58505

Dear Ms. Fine:

Subject: Letter of Support between the Energy & Environmental Research Center and GreatPoint Energy for the "North Dakota Lignite Hydromethanation" Research Program

We are pleased to provide this letter of support for GreatPoint Energy's application for a Lignite Research Council grant. This letter confirms the agreement between GreatPoint Energy and the Energy & Environmental Research Center (EERC) to participate in the "North Dakota Lignite Hydromethanation" research program. Under this agreement, we have partnered with GreatPoint in a professional research and development (R&D) program to study large-scale lignite hydromethanation. The EERC is committed to fully participating in the execution of this project and will work to support the activities and objectives described in this proposal.

GreatPoint Energy and the EERC have an existing relationship based on a continued series of assignments/projects that the EERC has undertaken for GreatPoint over the past several years. We are excited about the opportunity to participate in GreatPoint's project, and we look forward to working with GreatPoint to successfully implement this project.

Sincerely,

Thomas A. Erickson
Associate Director for Research

TAE/cs

GreatPoint ENERGY

Karlene Fine

Executive Director, North Dakota Industrial Commission

State Capitol

600 East Boulevard Ave Dept 405

Bismarck, ND 58505

Dear Ms. Fine,

This document is to inform the Lignite Research Council of an amendment to GreatPoint Energy's grant application titled "**Lignite Catalytic Hydromethanation Development Project**" submitted October 1st, 2009. Rather than one project composed of several phases, as described in the original application, the new proposal is composed of two distinct phases, each with a separate budget and schedule. While the tasks and objectives of the original proposal have not been modified, this reconfiguration allows for more streamlined management of technical and financial risks. For the purpose of the application to the Lignite Research Council, GreatPoint is submitting a request for funding for Phase I of the "**Lignite Catalytic Hydromethanation Development Project.**"

Under this new configuration, Phase I focuses on laboratory scale development, process model development, and pilot scale design engineering activities, all of which will demonstrate readiness for continuous and pilot-scale testing. Phase I will last for seven months and total project cost will be $917,000. With a 50% cost share, both GreatPoint and the Lignite Research Council will contribute $458,500. The second phase includes continuous and pilot scale demonstration of the process and an economic evaluation to demonstrate the state of readiness for commercial scale projects. Phase II will last for 12 months and total project cost will be $6,978,158. With a 50% cost share, both GreatPoint and the Lignite Research Council will contribute $3,489,079. GreatPoint is confident that the successful completion of Phase I will provide sufficient impetus for approval for Phase II of the program.

Phase I is designed to demonstrate and model the lignite based hydromethanation process as well as prepare for the pilot scale activities in Phase II. The laboratory scale process development will include optimization of the catalyst system with a lignite feedstock, optimization of hydromethanation process conditions for lignite feeds, and identification of the operational envelope. The laboratory data and operational information will provide data for process model development and guidance for the detailed, lignite specific planning of the pilot scale test program. In conjunction with the laboratory efforts, GreatPoint will perform design and haz-op reviews of the Mayflower facility modifications. The facility modifications, to be made upon approval of Phase II, include upgrades to existing feed, hydromethanation reactor, and char systems to handle the increased moisture and ash content of lignites. The completion of the activities in phase I provide a natural evaluation and decision point for proceeding with the lignite-based hydromethanation development program.

Phase II is intended to demonstrate the commercial readiness of the lignite based hydromethanation process through pilot scale demonstration testing and detailed evaluation of the economics. Following the batch scale work at the laboratory, a continuous feed test will be performed at the EERC to more closely simulate pilot-scale activities and to generate adequate quantities of char to make preliminary assessment of catalyst recoverability. Detailed engineering and modifications to the Mayflower facility will be implemented based on the design and haz-op reviews in Phase I. The pilot plant test program, based on the process, modeling, and operational knowledge gained in Phase I, will provide data, validated pilot-scale models, and operational knowledge for commercial scale design and engineering. Following successful demonstration of the lignite based hydromethanation process and utilizing data from the pilot scale testing, the commercial scale economics will be evaluated.

GreatPoint's proposal offers a compelling opportunity to accelerate the technology to the point of commercial readiness in a short period of time. Successful completion of this project will provide a technology platform for optimizing lignite resources, reducing greenhouse gas emissions and providing long-term economic growth to the State. Additionally, GreatPoint has met with Westmoreland Coal, who is enthusiastic about the project, and has submitted a letter of support on our behalf.

GreatPoint ENERGY

I am confident that other key stakeholders in North Dakota and throughout the country will recognize GreatPoint's enormous potential as well.

Sincerely,

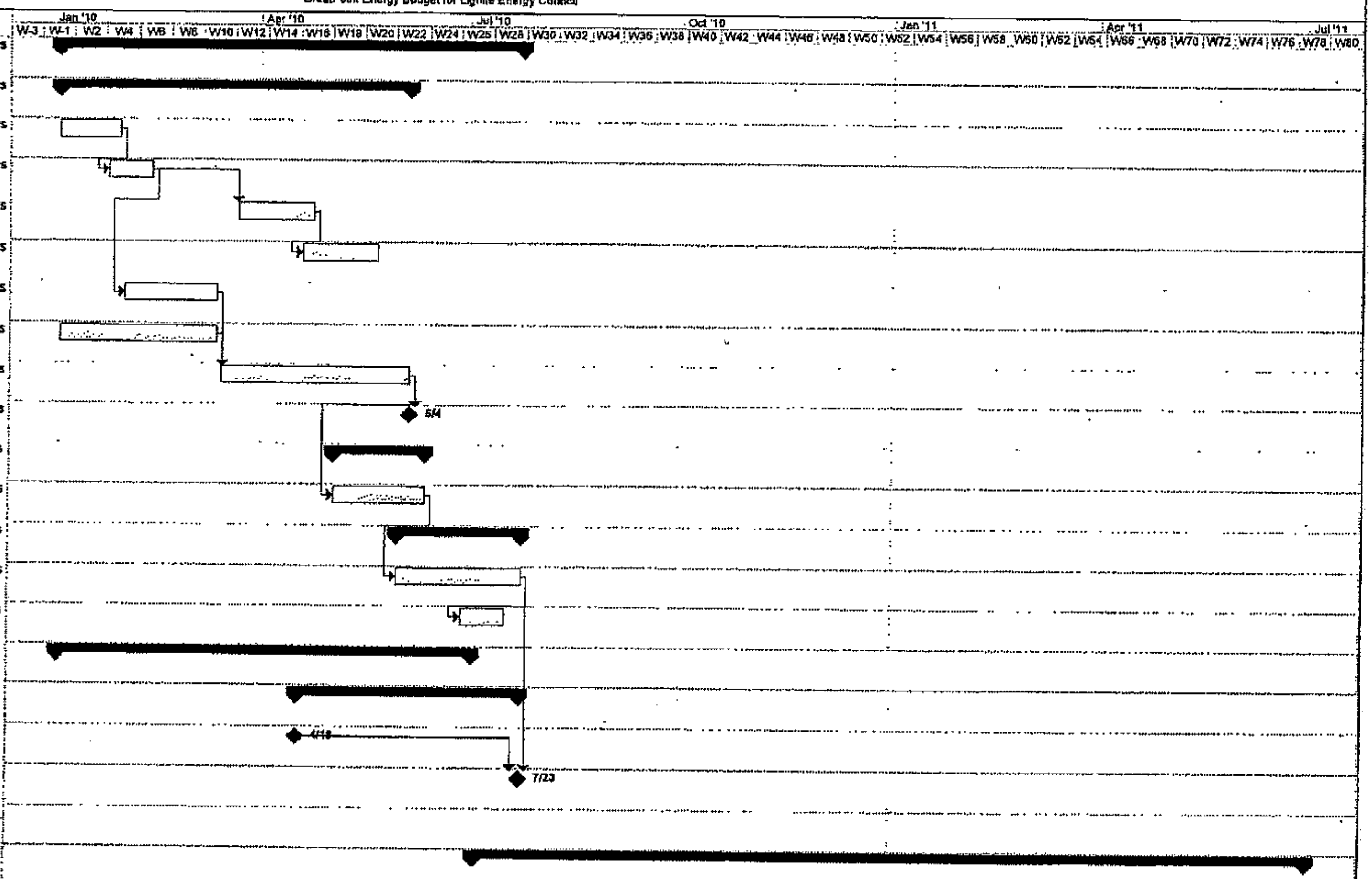
Daniel P. Goldman
Executive Vice President & Chief Financial Officer
GreatPoint Energy, Inc.

GreatPoint Energy, Inc.
Proposal Budget to North Dakota Lignite Research Council

	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 5	Qtr 6	Total
Phase I: Lab Testing, Modeling, and Pilot Engineering	**199,035**	**285,550**	**65,897**	-	-	-	**550,483**
Task 1: Hydromethanation Process Development	159,783	156,799	-	-	-	-	316,582
Task 2: Process Modelling	-	18,233	-	-	-	-	18,233
Task 3: Mayflower Conversion and Retrofit	-	60,897	65,897	-	-	-	126,795
Task 6: Project Management	39,253	49,621	-	-	-	-	88,874
Phase II: Pilot scale demonstration and economic evaluation	-	-	**522,345**	**1,280,949**	**1,684,480**	**1,901,536**	**5,389,310**
Task 1: Hydromethanation Process Development	-	-	288,313	18,094	-	-	306,407
Task 2: Process Modelling	-	-	-	69,293	-	-	69,293
Task 3: Mayflower Conversion and Retrofit	-	-	194,780	1,153,846	1,207,692	-	2,556,317
Task 4: Mayflower Pilot Scale Testing	-	-	-	-	430,112	1,720,448	2,150,560
Task 5: Economic and Risk Evaluation	-	-	-	-	-	134,412	134,412
Task 6: Project Management	-	-	39,253	39,716	46,676	46,676	172,320
Total Direct Costs	**199,035**	**285,550**	**588,242**	**1,280,949**	**1,684,480**	**1,901,536**	**5,939,793**
Indirect Costs	103,923	216,615	202,377	171,466	381,522	879,463	1,955,366
TOTAL COSTS	**302,958**	**502,165**	**790,619**	**1,452,416**	**2,066,002**	**2,780,999**	**7,895,158**
Total Phase 1 Cost (including Indirect Costs)	**302,958**	**502,165**	**111,877**	-	-	-	**917,000**
GreatPoint Cost Share @ 50%	*151,479*	*251,083*	*55,938*	-	-	-	*458,500*
Lignite Research Council Funding	*151,479*	*251,083*	*55,938*	-	-	-	*458,500*
Total Phase 2 Cost (including Indirect Costs)	-	-	**678,742**	**1,452,416**	**2,066,002**	**2,780,999**	**6,978,158**
GreatPoint Cost Share @ 50%	-	-	*339,371*	*726,208*	*1,033,001*	*1,390,499*	*3,489,079*
Lignite Research Council Funding	-	-	*339,371*	*726,208*	*1,033,001*	*1,390,499*	*3,489,079*
Total GreatPoint Cost Share @ 50%							**3,947,579**
Total Lignite Research Council Funding							**3,947,579**

GreatPoint Energy Budget for Lignite Energy Council

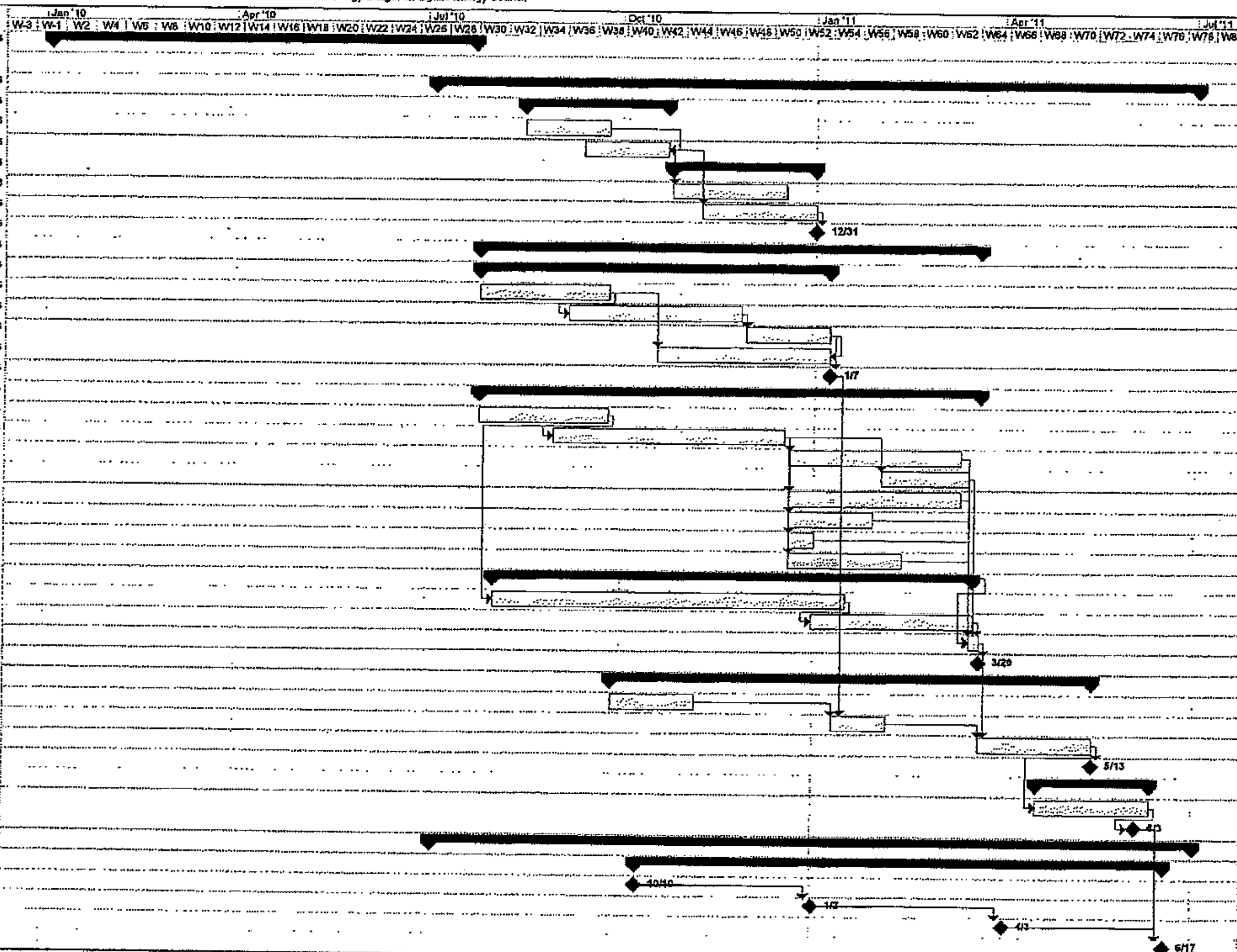
ID	Task Name	Duration
1	Project Phase I	145 days
2	Lignite Hydromethanation Process Development (Task	110 days
3	ND Lignite Procurement	20 days
4	Feedstock Characterization	15 days
5	Material Preparation	25 days
6	Lab-Scale cold flow evaluation	25 days
7	Feed Preparation for Bench-scale tests	30 days
8	Equipment Upgrade Procurement & Installation	50 days
9	Bench Scale Testing	60 days
10	Milestone 1: Lab Testing Complete	0 days
11	Lignite Hydromethanation Process Modeling (Task 2)	30 days
12	Kinetic Model Validation	30 days
13	Mayflower Conversion Work (Task 3)	40 days
14	Design Finalization	40 days
15	Haz-Op Studies	15 days
16	Project Management (Task 5)	130 days
18	Quarterly Reports	70 days
19	1st Quarter Report	0 days
20	Phase I Report and Phase II Budget Request	0 days
21		
22	Project Phase II	260 days



Project: Lignite Energy Council Date: Wed 10/14/09	Task		Progress		Summary		External Tasks		Split
	Split		Milestone	◆	Project Summary		External MileTask	◈	

GreatPoint Energy Budget for Lignite Energy Council

ID	Task Name	Duration
1	**Project Phase I**	145 days
21		
22	**Project Phase II**	260 days
23	**Lignite Hydromethanation Process Development (Task**	50 days
24	EERC Continuous Feed Testing	30 days
25	Catalyst Recovery Assessment	30 days
26	**Lignite Hydromethanation Process Modeling (Task 2)**	50 days
27	Catalyst Recovery Model Validation	40 days
28	Material and Energy Balance Modeling	40 days
29	Milestone 2: Modeling Complete	0 days
30	**Mayflower Conversion Work (Task 3)**	170 days
31	**Lignite Preparation & Feed System**	120 days
32	Detail Engineering for Lignite Preparation & Feed S	45 days
33	Feed System Procurement	60 days
34	Feed System Installation	30 days
35	Procurement & Commissioning of Rental Lignite Pr	60 days
36	Milestone 3: Complete Lignite Systems	0 days
37	**HMR Modifications**	170 days
38	Detail Engineering for HMR Modifications	45 days
39	Procurement	80 days
40	Char Discharge rebuilding	60 days
41	Feed Gas Heater Coil	30 days
42	Fines Filter Upgrade	60 days
43	Boiler Retrofit	30 days
44	Sulfur Guard Bed Replacement	10 days
45	Char Recycle System	40 days
46	**Cyclone Modifications**	164 days
47	Procurement	120 days
48	Installation	55 days
49	Pressure Test	3 days
50	Milestone 4: Complete HMR & Cyclone Modificatior	0 days
51	**Mayflower Demonstration (Task 4)**	165 days
52	Feedstock Procurement	30 days
53	Feedstock Preparation	20 days
54	Reactor Testing	40 days
55	Milestone 5: Completion of HMR Test	0 days
56	**Economic Evaluation (Task 5)**	40 days
57	Economic Analysis of Commercial Scale Plant	40 days
58	Milestone 6: Economic Evaluation Complete	0 days
59	**Project Management (Task 6)**	260 days
61	**Quarterly Reports**	180 days
62	3rd Quarter Report	0 days
63	4th Quarter Report	0 days
64	5th Quarter Report	0 days
65	Milestone 7: Final Project Report	0 days



Project: Lignite Energy Council
Date: Wed 10/14/09

Task | Progress | Summary | External Tasks | Split
Split | Milestone | Project Summary | External MileTask

WESTMORELAND COAL COMPANY

2 North Cascade Avenue, 2nd Floor, Colorado Springs, CO 80903
Phone: (719) 442-2600

October 12, 2009

Karlene Fine
Executive Director, North Dakota Industrial Commission
State Capitol
600 East Boulevard Ave Dept 405
Bismarck, ND 58505

Dear Mrs. Fine:

I am writing in support of GreatPoint Energy's application for its "North Dakota Lignite Hydromethanation" research program under the Lignite Research Council grant. Collaborating with GreatPoint represents an opportunity for North Dakota to help bring a transformational clean energy technology to market. Successful completion of this feedstock testing program would provide a technology platform for optimizing lignite resources, reducing greenhouse gas emissions and providing long-term economic growth to the State

I understand that, in this late-stage R&D project GreatPoint will seek to demonstrate that lignite can be converted to natural gas and hydrogen using catalytic hydromethanation at significantly greater efficiencies and economics than any alternative technology. While I understand that GreatPoint's hydromethanation technology has already been demonstrated to effectively process lignite samples from North Dakota in a series of bench-scale tests, a Lignite Research Council grant will enable GreatPoint to advance its key development and commercialization goals. In addition, with its integrated carbon capture and sequestration capability, hydromethanation is potentially one of the few renewable options available that can economically capture and sequester nearly all of the carbon dioxide generated in the process.

GreatPoint reports that it has successfully completed pilot testing at the Gas Technology Institute's flex-fuel test facility in Des Plaines, Illinois. In June 2009, GreatPoint began operating its $40 million Mayflower Clean Energy Center in Somerset, Massachusetts – a dedicated Hydromethanation demonstration facility. GreatPoint has raised $140 million in private equity investment to date and is backed by leading strategic and financial investors including Kleiner Perkins, Khosla Ventures, The Dow Chemical Company, Peabody Coal, and Suncor Energy. GreatPoint's lignite hydromethanation proposal offers an opportunity to accelerate the technology to the point of commercial readiness in a short period of time.

Westmoreland views development of the GreatPoint hydromethanation technology as a potential avenue to the commercial development of lignite reserves in North Dakota, potentially including reserves at Gascoyne, Bowman County, in which we have an interest. We therefore respectfully request your support for the GreatPoint grant application.

Thank you for your consideration.

Sincerely,

Todd A. Myers

Todd A. Myers
Vice President - Westmoreland Coal Company
President - Westmoreland Coal Sales Company