Oil and Gas Research Program

North Dakota

Industrial Commission

Application

Project Title: Wellhead Reformer for Electricity Production and Other Applications

Applicant: Novorocs Technologies, LLC and Blaise Energy Inc.

Principal Investigator: Dr. Phillip Hutton

Date of Application: June 1, 2016

Amount of Request: $270,110

Total Amount of Proposed Project: $540,220

Duration of Project: 12 Months

Point of Contact (POC): Dr. Phillip Hutton

POC Telephone: 585-426-5000

POC E-Mail Address: phillip.hutton@novorocs.com

POC Address: 771 Elmgrove Road, Rochester NY 14624

TABLE OF CONTENTS

***Please use this table to fill in the correct corresponding page number*.**

ABSTRACT

Objective: The proposed project will demonstrate the economic and environmental benefits of reforming heavy hydrocarbon wellhead gas, as typically found in the Bakken, to pipeline quality natural gas for electricity and CNG production, and emissions reduction. The project has the following objectives:

1. Construct and demonstrate on a Bakken well site, provided by Halcon Resources, a reforming system that converts heavy hydrocarbon wellhead gas to pipeline quality natural gas using Novorocs' proprietary selective catalytic reforming technology.
2. Operate a natural gas generator provided by Blaise Energy on the resultant reformate stream at full power without engine knock.
3. Clean and compress natural gas for use in a compressed natural gas vehicle as provided by Blaise Energy.
4. Demonstrate emissions reductions on a natural gas generator and a natural gas burner, compared with direct combustion of wellhead gas and/or diesel fuel.
5. Quantify and disseminate the operational, economical, and emissions benefits of reforming wellhead gas before utilizing it in subsequent applications.

Expected Results:

1. Build a prototype commercially viable reforming system to convert Bakken wellhead gas to pipeline quality natural gas, based upon Novorocs' proprietary selective catalytic reforming technology.
2. Demonstrate significant cost savings with reformer for power generation and CNG production from wellhead gas. Based on field data, create improved model of system cost, operating cost, return on investment, and overall financial viability of proposed technical solution.
3. Demonstrate significant reductions in greenhouse gases, particulates, NOx, SOx, carbon monoxide, and unburned hydrocarbon emissions by reforming wellhead gas to natural gas.
4. Disseminate project findings, further discussions within Bakken stakeholders in support of the wellhead gas reforming solution, and foster the creation of a local system manufacturing line.

Duration: 12 Months

Total Project Cost: $540,220 (NDIC Funding Request $270,110)

Participants: Novorocs Technologies, Blaise Energy, University of North Dakota, Halcon Resources

PROJECT DESCRIPTION

Technical Background: The proposed technology is based on selective catalytic reforming of the heavy hydrocarbons in wellhead gas to methane. The chemical processes are based on the following low temperature reactions: $C_nH_{2n+2} + 2nH_2O \rightarrow nCO_2 + (3n + 1)H_2$ and $CO_2 + 4H_2 \leftrightarrow CH_4 + 2H_2O$. A small-scale proof-of-concept catalytic reformer shown in Figure 1 for processing 8.5 mcfd of wellhead gas was successfully demonstrated in prior field trials. The result of proof-of-concept testing was that over 99% of the heavy hydrocarbons were converted to methane, producing a pipeline quality natural gas with only trace amounts of heavy hydrocarbons. The proposed project will demonstrate a 50 to 100 mcfd commercial prototype, as shown in Figure 2, in the Bakken on well site provided by Halcon Resources.

Objectives: The proposed project will demonstrate the economic and environmental benefits of reforming heavy hydrocarbon wellhead gas, as typically found in the Bakken, to pipeline quality natural gas for electricity generation, CNG production, and flaring emissions reduction. The project has the following objectives:

1. Construct and demonstrate on a Bakken well site a reforming system that converts heavy hydrocarbon wellhead gas to pipeline quality natural gas with only trace amounts of heavy hydrocarbons using Novorocs' proprietary selective catalytic reforming technology.
2. Operate a natural gas generator provided by Blaise Energy on the resultant reformate stream at full power without engine knock.
3. Clean and compress natural gas for use in a compressed natural gas vehicle as provided by Blaise Energy.
4. Demonstrate emissions reductions when compared with direct combustion of wellhead gas and/or power generation using a diesel generator.
5. Quantify and disseminate the operational, economical, and emissions benefits of reforming wellhead gas before utilizing it in subsequent applications.

Conventional Technology: Conventional technology currently compresses and cools the wellhead gas until the different components drop out as liquids. The liquids are subsequently collected and sold on the market. This requires expensive turboexpanders, cryogenic equipment and a host of supporting subsystems, as shown below. An analysis of flare gas technologies by the Energy and Environmental Research Center at the University of North Dakota[1] estimate the capital and operating costs of this

approach to be $2.5million and $250,000, respectively, putting this technology out of range to 98% of wells flaring wellhead gas.

Typical NGL processing facility at a well site.

Proposed Technology: Wellhead gas can vary significantly from location to location. While the overall energy content of Bakken wellhead gas is high, the variability in composition makes it difficult to standardize the design and operating parameters of equipment required to process it. Equipment designed and optimized for pipeline quality natural gas will not perform as well on Bakken wellhead gas. This has a direct impact on the efficiency, emissions profile, and profitability of wells. The impact is most pronounced for smaller to medium sized stranded wells that cannot economically justify the high capital expenditures required to extract the high value liquids in the wellhead gas. Typical on-site natural gas liquids (NGL) processing plants are economically justifiable for wells producing more than 2,000 mcfd.[1] Since the average stranded well is less than a quarter[1] this size, the wellhead gas is typically flared at these sites. This practice is wasteful and forces many stranded wells to use dirty diesel fuel for power production. The estimated capital cost of current NGL processing plants is $2.5 million. The estimated capital cost of the proposed technology will be approximately $75,000 for a system that will operate a 150 - 200 kW natural gas engine, making the system scalable to smaller well sites, as well as large well sites.

[1] Wockens, Chad; et al, *End Use Technology Study - An Assessment of Alternative Uses for Associated Gas, University of North Dakota*, Report submitted to the North Dakota Industrial Commission and the National Technology Laboratory, Sept, 2012

North Dakota Century Code 38-08-06.4 requires seventy-five percent of wellhead gas to be utilized for electricity production or other products after the first year of operation; or that the wellhead be equipped with value-added processes that reduce the volume and intensity of the flare by more than sixty percent. A wellhead gas reformer for on-site power and other applications will help wells meet the emissions targets in an economically viable manner. As an example, a typical medium sized stranded well requires approximately 150 kW of electrical power for on-site needs. The cost of diesel fuel to produce the required electrical power is $20,000 to $25,000 per month. The installed cost of a wellhead gas reformer that feeds an existing dual-fuel generator is under $100,000. Since the cost of wellhead gas is zero, the resulting payback period is less than 6 months. In addition to the economic benefits of power generation from wellhead gas, any remaining portion of gas that may potentially be flared after reforming through a natural gas burner has reduced emissions by over 90% for carbon monoxide, NOx, SOx, unburned hydrocarbons, and particulates, helping the well site meet emissions targets.[2] [3]

Several examples of prior NDIC projects illustrate the problem of using off-the-shelf natural gas equipment for Bakken wellhead gas:

1. Bakken Express, LLC stated in their final report for project # G-022-048 entitled, *Wellhead Gas Capture via CNG Technologies*, that "The original premise of simply porting existing technologies from the CNG industry to the oilfield didn't work out as planned" and that, among other issues, the high liquids content required more customization than originally anticipated.
2. The University of North Dakota Energy & Environmental Research Center (EERC) recently reported in their application for project # G-024-052 that Bakken wellhead gas increases the technical risk of utilization in bi-fuel engine generators due to its high liquids content. This discourages well operators from utilizing the technology. In their final report the EERC reported that bi-fuel engines can run on wellhead gas, but the replacement rates are limited to approximately 40%, well below the replacement rate of 75% for pipeline quality natural gas. It was also noted that wellhead gas

[2] Wockens, Chad, Utilization of Associated Gas to Power Drilling Rigs-A Demonstration in the Bakken, North Dakota Pipeline Authority Webinar, Feb 2013

[3] EMISSION FACTOR DOCUMENTATION FOR AP-42 SECTION 1.4 NATURAL GAS COMBUSTION, prepared for U.S. Environmental Protection Agency by Eastern Research Group, March 1998

increased carbon monoxide, NOx, and unburned hydrocarbons emissions significantly over diesel, especially at low load.

3. In the final report for project # G-024-052[1], the EERC states that compressed natural gas (CNG) and power production were the two most technically feasible applications for monetizing wellhead gas, especially for smaller wells (50 - 600 mcfd). However, CNG would require the removal of liquids from the wellhead gas, which is not economically feasible below 2,000 mcfd.

The proposed approach of first reforming the wellhead gas to natural gas has the potential to allow the use of natural gas generators with no loss of power or reliability, while reducing greenhouse gas emissions. For CNG and LNG applications, the reformer will convert the flare gas to methane without requiring expensive cryogenic equipment, enabling CNG and LNG production without the high capital cost of cryogenic liquid separation plants.

Figures: 1 Proof-of-Concept Reactor (left), and 2 Trailer Mount Field Prototype (right)

Methodology:

The prototype Novorocs Technologies wellhead gas reformer shown in Figure 1 was proven to reduce the heavy hydrocarbons in wellhead gas to trace amounts by converting them to methane. The small scale proof-of-concept reformer processed 8.5 mcfd. For the proposed project, a 50 to 100 mcfd prototype, shown in Figure 2, will be constructed for field trials in the Bakken. The methodology for the project is described by the following scope of work:

Task 1 - Reformer Skid Construction and Delivery: A trailer mounted wellhead gas reforming system will be constructed and delivered to North Dakota for testing. The field prototype reforming system will

process 50 - 100 mcfd of wellhead gas to pipeline quality natural gas. Time: Months 1 - 4. Deliverable: A trailer mounted wellhead gas reforming system.

Task 2 - Reformer Skid Setup and Shakedown: Novorocs will set up the reforming system at the University of North Dakota (UND) and shake it down for operation. The purpose of initial trials at UND is to establish baseline data points and to have a tests stand in place for future tests and demonstrations. A report of results will be provided to project stakeholders. Time: Months 5 - 6. Deliverable: Report.

Task 3 - Production of Pipeline Quality Natural Gas from Wellhead Gas: Blaise Energy and Novorocs will set up the reformer to operate on wellhead gas at a Halcon Resources well site. The flow rates and composition of the reformer inputs and output will be quantified over two weeks of operation. Time: Month 7. Deliverable: Report.

Task 4 - Electrical Power and CNG Production: Blaise Energy and Novorocs will simultaneously connect the reformer output to a natural gas generator and natural gas compressor. The electrical generator will be tested through the full range of loads to quantify its operating window as compared to its design point. The natural gas compressor will store CNG for use in a natural gas vehicle provided by Blaise Energy. Time: Months 8-10. Deliverable: Report.

Task 5 - Emissions Testing: The emissions profile of the generator and a commercial natural gas burner operating on the reformer output will be compared to the emissions of flared gas. An analysis will be performed to determine the overall capital and operating costs and return on investment for different well sizes. Time: Months 8-10. Deliverable: Report.

Task 6 - Reporting: Deliver interim and final reports to NDIC/OGRC according to the time line and notify all parties of material deviations from approved work plans. Time: Months 3, 6, 9, 12. Deliverables: Quarterly and Final Reports.

Anticipated Results: Blaise Energy and Novorocs expects the project to demonstrate the ability to safely and reliably convert heavy hydrocarbon wellhead gas to natural gas with only trace amounts of heavy hydrocarbons. With the reformer cost estimated in the tens of thousands at production volume, the technology will provide a high return on investment compared to alternative approaches, especially for small to medium stranded wells.

More specifically, the successful outcome of the proposed project will:

1. Build a prototype commercially viable reforming system to convert Bakken wellhead gas to pipeline quality natural gas, based upon Novorocs' proprietary selective catalytic reforming technology.
2. Demonstrate significant cost savings with reformer for power generation and CNG production from wellhead gas, as compared to current practices. Based on field data, create improved model of system cost, operating cost, return on investment, and overall financial viability of proposed technical solution.
3. Demonstrate significant reductions in greenhouse gases, particulates, NOx, SOx, carbon monoxide, and unburned hydrocarbon emissions by reforming wellhead gas to pipeline quality natural gas prior to use or flaring.
4. Disseminate project findings, further discussions within Bakken stakeholders in support of the wellhead gas reforming solution, and foster the creation of a local system manufacturing line to serve the Bakken oil fields and beyond.

Facilities: Novorocs will fabricate the trailer mounted wellhead gas reforming system at its 5,000 square foot product development facility in Rochester, NY. Final integration and modifications are planned to be carried out directly at UND and subsequently the oil well pad provided by Halcon Resources. As part of its commercialization strategy, Novorocs plans to set up a facility in North Dakota for balance of plant and systems integration activities. Blaise Energy will work with Novorocs to set up the dual power generation and CNG production system at the well site.

Resources: Critical manpower and resources will be provided by Novorocs Technologies, Blaise Energy, Halcon Resources, and the University of North Dakota. Novorocs will design and fabricate the trailer mounted reforming system. The University of North Dakota will provide the facilities to shake down the system under controlled conditions prior to testing in the field. Blaise Energy will provide the training, consulting, equipment, and additional field personnel necessary to reduce the test plan to practice in the field. Halcon Resources will provide the well site for the demonstration.

Techniques to Be Used, Their Availability and Capability:

From the start of the project, discussions will be initiated with Bakken area stakeholders aimed at creating a system fabrication and assembly plant in Grand Forks, North Dakota. Grand Forks has been selected as the target location for a plant because it will allow the Company to leverage existing resources at UND and the EERC. It is also the resident town of the principal investigator of the project. Fabrication and assembly of the field prototype and future commercial units will utilize off-the-shelf

components to as large an extent as possible, thereby reducing risk, cost, and time to market. Novorocs' principal investigator, Dr. Phillip Hutton, has working relationships with local area businesses in Grand Forks, ND, stemming from his former position as a Research Manager at the EERC. The Company will leverage Dr. Hutton's relationships to identify appropriate local subcontractors.

Novorocs will host technology workshops to share valuable insights gained with oil operators, the community, and other stakeholders in the Bakken. The technology workshops will include the lessons learned during the projects, and their benefits to the oil & gas operators, local electric utilities, North Dakota, and the environment.

Environmental and Economic Impacts while Project is Underway:

The negative environmental impact at the well site will be minimal for this project, since the equipment will be sited on existing pads. Some trenching and re-grading may be required to run piping to and from the trailer mounted reformer. It is expected that the test site will be co-located at a Halcon Resources well with existing power production systems online. Positive environmental impact, on the other hand, will be demonstrated once the reformer system is brought into service, through immediate reductions in emissions of greenhouse gases, particulates, NOx, SOx, carbon monoxide, and unburned hydrocarbons.

Training and safety will be a high priority on-site. Novorocs personnel will be trained in field safety programs as recommended by Blaise Energy and Halcon Resources well site operator. The trailer mounted reformer will be designed with redundant safety measures and operated at atmospheric pressure for intrinsic safety.

The economic impact will be positive for the project. While the project is underway, at least two new jobs will be created at the well site to support operations. In addition, several temporary jobs will be created associated with transporting, installing, and commissioning the system.

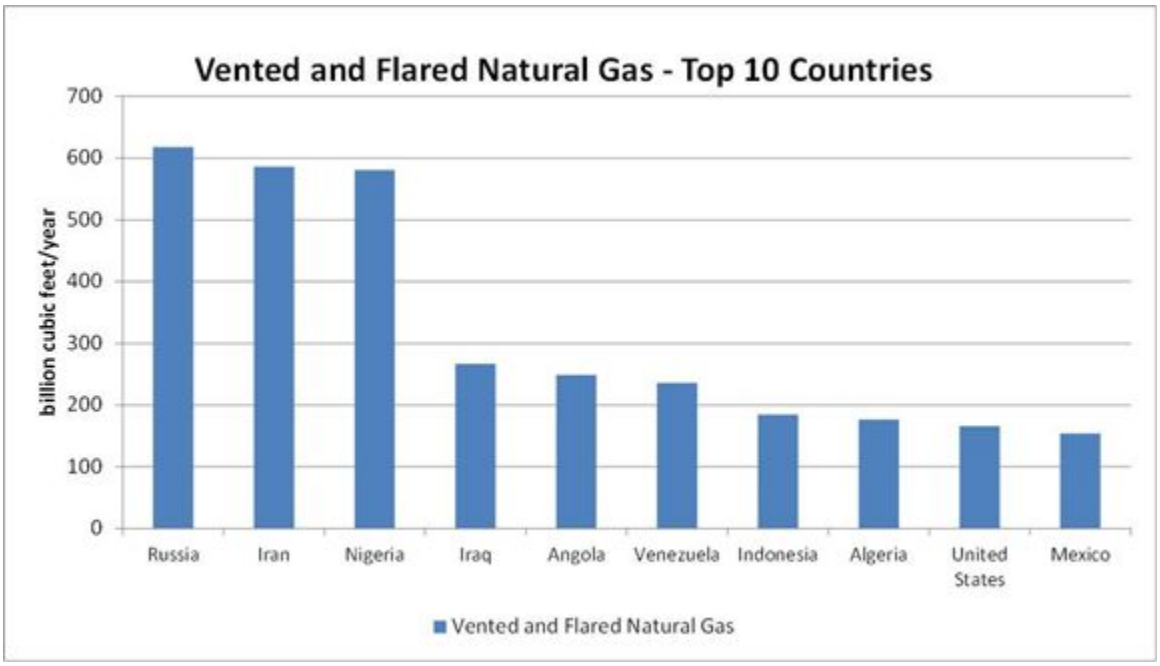
Ultimate Technological and Economic Impacts:

The proposed technology enables new technical paths for monetizing wellhead gas for small to medium sized stranded well sites. Instead of paying the high capital costs associated with specialized equipment for processing wellhead gas, well operators will have a less costly and more scale-appropriate system to help them meet specific business, regulatory, and environmental challenges.

The ultimate technological, environmental, and economic impacts are expected to be significant. The most significant environmental impact is the reduction of flare gas emissions in all categories. This is especially important for operators of small to medium sized stranded wells that have few economical ways to meet emission targets. The successful implementation of the reformer system in the Bakken will serve as both a model and springboard for expansion beyond the region. In so doing, the manufacturing plant initially formed to serve the region will increase its output beyond the needs of the region, creating more jobs and revenues. The figure below illustrates the potential size of the global market for the wellhead gas reformer, based on flaring volume.

Why the Project is Needed:

The proposed project will advance the OGRC goal of encouraging and promoting the use of new technologies and ideas that will have a positive economic and environmental impact on oil and gas exploration, development, and production in North Dakota. The project also supports the objectives of North Dakota Century Code 38-08-06.4 by enabling an economically viable solution to reducing flaring and emissions at oil wells. North Dakota will benefit financially because this technology opens new avenues to monetize wellhead gas in a safe, sustainable, environmentally sound, and cost effective manner.



Market potential for a wellhead gas reformer (Data from the Energy Information Agency)

STANDARDS OF SUCCESS

1. Convert heavy hydrocarbons wellhead gas to pipeline quality natural gas with only trace contents (<1% total) of heavy hydrocarbons remaining.
2. Reduce the emission profile of flaring reformed gas by more than 90% compared with flaring wellhead gas.
3. Demonstrate the production of electricity and CNG from reformed wellhead gas.
4. Payback to the State - Novorocs' projects that funds requested in this proposal will be fully repaid to the State of North Dakota in the form of additional tax revenue and job creation within 5 years after project completion. Indirect benefits to the State of North Dakota include the mitigation of ecological and health related problems associated with flaring of wellhead gas.

BACKGROUND/QUALIFICIATIONS

Novorocs' Technical Director, Dr. Phillip Hutton, is the project's principal investigator and will oversee the design, fabrication, and testing of the trailer mounted wellhead gas reforming system. As a former Research Manager at the Energy & Environmental Research Center in Grand Forks, North Dakota, Dr. Hutton has designed and tested several power systems on a scale equivalent to the Novorocs reformer, most notably a 300 kW gasification system feeding a Capstone gas turbine, and a 10kW integrated biomass gasification-solid oxide fuel cell system. Dr. Hutton has nearly 20 years of experience in the energy, research, and product development field. Dr. Hutton has a PhD in Engineering from the University of North Dakota; MS degrees in Physics, Chemical Engineering, and Colloids, Polymers and Surfaces; and a BS in Electrical Engineering.

Mr. Russell Bosch, P.E. is the Commercial Director of Novorocs Technologies. Mr. Bosch is a licensed professional engineer, with more than 35 years experience. Mr. Bosch's background includes management roles with GM and Delphi Automotive. He has extensive experience with reforming, having authored several patents. Prior to Novorocs, he was Director of Engineering for Fuel Cells and Reformers at Delphi, where he managed more than 200 people and a $20M annual budget. Mr. Bosch has an BS from Kettering University and a MS in Materials Engineering from Rensselaer Polytechnic Institute.

MANAGEMENT

Novorocs Technologies will oversee all aspects of the project and ensure tasks are completed on schedule. The principal investigator will work closely with Blaise Energy, Halcon Resources, and UND to ensure all requirements for moving the project forward are met. Each task will follow this management process: 1) clearly define the scope of each task, 2) evaluate the marketplace & select the best contracting option, 3) issue requests for quotations and awards, 4) oversee execution, and 5) review results and lessons-learned.

TIMETABLE

BUDGET

Project Associated Expense	NDIC's Share	Applicant's Share (Cash/In-Kind)
Prototype Reformer Fabrication	$45,750	$45,750
Project Salaries*	$97,350	$97,350
Equipment**	$122,010	$122,010
Information Dissemination & Outreach	$5,000	$5,000
Total	$270,110	$270,110

*** Includes in-kind and equipment cost share from Blaise Energy Inc.**

Direct Labor + Overhead	Hours	Loaded Rate/Hr	Total
Principal Investigator	660	$90.00	$59,400
Engineer	1320	$52.50	$69,300
Technicians	1600	$41.25	$66,000
Total Direct Labor + Overhead			$194,700

****Equipment includes: One (1) CE-C30SX CNG Gas Compressor Package w/ Electric Motor Driver**

Ingersoll Rand 05H25NGSX ($76,520), Model# CE-VRA – CNG storage cascade ($84,000), Model# CE-DFF – Dual Hose CNG Fast Fill Dispenser ($53,550), CE-PFP.5 ½" Priority Fill Panel ($17,600), and Model# CE-GDS14 - CNG Dryer Package ($12,350), as priced in Quotation No. 16-9918 R0[4].

CONFIDENTIAL INFORMATION

The applicant has no confidential information in the application

PATENTS/RIGHTS TO TECHNICAL DATA

The applicant retains all rights to future patents

STATUS OF ONGOING PROJECTS (IF ANY)

The applicant has no previous projects or funding from the Commission.

[4] Bakken CNG Station COBEY Quotation No. 16-9918 R0, June 1, 2016.

NOVOROCS
Technologies LLC

771 Elmgrove Road, Rochester, NY 14624, USA
T: (+1) 585 426 5000, F: (+1) 585 426 5001

June 1, 2016

Karlene Fine, Executive Director
North Dakota Industrial Commission
State Capital - 14th Floor
600 East Boulevard Ave Dept 405
Bismark, ND 58505-0840

Re: Transmittal Letter for Novorocs Technologies / Project Title: Wellhead Reformer for Electricity Production and Other Applications

Dear Ms. Fine:

Novorocs Technologies, LLC and Blaise Energy, Inc. is pleased to propose the subject demonstration project that promotes efficient use of the State's energy resources, encourages environmentally sound technologies to improve economics and quality of life, and fosters further sustainable development of the State's oil and gas resources. Revisions made since last application: Section added on conventional technology (p 2), budget clarification (p 11), additional edits to clarify text throughout proposal, and signed wellhead commitment letter (Appendix).

Enclosed please find the grant application titled, Wellhead Reformer for Electricity Production and Other Applications. Novorocs Technologies is a for profit company commercializing a wellhead reformer systems designed specifically to reduce flaring by enabling low cost, economically viable paths to monetize wellhead gas. The Novorocs reformer system works with commercial, off-the-shelf natural gas technologies for power generation, compressed & liquefied natural gas production, and emissions reduction.

This transmittal letter represents a commitment by the Novorocs Technologies to complete the project described in this proposal. If you have any questions, please contact me directly by telephone at (585) 426-5000.

Statement of Tax Liability
Novorocs Technologies, LLC does not have any tax liability owed to the State of North Dakota or any of its political subdivisions.

Best regards,

Arkady Malakhov
Managing Director
Novorocs Technologies, LLC

Mann, Michael <michael.mann@engr.und.edu> Wed, Jun 1, 2016 at 4:59 PM
To: Phil <phillipnhutton@gmail.com>

Hello Phil

I understand that you will be resubmitting your proposal for the demonstration of your reformer technology. The University of North Dakota provided a letter expressing our interest and availability to participate in the testing using our facilities here at UND. We are still interested in the project, and if you are successful with you revised proposal, will be happy to execute the work originally laid out in our May 28, 2015 letter (see attached). If you need any additional information, please don't hesitate to let me know.

Sincerely,

Dr. Michael D. Mann
Distinguished Professor, Chemical Engineering

Executive Director, Institute for Energy Studies

University of North Dakota
Upson II, Room 366
243 Centennial Drive, Stop 8153
Grand Forks, ND 58202-8153

Tel. 701-777-3852
Fax. 701-777-3773
email: michael.mann@engr.und.edu

"It is amazing what you can accomplish if you do not care who gets the credit." ~Harry S. Truman

UNIVERSITY OF UND NORTH DAKOTA

INSTITUTE FOR ENERGY STUDIES
COLLEGE OF ENGINEERING AND MINES
UPSON II ROOM 165
243 CENTENNIAL DRIVE – STOP 8155
GRAND FORKS, NORTH DAKOTA 58202-8155
PHONE (701) 777-3411 FAX (701) 777-4838
www.engineering.und.edu

May 28, 2015

Dr. Phillip Hutton
Novorocs Technologies LLC
771 Elmgrove Rd
Rochester, NY 14624

Dear Dr. Hutton:

The University of North Dakota Institute for Energy Studies (IES) is happy to work with Novorocs Technologies LLC on the demonstration of your reformer technology. The IES will provide a test site for the demonstration on the UND campus and will provide engineering support. We anticipate processing approximately 50 cubic meters of gas per hour, with this being a mix of methane and propane. Gas samples will be collected every four hours analysis to measure the conversion of the propane to methane, and to demonstrate the effectiveness of your technology.

Based upon our conversations, we anticipate performing the testing sometime late fall to early winter 2015. We are in the process of obtaining final approval from UND Facilities to site the demonstration unit next to the UND Steam Plant. The UND Steam Plant has hosted IES demonstration projects in the past, and has been a good partner in the development of various energy technologies.

The IES is proposing to provide up to 200 hours of demonstration time on your reformer. The projected cost for this work is $40,073. Budget details are attached. UND is willing to make the site available for additional testing if required to satisfy the needs of other Novorocs clients.

Feel free to contact me with questions at michael.mann@engr.und.edu or 701-777-3852.

Sincerely

Michael D. Mann
Executive Director
Institute for Energy Studies

Harmon Abrahamson
Interim Associate Vice President
Research & Economic Development

June 1, 2016

Arkady Malakhov
Managing Director
Novorocs Technologies LLC
771 Elmgrove Rd.
Rochester, NY 14624

RE: Proposal Entitled: *Wellhead Reformer for Electricity Production and Other Applications*

Dear Mr. Malakhov,

Blaise Energy is proud to submit the proposal entitled *Wellhead Reformer for Electricity Production and Other Applications* in partnership with Novorocs Technologies to the NDIC. We are working closely with several operators that have expressed an interest in hosting the demonstration site, and are in the process of choosing the site best suited for successfully executing the project. We will provide manpower and equipment we have on hand as partial in-kind support for the project.

As a provider of electrical generation and NGL recovery from flare gas, CNG conversions of vehicles and successful ongoing usage of light duty CNG in transportation applications, we believe there is a commercial benefit for a front end reformer that can economically convert heavy carbons to leaner gas, lowering the BTU for more reliable and cleaner burning gaseous power generators, as well as providing a gas stream suitable for alternative fuel production such as CNG. Blaise is the first oil field service company in North Dakota to convert some of its Bakken fleet to CNG duel fuel and we believe there is an emerging market for transportation fuels that can be produced from a lean gas stream output of the reformer technology.

In addition, Blaise Energy is committed to helping industry operators demonstrate proactive environmental stewardship and meet compliance of regulatory guidelines to reduce flaring and emissions.

Sincerely,

Mark Wald
President and Co-Founder
Blaise Energy Inc.

HALCÓN
RESOURCES

January 13, 2016

Ms. Karlene Fine
Oil and Gas Research Program
State Capitol, 14th Floor
600 E Boulevard Ave.
Dept. 405
Bismarck, ND 58505-0840

Dear Ms. Fine,

Subject: Proposal entitled "Wellhead Reformer for Electricity Production and Other Applications" in response to the North Dakota Industrial Commission Oil and Gas Research Solicitation

Halcon Resources is pleased to enumerate its support of the proposal provided to the NDIC by Blaise Energy Inc. and Noverocs Technologies, LLC entitled "Wellhead Reformer for Electricity Production and Other Applications" by providing a well site for the demonstration. The well site is Tabeguache located in Dunn County:

FB 148-94-27C-22-3H
FB 148-94-27C-22-4H
FB 148-94-27C-22-6H
FB 148-94-27C-22-7H
FB 148-94-27C-22-8H

Sincerely,

Name Jon Wright
Title Sr. VP Operations
Company Halcon Resources

1801 California Street, Suite 3500 Denver, CO 80202
P: 303.297.2028 F: 303.297.2196