

Blaise response to questions raised in:

TECHNICAL REVIEWERS' RATING SUMMARY

G-021-D

Flare to Electricity - Recycled Energy from a Wasted Resource
Submitted by Blaise Energy

Request for \$2,000,000; Total Project Costs \$4,000,000

Rating Category	Weighting Factor	Technical Reviewer			Average Weighted Score
		21D-0A	21D-02	21D-03	
Objective	9	2	2	5	27.0
Availability	9	2	2	5	27.0
Methodology	7	4	3	3	23.3
Contribution	7	2	1	4	16.3
Awareness	5	3	3	4	16.7
Background	5	4	3	4	18.3
Project Management	2	4	3	3	6.7
Equipment Purchase	2	4	3	3	6.7
Facilities	2	5	3	3	7.3
Budget	2	4	2	4	6.7
Average Weighted Score		147	116	205	156.0
Maximum Weighted Score					250

OVERALL RECOMMENDATION

FUND				X
FUNDING TO BE CONSIDERED		X		
DO NOT FUND			X	

Section B. Ratings and Comments:

- 1. The objectives or goals of the proposed project with respect to clarity and consistency with North Dakota Industrial Commission/Oil and Gas Research Council goals are: 1 – very unclear; 2 – unclear; 3 – clear; 4 – very clear; or 5 – exceptionally clear.**

Reviewer 21D-01 (Rating: 2)

The objectives of maximizing EUR's is an objective of the NDIC/OGRC, but I just don't feel like this project would do this on a large scale. In the project description, it talks about ND flaring at 30%, when I look at Dec. 09, I come up with 21% (56 MMcf/d), and if I take Bowman County out of that, it brings ND flaring down to ~11% (25.4 MMcf/d). Currently, most new development is happening in Williams, Mountrail, Mckenzie, and Dunn Counties, with development happening in these areas, in my opinion I feel that infrastructure will come to these counties. The highest flaring occurs in Bowman county where they have a high level of nitrogen in their gas so it is not a desirable gas.

This proposal is a great solution for non-pipeline quality gas such as high nitrogen scenarios. We respectfully submit that the reasoning for a rating of 2 is not aligned with the stated objective of being consistent with OGRC goals.

Blaise has strived to meet many of the goals of the OGRC whereby Grant priority is given to development projects, processes, ideas, and activities that:

- Identify oil and gas exploration and production technologies presently not used in North Dakota.*
- Maximize the market potential for oil, natural gas, and the associated byproducts produced therewith*
- Positively effect ultimate recovery from North Dakota's existing oil and gas pools.*
- Improve the overall suitability of the oil and gas energy industry in North Dakota through the development of new environmental practices that will help to reduce the footprint of oil and gas activities*
- Generate information and knowledge that will have the highest probability of bringing new oil and gas companies and industry investment to North Dakota.*
- Have the highest potential for creating new oil and gas jobs, wealth, and tax revenues for North Dakota.*
- Develop baseline information that will lead to other projects, processes, ideas, and activities.*

These are the stated goals that we believe this project is very much in alignment with.

Additionally, the Blaise Energy project contributes to the Department of Energy's (DOE) Office of Energy Efficiency and Renewable Energy (EERE) objectives and is uniquely aligned with the stated goals of EmPower ND, the State's official comprehensive energy policy.

Although perhaps not directly addressing certain objectives, this project provides a solution for the operators and the industry to take action in areas scrutinized by regulating agencies. Taking proactive action to reduce flaring will help alleviate pressures to regulate at the Federal level and could ultimately have a very positive impact on production in North Dakota.

Reviewer 21D-02 (Rating: 2)

- The project appears to fail on economics. At 100% capacity factor at peak generation of 732kW- a \$4,400,000 project cost and if a five year return on investment is considered, the cost per kWh is \$0.1372 – far greater than the regions average cost and greater than the rate purchasers are willing to pay for the product. Payback terms may be significant.

There may be some confusion as to what was presented in our proposal and consequently the statement on the economics above. The \$4.4 million project was for 5MW of generation, and the stated 730kW was just the first target site. The economics are to spread the \$4.4 million over 5MW not over just 730kW. When spreading the cost over the total 5MW, the costs are within market rates for electricity. Using same metrics as the reviewer (5 years) at 5 MW yields \$0.020 per KWh.

- The environmental impact statements are somewhat misleading. The gas conditioning process is not described and therefore could disguise other emissions not present in the generator emissions. The coal emissions offset, though technically correct, is only accurate if Basin Electric ramps down its coal generation by 732kW or is able to postpone construction of a new coal generating station due to the addition of the 732kW generator. Coal plants operate at or near 100% capacity factor whenever possible.

Emissions are calculated based on EPA Emission factors (EPA document AP42) and have been verified by North Dakota Department of Health.

The goal of alternative energy is to develop alternatives to traditional sources of energy which will be achieved over the long term. Arguments of wind, solar and other renewables displacing coal generation are the source of many debates, however reliable and consistent generation from geothermal, heat recovery, and now flare gas have the real potential to replace base load generation. The Blaise generation from a single well site is expected to have availability greater than 90%, and 99% from a central tank battery. This reliability while also conserving 600 Billion BTU per year of otherwise wasted energy from flared gas offers a very compelling solution with positive impacts on the environment.

- The fact that North Dakota has classified this generation as “Green” does not make the renewable energy credits (REC’s) equal in value to other nationally classified “Green” energy sources and may limit the market of these REC’s to North Dakota and therefore reduce their value.

The Blaise RECs will be administered by M-RETS and will follow established guidelines and will yield the same value as all other RECs administered.

Reviewer 21D-03 (Rating: 5)

The capture of flared gas and converting efficiently to usable electricity is an excellent example of meeting the Commission's and NDPC's goals of environmentally sound best practices along with utilizing existing plus new technology.

- 2. With the approach suggested and time and budget available, the objectives are: 1 – not achievable; 2 – possibly achievable; 3 – likely achievable; 4 – most likely achievable; or 5 – certainly achievable.**

Reviewer 21D-01 (Rating: 2)

I believe this project can be done on a small scale, but if operators were to develop up an area and add infrastructure or operate one of these units, I don't see this being a choice option.

We respectfully submit that the reasoning for a rating of 2 is not aligned with the stated criteria objective of whether our approach is achievable for the time and budget stated in our proposal.

Our stated objectives are in part to:

- Recycle 600 billion BTU of currently wasted energy per year, equivalent to 600 million cubic feet of natural gas (at a heat content of 1000 BTU/scf) by transforming otherwise flared and wasted associated gas into high quality, reliable and environmentally friendly electricity for sale to the grid.*
- Facilitate the adoption of this solution through a turn-key service and the elimination of capital investment from the oil operator.*
- Demonstrate a viable and sustainable alternative to wasteful flaring.*
- Demonstrate and test practical methods for new energy efficiency technologies to transform waste into value. This benefits America, the State of North Dakota and oil & gas operators while making a long-term investment in the next generation of Clean Energy technologies and jobs.*
- Reduce emissions: The Blaise solution will reduce emission compared to flaring by approximately 75%. *Please see EERC study.*
- Improve the public's perception of the environmental performance and stewardship of the State of North Dakota and oil field operators, while maximizing market potential for associated gas.*

We feel confident that this is achievable for the time & budget available.

Our intent is not to deploy this solution where pipeline infrastructure is close. This is not a solution designed to compete with pipelines, but offers an alternative to flaring when a sales market is not practical or financially justified.

Reviewer 21D-02 (Rating: 2)

Only if the project receives grant funds and even then the economics are questionable.

There may be some confusion as to what was presented in our proposal and consequently on the economics. The \$4.4 million project was for 5MW of generation, and the stated 730kW was just the first target site. The economics are to spread the \$4.4 million over 5MW not over just 730kW. We believe the economics are solid given the costs over 5 MW.

The intent of the this federal grant is to encourage and support deployment of equipment for the purpose of recycling 600 billion BTU of currently wasted energy per year by transforming otherwise wasted associated gas into high quality, reliable and environmentally friendly electricity for sale into the grid. We feel the economics are solid and are confident that this is achievable for the time & budget available.

Reviewer 21D-03 (Rating: 5)

The project is presented to be on a very tight timeline but appears to be doable and achievable.

- 3. The quality of the methodology displayed in the proposal is: 1 – well below average; 2 – below average; 3 – average; 4 – above average; or 5 – well above average.**

Reviewer 21D-01 (Rating: 3)

The methodology is sound, taking flared gas that is currently flared into the atmosphere and capturing it and selling it to current utility companies.

Reviewer 21D-02 (Rating: 3)

The concept is sound however lacking in description regarding gas conditioning and any emissions or costs associated with the operation, maintenance, cost, etc.

Exact gas conditioning and associated costs are on a case by case basis and is to be determined as sites are deployed. In most cases knocking out water and compressing the gas to 150psi is all that is required.

Reviewer 21D-03 (Rating: 3)

The methodology seems to be clear at the proposal level. The specific practices and details of the procedures to implement the project are vague but at the proposal level of the project Application, more details may not be needed. When the project is implemented, the details of installation and procedures need to be in place.

- 4. The educational contribution of the proposed work to specifically address North Dakota Industrial Commission/Oil and Gas Research Council goals will likely be: 1 – extremely small; 2 – small; 3 – significant; 4 – very significant; or 5 – extremely significant.**

Reviewer 21D-01 (Rating: 2)

This comes back to a size of the project, I don't feel like this project would significantly cut into the 21% of ND gas that is flared. It was brought up about "unchoking", if a wells is producing significantly above these rates, one has to wonder if it is feasible to build gathering lines.

We feel one of the educational contributions is to prove a new and innovative service model by leveraging technologies not currently used in oil & gas operations. This will lead to greater natural gas utilization, conservation and emission reductions while providing distributed recycled energy where it is needed.

Reviewer 21D-02 (Rating: 1)

For the most part this process is using currently available technology to accomplish generating electricity.

The stated objectives of the project are in part to use currently available technology in a unique business model to provide a compelling solution for operators to deploy this solution with many benefits vs. flaring.

We believe there is great educational benefit to testing new methodologies and business models to provide alternative to tackle flaring. Other educational contributions are testing new applications which advance North Dakota as a model for America in the development of innovative, new technologies and applications in a clean, environmentally friendly and sustainable way. (description from the Executive Summary of the EmPower ND Comprehensive State Energy Policy)

This project also supports the US DOE's Methane-to-Markets (M2M) goals and adds to its knowledge base by demonstrating the application of new ideas and applications right at the polluting source.

Blaise has implemented a service model expected to facilitate and accelerate the adoption of existing technologies not currently leveraged in the industry. Blaise provides

a no cost, no hassle way for operators to show proactive action and leadership to conserve resources and reduce emissions. This proactive action will help demonstrate self regulation and alleviate Federal desire to step in.

Reviewer 21D-03 (Rating: 4)

This project is a very proactive approach to meeting specific Commission and Council goals. It portrays a positive energy towards environmental and innovative concerns.

5. The principal investigator's awareness of other current educational efforts being conducted by other persons or entities related to the proposal is: 1 – very limited; 2 – limited; 3 – adequate; 4 – better than average; or 5 – exceptional.

Reviewer 21D-01 (Rating: 3)

Flaring has dropped from the 30% of March 09 to the 21%, a lot of this is due to the EOG plant, Hess gathering lines, and Whiting's plant, this changed Mountrail County flaring volumes from 49% to 22%. For the most part they are on top of the data, just a little bit out of date.

Reviewer 21D-02 (Rating: 3)

No Comment

Reviewer 21D-03 (Rating: 4)

Obvious research from the author has focused on alternative methods to capture emissions, availability of grant monies, EPA policies, North Dakota Codes, and various agencies.

6. The background of the investigator(s) as related to the proposed work is: 1 – very limited; 2 – limited; 3 – adequate; 4 – better than average; or 5 – exceptional.

Reviewer 21D-01 (Rating: 4)

Pascal Boudreau seems to have a lot of experience related to this field, 15 years experience is a plus in any engineering project.

Reviewer 21D-02 (Rating: 3)

No Comment

Reviewer 21D-03 (Rating: 4)

The necessary information contained in the documents was sufficient for bringing awareness and knowledge to the reader.

- 7. The project management plan, including a well-defined milestone chart, schedule, financial plan, and plan for communications among the parties involved in the project . is: 1 – very inadequate; 2 – inadequate; 3 – adequate; 4 – very good; or 5 – exceptionally good.**

Reviewer 21D-01 (Rating: 4)

The timing of the project seems sound, the financial plan is pretty basic, as it really doesn't talk about what cost the gas will be purchased from the producers and sold back to the Power Companies. The scheduled weekly meetings at the start of the project would help coordinate the process/work as it takes off.

The model is not to purchase the gas from producers. We are providing a no cost, no hassle service to eliminate the flare. By doing so we are reducing waste and returning a site payment to the producer to further incentivize them.

Reviewer 21D-02 (Rating: 3)

No Comment

Reviewer 21D-03 (Rating: 3)

Again, more details will be required to streamline the installation and operation of the project. But those details probably do not need to be in these documents for the initial review.

- 8. The proposed materials and media to be developed or used are: 1 – very inadequate; 2 – inadequate; 3 – adequate; 4 – very good; or 5 – exceptionally good.**

Reviewer 21D-01 (Rating: 4)

The Generator is a good unit, one of the attractive things about the generator is the 25,000 hour life which will keep maintenance cost down and allow it to be cost effective.

Reviewer 21D-02 (Rating: 3)

No Comment

Reviewer 21D-03 (Rating: 3)

No mention was given for available equipment other than the 1 (one) specific engine/generator package. If the AL800 generator is the most optimal package available, no comparison to other options is mentioned.

Our equipment manufacturer has many similar generators available and the selection is specific to the site. The grant project consists of 5 MW of generation which may be delivered via one single generator or multiple parallel generators. Final site design will take into consideration redundancy, phased deployment and permitting requirements.

- 9. The materials and media available and to be purchased for the proposed educational effort are: 1 – very inadequate; 2 – inadequate; 3 – adequate; 4 – notably good; or 5 – exceptionally good.**

Reviewer 21D-01 (Rating: 5)

According to the chart in the Appendix, the equipment has been purchased and ready to install so I don't think availability is an issue.

Reviewer 21D-02 (Rating: 5)

No details regarding the gas conditioning enclosure – operation, maintenance, environmental, cost, etc.

Reviewer 21D-03 (Rating: 3)

The documents do not mention if the equipment will be available for the referred timeline so assumption is given that no delays for equipment is possible or expected.

Equipment is readily available from our equipment manufacturer.

- 10. The proposed budget value relative to the outlined work and the financial commitment from other sources is of: 1 – very low value; 2 – low value; 3 – average value; 4 – high value; or 5 – very high value. (See below)**

Reviewer 21D-01 (Rating: 4)

The budget looks good, from the financial's provided, it appears as most of the money is going towards equipment etc..with minimal money spent on overhead. What seems expensive is cost per gathering system, a expected cash flow to show this project to be feasible would have helped some. One of the questions that really was not answered was what would be the cost to the operator (Operating Cost/Royalties)

Reviewer 21D-02 (Rating: 2)

This single site with the potential addition of four more like units must at some point consider the real competition from gas gatherers and processors along with recognizing the likely installation locations that these units and the challenges of those locations with regard to the electric system to be interconnected with.

We intend to specifically target areas that are not close to pipeline infrastructure.

- With the announced expansion and or green field construction of new gas processing plants, the demand for available gas is destined to increase. As demand increases, so does the value of the gas and, as such, producers will realize a greater incentive to construct and expand gas gathering systems.
- Most wildcat wells are in remote areas. These remote areas are also the likely locations for this generation source as the gas gathering infrastructure is virtually non-existent. This lack of gas gathering infrastructure in most cases is likened to the electric distribution system that is likely to exist in these same areas. Electric systems are constructed with a higher capacity from the source (substation or transmission facility) out meaning facilities decrease in load serving capability the further from the source. A generator on the end of a line is connecting, if they exist at all, to small capacity facilities that may restrict the amount of generated capacity that can be injected into the distribution system.

Although this reviewer's comment isn't relative to this section here is our response to his comments:

According to US Data Projections from EIA (US Energy Information Administration) gas prices are expected to stay relatively flat and aren't expected to bounce back above 2008 wellhead prices of \$7.85 before 2035, which should keep the financial justification for gathering relatively unchanged. With over 100 rigs in North Dakota, the continued increase in assessed reserves, and the price of oil, stranded gas is anticipated to be available for many years to come.

Blaise has narrowed its focus to key areas of North Dakota which are expected to flare for the foreseeable future. Blaise has a good understanding of the electrical infrastructure in western North Dakota and great relationship with the local electric coops. This allows us to quickly assess the interconnect options and identify potential limitations.

Reviewer 21D-03 (Rating: 4)

By no mention of bidding equipment or details of the specifics detailed by categories, a level of financial value was difficult to be determined. It's been several years since I priced generator packages, electrical hardware, and compressor setups but I

am aware that this type of equipment is very expensive, especially the turbine-type design.

¹ “Value” – The value of the projected work and technical outcome for the budgeted amount of the project, based on your estimate of what the work might cost in research settings with which you are familiar.

Financial commitment from other sources – A minimum of 50% of the total project must come from other sources to meet the program guidelines. Support less than 50% from Industrial Commission sources should be evaluated as favorable to the application.

Section C. Overall Comments and Recommendations:

Reviewer 21D-01

There were a few unanswered questions in the application which make it hard for me to support the application. The 30% compared to the 11% (When you take out Bowman County Gas which does not have value), the gathering systems seem to have come a long ways, looking at maps of the current spacing (available on the NDIC website), it appears as future development is going to drill out most of the Bakken in the thermally mature area, I believe in the areas such as Williams County, infrastructure will soon follow development as a large scale development of an area, history tells us infrastructure will follow (I.E. EOG, Hess, and Whitings capturing of Gas in Mountrail County).

There are a couple of different scenarios where this solution makes sense: 1) areas away from pipeline infrastructure and 2) Non-Pipeline quality gas where gas conditioning doesn't pencil out for the producer but works for Blaise. Gathering systems have come a long way, however there are still areas that are several miles from a pipeline where it will conceivably be flaring for a while and potentially for the life of the well(s). Bowman County has gas that may not be of value to a pipeline but may still be applicable in the Blaise solution. We've analyzed some opportunities confirming potential in Bowman County. The percentage of flared gas in North Dakota is reducing; however the volumes remain favorable to sustain a Blaise business well into the future.

The other data that did not go into depth was on the financial data, on whether the gas was going to be at a cheap discount due to the current status of the gas or if you were going to pay plant prices. Was this going to be a cost to the producers, who pays for operating cost, Now wouldn't the producer be required to pay royalties? All these questions lead me to wonder at what point is the operator going to have enough volumes to build infrastructure.

Blaise is not intending to buy the gas, but give producers an economically viable alternative to proactively practice enhanced stewardship compared to flaring. We are eliminating an unsightly flare and doing something positive with it. For the price we are getting for the electricity, we are not able to pay market rates for the gas. Blaise

provides a method for the operator to reduce or eliminate flaring at no cost to them. This allows the operator to take preventative and proactive action to reduce flaring and waste. This action, combined with aggressive infrastructure deployment and other initiative will give the industry powerful arguments to keep regulations at the local level.

The unanswered questions are what led me to choose the option funding may be provided, I think with a little clarity some of these issues could be resolved and funding could be approved.

Blaise is in the process of securing a 5 MW project that will allow us to provide more details and clarity specific to this site.

Reviewer 21D-02

The overall concept of generating from flare gas is sound from an engineering standpoint however I question the economics, environmental benefits and ultimately, the ability to compete with impending gas gathering systems.

A possible misunderstanding of the economics has been addressed above.

The Blaise solution is not designed to compete with impending gas gathering systems but rather to offer the operator an easy and free alternative to flaring. The Blaise solution should only be considered where flaring is expected for at least 18 months. Based on reports and many experts there are, and will continue to be such opportunities in North Dakota.

The Environmental data provided was calculated according to EPA guidelines and emission factors (AP42) as well as verified by the North Dakota Department of Health. All site calculations will be verified by an environmental consulting firm and the North Dakota Department of Health prior to implementation as permit requirements are assessed.

Although I believe in the concept, the practicality is questionable at best in the short term and highly doubtful over a longer period as to whether this is a viable business venture. The same hold true when considered from an environmental or job creation point of view.

The stated purpose of the this federal grant is to assist in the purchase and installation of electrical generators that consume at least 75% of the gas from oil & gas well sites which would otherwise be flared or wasted.

Although the purpose of the Federal Grant isn't to assess business viability, Blaise has specifically analyzed that potential and is aggressively pursuing this business because of

its findings to date. The State Grant recently awarded to Blaise will help further confirm these findings and share them with the industry.

My recommendation would be to not fund this project.

It should be noted that comments from this Reviewer with regards to financials, environmental, and potential market have been addressed in previous sections of this document and would likely have a positive impact on his final recommendation.

Reviewer 21D-03

With my past experience in the oil and gas industry, with a previous life which includes agriculture, my first thought is to look for the installation and operational expense to this project. I did not see a breakout for the operational costs or a rate of return of the investment. That being said, the project information given appears to be of significant value from the environmental side. My hope is the economics are attainable to pay for the capital invested and the operational costs are low.

All in all, the project is a great idea, the proposal is well done, and the benefits for the environmental in North Dakota are significant. This project should move forward.