Technical Reviewers' Rating Summary

Proposal Number G-55-01 Application Title Well Site Thief Hatch Methar Submitted By Vareberg Engineering, Ltd Bl Request For $266,000.00 Total Project Costs $582,000.00

Section A. Scoring

Statement	Weighting Factor	G-55-01A	G-55-01B	G-55-01C	Average Weighted Score
1. Objectives	9	**3**	**4**	**5**	**36**
2. Achievability	7	**3**	**4**	**4**	**21**
3. Methodology	8	**3**	**4**	**4**	**24**
4. Contribution	8	**2**	**5**	**5**	**32**
5. Awareness / Background	5	**4**	**4**	**2**	**15**
6. Project Management	3	**2**	**3**	**3**	**6**
7. Equipment / Facilities	2	**3**	**5**	**4**	**8**
8. Value / Industry - Budget	4	**3**	**4**	**4**	**12**
9. Financial Match - Budget	4	**2**	**4**	**3**	**12**
Average Weighted Score		**140**	**207**	**200**	**182**
	Total: 50				**250 possible points**

OVERALL RECOMMENDATION

FUND		**X**	**X**
FUNDING TO BE CONSIDERED	**X**		
DO NOT FUND			

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:

   The objectives of the thief hatch methane detector application are consistent with the following two OGRP goals and purposes. •Promote efficient, economic, and environmentally sound exploration, development, and use of North Dakota’s oil and gas resources. •Encourage, and promote 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.
   - Reviewer: G-55-01A
   - Rating: 3

   The goal of the proposed project is to finalize design and construction of a fugitive methane emissions from oil and gas producing facilities in ND. This aligns well with the goals of the OGRP.
   - Reviewer: G-55-01B
   - Rating: 4

To promote growth, create jobs and support regulatory compliance are all goals of the OGRC. As well as demonstrate to the public the importance of the state oil and gas exploration and production industry, to encourage and promote wise use of energy, sound environmental practices and production methods and technologies. In this particular case, sound environmental practices aligned with new technology will lead to greater regulatory compliance and a demonstrate to the general public and regulators that this industry is always searching for the next best practices.
- Reviewer: G-55-01C
- Rating: 5

No additional comments - TDV.
- Applicant

2. With the approach suggested and time and budget available, the objectives are:

The applicant's timeline and budget appear reasonable to accomplish the stated objectives. With a prototype already developed, the biggest timeline hurdle will likely be developing a robust software package to support the sensors while communicating as seamlessly as possible with an operator's existing wellsite monitoring program.
- Reviewer: G-55-01A
- Rating: 3

The proposers state that they have developed a prototype for the detection system and will be working to finalize/optimize the communications system to affect real time monitoring and therefore significantly reduce methane emissions. With the team assembled and budget proposed i believe they most likely will successfully complete the proposed work.
- Reviewer: G-55-01B
- Rating: 4

6 months to complete construction of sensors and associated equipment and 12 months for pilot program appears reasonable. I voted mostly likely achievable due to potential for longer time frame in final device development.
- Reviewer: G-55-01C
- Rating: 4

Subsequent to submitting the proposal, we have extended the timeline to account for obtaining Underwriters Laboratory (UL) listing of the final device as well as allow for any potential delays due to current supply chain issues (both materials and labor). - TDV
- Applicant

3. The quality of the methodology displayed in the proposal is:

While a bit more detail would have been helpful, I saw no major omissions and have no major concerns with the methodology as proposed. The team outlined in the application appear capable of executing on the proposed methodology.
- Reviewer: G-55-01A
- Rating: 3

The team assembled and the proposed management of the activities they should be successful. I would suggest a go/no go decision point after the completion of the prototype unit prior to completion of construction of the 20 units and the initiation of the pilot program.
- Reviewer: G-55-01B
- Rating: 4

Though not sure what to compare to as a new evaluator, the plan for design, construction of additional monitors from an existing prototype and the pilot program are fairly straight forward and simple. What the methodology will accomplish is to move the oil and gas industry miles forward in leak detection from thief hatches, and fast maintenance to reduce leaks.
- Reviewer: G-55-01C
- Rating: 4

Our business plan (not included in the Grant Application) also calls out for us to thoroughly evaluate projected production costs after a final prototype is developed. At that point, we will determine whether or not moving forward with the project is fiscally responsible - both for us and the OGRC. - TDV
- Applicant

4. The scientific and/or technical contribution of the proposed work to specifically address North Dakota Industrial Commission/Oil and Gas Research Council goals will likely be:

   I am in full agreement that targeting thief hatch emissions should be a priority for all operators in North Dakota. Much of the current thief hatch emissions are a result of outdated tank pressure relief mechanisms with poor seals and/or hatches being unintentionally left open. Replacement or retrofit of existing thief hatches, along with commercially available thief hatch closure sensors would greatly reduce emissions for tanks in the state.
   - Reviewer: G-55-01A
   - Rating: 2

   Methane emissions are a major challenge to ongoing development of ND oil and gas resources. The proposed work offers an opportunity ot significantly reduce those emissions in existing and future wells in ND.
   - Reviewer: G-55-01B
   - Rating: 5

   Currently, regulations require semiannual or quarterly inspections of facilities. Often audio visual and olfactory inspections occur whenever a pumper or other company personnel are at the site. However, online sensors that are in constant communication with maintenance is a giant leap forward towards control and reduction of leaks from thief hatches. EPA has been taking a hard look at methane leaks from facilities for years. This could change industry response significantly. There is a potential to reduce emissions by 80%.
   - Reviewer: G-55-01C
   - Rating: 5

   I completely agree with the fact that many of the emissions are due to the items brought up by Reviewer G-55-01A. This project will be another tool to assist the operators in determining that hatches (or just the relief mechanisms) may need to be replaced. We are also already considering adding the closure sensor mentioned to the overall device package.- TDV
   - Applicant

5. The background of the principal investigator and the awareness of current research activity and published literature as evidenced by literature referenced and its interpretation and by the reference to unpublished research related to the proposal is:

   The team outlined for the proposed work appear to be very capable and well suited to accomplish the outlined application goals. I have no concerns related to the team’s ability to fully execute on the proposed project.
   - Reviewer: G-55-01A
   - Rating: 4

The proposed team has the experience and technical background required to successfully complete the proposed development activity.
- Reviewer: G-55-01B
- Rating: 4

I did not see any references to current published literature in the application package. However, given the involvement of NDSU engineering, along with one PhD from NDSU, the potential for publication of this research, pilot program and success are quite possible. The sensor, communication tools and pilot program design are simple and results could be quite staggering. A provisional patent has been submitted for the methane detection device being proposed for this project.
- Reviewer: G-55-01C
- Rating: 2

Along with the provisional patent, a student research paper and final report was written by the NDSU students who performed some of the initial tests and studies to determine the overall performance of the sensors in varying degrees of methane as seen at a typical well site thief hatch. - TDV
- Applicant

6. The project management plan, including a well-defined milestone chart, schedule, financial plan, and plan for communications among the investigators and subcontractors, if any, is:

   The proposed financial outline appears appropriate for the proposed work, but the application was lacking a well-defined timeline/milestone chart.
   - Reviewer: G-55-01A
   - Rating: 2

   There are no milestones identified. I would suggest the team work with the NDIC technical representative to determine appropriate milestones including the go/no go decision point noted above.
   - Reviewer: G-55-01B
   - Rating: 3

   Did not see a milestone chart, Gantt chart or full schedule. There is a plan for communication back to the OGRC and defined measure of success.
   - Reviewer: G-55-01C
   - Rating: 3

   A more detailed timeline has been created and will be shared with the Oil and Gas Research Council at the final presentation. - TDV
   - Applicant

7. The proposed purchase of equipment and the facilities available is:

   The budget expenditures related to hardware fabrication, testing, and installation appeared to be justified and did not raise any concerns.
   - Reviewer: G-55-01A
   - Rating: 3

   No equipment will be purchased. The prototype system will be constructed using 'off the shelf" materials.
   - Reviewer: G-55-01B
   - Rating: 5

Prototype sensor development has been completed. Sensors are existing, low cost, mass produced methane sensors. Equipment costs are less than 8 percent of the total cost of the pilot project. Software development adds another nearly 8 percent cost. The majority of the cost is personnel, labor costs incurred traveling to install and visit the sites as well as engineering, design, fabrication and testing of equipment. All understandable costs.
- Reviewer: G-55-01C
- Rating: 4

No additional comments. - TDV
- Applicant

8. The proposed budget “value”1 relative to the outlined work and the commitment from other sources is of:

The “value” appears to be fair and adequate for the goals and objectives outlined in the application. The costs associated with the outlined work seem reasonable in the current marketplace.
- Reviewer: G-55-01A
- Rating: 3

The requested funds amounts to approximately 46% of the funding for the proposed activity. Cost share includes funding from the developers as well as potential users of the technology and is less than the 50% that can be requested.
- Reviewer: G-55-01B
- Rating: 4

Applicant's share of the costs is >54% of the total costs. The plan is simple, based upon already existing, low cost methane sensors to be installed within the thief hatch on tanks. This is a major source of leaks on well site and this constant monitoring technique will eliminate need for personnel to inspect the wellsite, it will reduce leak volumes (due to faster maintenance response time).
- Reviewer: G-55-01C
- Rating: 4

No additional comments. - TDV
- Applicant

9. The “financial commitment”2 from other sources in terms of “match funding” have been identified:

The applicant’s overall financial commitment is just above the minimum 50% (54.3% contribution with a 45.7% match from OGRP). The inclusion of Continental Resources does provide additional value to the overall project, but their direct financial contribution is quite low at ~3.0% of the overall application budget.
- Reviewer: G-55-01A
- Rating: 2

The cost share proposed for this activity is over 54% of the cost of this activity and have been identified.
- Reviewer: G-55-01B
- Rating: 4

It was not specifically stated who was providing the match funding, however I am confident it is Continental Resources (CLR). CLR has much to gain from this pilot program in developing a much faster detection system for wellsite leaks, with a subsequent faster response from maintenance. It is costly to send personnel out to inspect well sites to verify that all is normally functioning. These detector system can automate the fugitive emissions detection

piece. Matching Funds are >54%.
- Reviewer: G-55-01C
- Rating: 3

CLR is providing a small portion of the matching funds in the form of labor to help with the pilot project installation and monitoring. Vareberg Engineering has already invested nearly $100,000 in research and development to this point, and currently has the resources (money and personnel) earmarked to meet the needs of this project. - TDV
- Applicant

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. A commitment of support from industry partners equates to a higher value.

2 “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; industry partnerships equates to increased favorability.

General Comments

As proposed, funding considerations should be cautiously considered for following reasons. I do like the mission of the application because thief hatch emissions are very real challenge for the industry. With that said, very significant reductions can be achieved by replacing, repairing, or retrofitting existing thief hatches with modern designs and the installation of existing thief hatch closure sensors. A complete thief hatch replacement/retrofit, and the benefits that would bring, would likely occur with the installation of the proposed sensors. The current design appears to share the void space in which overpressure tank gas would release to atmosphere. A design concern is that windy conditions could make reliable emission monitoring challenging and quantitative measuring attempts near impossible. With the reliability concerns noted above, numerous other potential emission locations on site, and regulatory pressure for accurate measurements, I suspect many operators will still continue to deploy camera systems for location wide monitoring. One potential option that may better warrant funding consideration is to scale down the overall scope with less sensors for the initial field testing and reporting.
- Reviewer: G-55-01A

The proposed activity addresses a critical issue facing the oil and gas industry in ND. With success the green house gas footprint of oil and gas production could be significantly reduced both for existing and future oil and gas production in ND. This would be of significant value to ND and the oil and gas industry. With the addition of a go/no go decision point noted earlier I would strongly suggest funding for this activity.
- Reviewer: G-55-01B

More detail could have been provided in terms of milestones, Gantt charts etc. However, the equipment, installation and pilot project are simple. The timeline might be lengthened by issues with final design, or communications to the proper EHS personnel. However, the project has a high likelihood of success and for its cost, a significant impact on fugitive emissions at well sites. Reduction of fugitive emissions through faster detection, and faster response, is an area OGRC should engage as EPA and other federal agencies are very concerned and plan to implement new rules on methane in the near future.
- Reviewer: G-55-01C