

Technical Reviewers' Rating Summary

Proposal Number **G-027-09** Application Title **Distributed Ammonia Proc** Submitted By
N-Flex Request For **\$1,100,000.00** Total Project Costs
\$4,000,000.00

Section A. Scoring

Statement	Weighting Factor	G-027-t2	G-027-09-t4	G-027-09-t1	Average Weighted Score
1. Objectives	9	3	4	3	27
2. Achievability	7	2	4	3	21
3. Methodology	8	3	4	3	24
4. Contribution	8	3	3	3	24
5. Awareness / Background	5	3	2	3	10
6. Project Management	3	3	4	4	9
7. Equipment / Facilities	2	2	3	3	4
8. Value / Industry - Budget	4	3	4	4	12
9. Financial Match - Budget	4	4	5	4	16
Average Weighted Score		145	184	161	163

Total: 50

250 possible points

OVERALL RECOMMENDATION

FUND

X

FUNDING TO BE
CONSIDERED

X

X

DO NOT FUND

Section B. Ratings and Comments

- 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 project would develop fertilizer from flared gas. This supports the OGRC goal of encouraging new or re-applied technologies.

- Reviewer: G-027-t2

- Rating: 3

The goals of reducing the wasting of natural gas while producing desired fertilizers and other fuels will certainly provide additional revenue to ND, mineral owners and producers and add job opportunities. These goals are clearly consistent with the NDIC and OGRC goals.

- Reviewer: G-027-09-t4

- Rating: 4

No comment

- Reviewer: G-027-09-t1

- Rating: 3

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

the timetable presented states 2011. but earlier talks about 8 months to construct unit to begin.. seems too aggressive and little confusing .. also talks about a phase 2 in 2013 with 20 more units, looks like that would start without completion of first unit.

- Reviewer: G-027-t2

- Rating: 2

Since this type of equipment is not exotic in terms of materials and size and is common in the industry, obtaining and constructing the equipment for the project should be quite achievable. The periods of time needed to reach agreements with providers of the natural gas and acquire the necessary permits is more difficult to predict.

- Reviewer: G-027-09-t4

- Rating: 4

No comment

- Reviewer: G-027-09-t1

- Rating: 3

Timeline: N-Flex endeavored to clarify this process with a visual Gantt chart. When our application was filed we had already made a lot of progress having already finalized engineering and with contingent interest from necessary partners including an investor, several oil companies and an ammonia off-taker. It was hoped that this project would have been reviewed earlier in 2012 to initiate production earlier. The unit will actually take 12 months from financial closure to operation. We are confident that a grant commitment will enable us to finalize our financial closure as well as gain a firm commitment from at least one of several interested appropriate oil and gas producers. Plant permitting: N-Flex is working with the ND Ag Commission already made progress on permitting and will be engaging the North Dakota firm of Kadrmas, Lee and Jackson to expedite the permitting process through the appropriate ND agencies.

- Applicant

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

methodology looks straight forward, try established technologies but smaller scale.

- Reviewer: G-027-t2

- Rating: 3

I have rated it above average because the methodology is straight forward. They will construct, start-up and operate a skid mounted system. Then measure the performance, efficiency and economics of the project. Perhaps the greatest knowledge to be gained is to determine and correct operational issues that will adversely affect the safety and economics of the project.

- Reviewer: G-027-09-t4

- Rating: 4

The project description provides a schematic, but does not address expected air emissions. It notes emissions reductions due to reduced flaring, however no comparison is made regarding any emissions generated by the project. Will the project require any water resource allocations? Will there be waste water issues that need to be addressed. Permits pertaining to air and water quality will need to be secured.

- Reviewer: G-027-09-t1

- Rating: 3

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:

any technology that can reduce flared gas and produce positive economics, is useful research project. the concern is "produced" gas is not conditioned so will the process work in that environment.

- Reviewer: G-027-t2

- Rating: 3

The science and technology to be used are indeed well known. Unless unique methodologies are developed in dealing with operational issues, science and technology will not likely be greatly advanced. It is the application of the combined capture of gas, production of ammonia and sale of products into one project that yields the greatest interest.

- Reviewer: G-027-09-t4

- Rating: 3

No comment

- Reviewer: G-027-09-t1

- Rating: 3

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 key hinges on the Haber Bosch process in a "mini scale".

- Reviewer: G-027-t2

- Rating: 3

There is little in the way of the principal investigator's background or reference to research material in the proposal. However, since the technology is well understood, little literature research is needed. This is an economic demonstration.

- Reviewer: G-027-09-t4
- Rating: 2

No comment

- Reviewer: G-027-09-t1
- Rating: 3

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:

like the fact updates (workshops) will occur 3 times in 18 months.

- Reviewer: G-027-t2
- Rating: 3

Again, the methodology, equipment to be used, and the process are straight forward. The stated schedule, financial sources and plans for sharing information gained appear to be quite acceptable.

- Reviewer: G-027-09-t4
- Rating: 4

No comment

- Reviewer: G-027-09-t1
- Rating: 4

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

not a lot of detail given so difficult to determine. I do think the actual footprint for all the equipment will be larger than mentioned , just due to safety considerations.

- Reviewer: G-027-t2
- Rating: 2

Without detailed listings of equipment and its cost and the man-hours assigned to construction, maintenance and operation, it is difficult to say how justified the costs are. I feel \$4 million should certainly suffice. I am surprised that they are proposing to have the first skid (and probably more) built in and shipped from Europe. I have difficulty in seeing that as cost effective.

- Reviewer: G-027-09-t4
- Rating: 3

Will compression for the project be electric or gas. If gas the emissions generated will need to be addressed before securing permits.

- Reviewer: G-027-09-t1
- Rating: 3

Footprint: N-Flex and Proton engineers are confident that we can shrink the total footprint needed for ammonia production by deploying the component containers in a tighter formation than in the sketch. In addition, when necessary, we can stack equipment for sites

that will be producing for over 6 months. While ammonia production may have a reduced footprint, in some situations we will need additional space for an NGL recovery skid and tank. Safety: In addition to electronic surveillance and remote monitoring, the N-Flex units are alarmed with multiple sensors that will trigger an automatic shut-off. We also have budgeted for attendants to be on each site at least once a day -- and have the ability to beef up security including fencing and more frequent attendant visits should that be warranted. Electric vs. Gas compressors: The N-Flex units will be outfitted with power generation units that will run off of the flare gas to provide energy for the electric compressors needed for ammonia production. The main emission will be CO₂ at a ratio of 2 tons per ton of ammonia with minor NO_x and SO₂ emissions addressed in an addendum sent to the the OGRP. US based vs. foreign build: The goal is to bring affordable production of N-Flex units to the US. We partnered with the best possible ammonia technology companies and unfortunately they are located in Switzerland and The Netherlands. Our intent is to manufacture these in the Midwest of the US in the near future but these initial pilot units will need to be assembled in Europe at Proton and Casale's facilities to gain their process guarantee. Its important to note that while this initial unit will be assembled in Europe, several of the key components will be manufactured by US companies including the critical Steam Methane Reformer will be manufactured by Air Products of New Jersey. Emissions: The main emission is CO₂ from the methane steam reforming in the amount of about 2 tons of CO₂ for each ton of ammonia produced (2,200 tons of CO₂ per annum). Small quantities of NO_x, SO₂ and VOCs are also detailed in the addendum.

- Applicant

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

No comment

- Reviewer: G-027-t2

- Rating: 3

Again, the overall cost may be high, but with a 3:1 cost input, ND should still be sell served. The potential value that may be realized should this project be successful is huge. So, the cost to potential value ratio is very favorable.

- Reviewer: G-027-09-t4

- Rating: 4

No comment

- Reviewer: G-027-09-t1

- Rating: 4

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

No comment

- Reviewer: G-027-t2

- Rating: 4

As given in #7, the sources of funding are clear and even if the project costs are high, the NDIC commitment will be well under 50% in real terms. I appreciate the Proposer stating

that they do not expect any money from the NDIC until they have met the stated conditions. I expect the NDIC will hold them to their statement.

- Reviewer: G-027-09-t4

- Rating: 5

No comment

- Reviewer: G-027-09-t1

- Rating: 4

We firmly believe that having the NDIC Grant available will help us finalize all of the milestones needed and assure a successful pilot.

- 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

funding to be considered. the time table seems aggressive.

- Reviewer: G-027-t2

I believe this project has excellent goals and is highly merited. The personnel named to their team is experienced and is well balanced. Some concerns I have are as follows: 1) While I likely have a good idea of what they will measure, the proposal would be stronger if some specific parameters to be measured and target values were stated; 2) Very little is stated about safety. Nothing is mentioned about precautions to be employed dealing with compressed natural gas, H₂S and ammonia. I think they have too much faith in remote communications (until well tested and proven); 3. Nothing is stated about site security - some persons try to steal ammonia; and 4) I would suggest they look at procuring equipment and assembling the skids in the USA. That is one way to create more US jobs. Perhaps they could provide more information about Items 2 and 3 and give some consideration to Item 4.

- Reviewer: G-027-09-t4

Searching for ways to minimize the amount of gas that is being flared in North Dakota while simultaneously capturing the gas to produce a product that is used in the area is a project that is worth considering. The project description does not address water allocations that may be needed for the project. The description further does not address in any detail expected emissions from the project. such details will be necessary in order for the project to secure any necessary environmental permits.

- Reviewer: G-027-09-t1