INDUSTRIAL COMMISSION OF NORTH DAKOTA

OIL AND GAS RESEARCH COUNCIL

Brent Brannan, Director
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Governor
Doug Burgum
Attorney General
Drew Wrigley
Agriculture Commissioner
Doug Goehring

Oil and Gas Research Council
July 22, 2024 – 10am --1:00pm CT
Department of Mineral Resources West Conference Room
1000 East Calgary, Bismarck, ND
or
Microsoft Teams
Join the meeting now
+1 701-328-0950,,265367309#

I. Call to Order –

II. **Approval of December 15th, 2023 Meeting Minutes**

III. Presentation Pipeline Authority – *Justin Kringstad*

IV. Presentation of Oil and Gas Research Program Project Management and Financial Report– *Reice Haase*

V. Final Report: Well Site Thief Hatch Methane Detectors: *Troy Vareberg, Vareberg Engineering, Ltd., Blue Rock Solutions, LLC*

VI. **Consideration of Grant Round 60 Research Applications**:

A. G-060-A: **Well Site Thief Hatch Methane Detectors** – Phase II, Blue Rock Solutions LLC; Principal Investigator: Troy D. Vareberg, PE ; Project Duration: 18 months; Total Project Cost $450,000; Request for: $900,000

VII. Final Report: Unitized Legacy Oil Fields: Prototypes for Revitalizing Conventional Oil Fields in North Dakota: *James Sorenson, Energy & Environment Research Center (EERC)*

VIII. Final Report: Creedence Energy Services Estimated Ultimate Recovery (EUR) Biosurfactant Applications: *Eric Nelson, Creedence Energy Services*

IX. Final Report: Weather Information System to Effectively Reduce Oilfield Delays and Disruption (Wise Roads) – Supplement to Secure Meteorological Services – *Geoff Simon and Jonathan Rosencrans, Western Dakota Energy Association*

X. Administration –
A. Next OGRC Grant Deadline: November 1, 2024
B. NDIC Meeting – July 30, 2024

XI. Adjournment

Minutes of a Meeting of the Oil and Gas Research Council

Held on December 15, 2023 beginning at 12:00 p.m.

Department of Mineral Resources West Conference Room

Present: Ron Ness
Lynn Helms
Preston Page
Steve Holen
Zac Weis
Daryl Dukart
Ed Murphy
Justin Kringstad
Reice Haase
Brenna Jessen
Erin Stieg

Others Present: This meeting was open on Microsoft Teams so all other attendees are unknown.

Zac Weis called the meeting of the Oil and Gas Research Council to order at approximately 12:08 p.m.

Mr. Justin Kringstad gave a presentation from the North Dakota Pipeline Authority. He gave an update on rig counts and the relationship between those rigs and the price of oil. Production models show 2-mile laterals, while many new rigs are 3-mile laterals. 80 well completions per month is where we need to stay in the near-term. He spoke about base decline rate and how in the long term we need to be thinking about additional technologies to keep oil production where it needs to be. There has been severe downward pressure on oil prices from the tax dept. discount to WTI. Trans Mountain Pipeline has had an impact on pricing, but prices are showing to be back at a premium by April of next year.

Mr. Kringstad mentioned that the comment period on the Energy Transfer project with Dakota Access and ETCOP is now closed. FERC filings show more than half the production that moves down comes off at Patoka, IL instead of showing a strong demand for light sweet crude further south.

Switching gears to natural gas, Northern Boarder Pipeline Grasslands project is online. Williston Basin has majority market share, and BTU is marching up. Northern Border Pipeline interconnects with known BTU limits.

There was some discussion regarding DUC (drilled but uncompleted) wells. About a hundred wells had been completed over the summer, and there about 50 uncompleted wells currently. Lynn Helms clarified that anything over ninety days is considered a DUC well. He said that we really don't have a DUC inventory anymore compared to what we used to have.

Mr. Reice Haase gave a presentation of the Oil and Gas Research Program Financial and Project Management Report. The cash balance as of November 30, 2023 was $21,991,407.65, and the non-committed cash funding is $1,619,362.17. There are currently 25 active projects, and $90 million has been awarded. There is currently $19,122,304.88 outstanding committed. The application presented

today, however will not come out of the Oil & Gas funds because it is part of a legislative-directed study, with a direct appropriation from the SIIF fund of $3 million dollars.

Mr. Haase also proposed an update to the policy for the Clean Natural Gas Capture and Emissions Reduction Program, converting the program from a tax incentive to an incentive payment (grant payment) from the Oil & Gas Research Council. There was some discussion on the changes to Senate Bill 2089, including adopting the criteria for the incentive program and doing away with paper applications. It was suggested to develop a guidance document along with a scoring methodology to give priority to proposals with a focus on emissions reduction versus more new technologies.

A motion was made by Ron Ness and seconded by Preston Page to adopt the policy presented and provide discretionary documents to target reducing emissions, prioritizing the applications that meet those guidelines.

It was agreed that a working group be formed to provide those documents.

On a roll call vote Ron Ness, Steve Holen, Zac Weis, Preston Page, Daryl Dukart, and Vicki Sund voted aye. Motion carried unanimously.

The consideration of the Grant Round 59 Application was presented.

A. **G-059-01 "IPIPE 3.0"** – Energy and Environmental Research Center; Principal Investigator: Darren Schmidt, PE; Project Duration: 2 years; Total Project Cost: $6,000,000. Request for: $3,000,000.

The purpose of the Intelligent Pipeline Integrity Program is Leak Detection Innovation. Mr. Darren Schmidt briefly discussed the history of the iPipe project over the years and what activities the investments have gone toward.

The project has several key areas of interest, including:

1. In-line inspection "small Diameter"
2. Intelligent sensors for early detection anywhere
3. Artificial intelligence monitoring
4. Advanced acoustics
5. Advanced aerial sensor technology
6. Subsurface polymer absorption monitoring
7. New generation monitoring from space

Six members from industry have provided letters of commitment for the 3.0 version of the project, including Chevron/Hess, MPLX, Energy Transfer, Enbridge, TC Energy, and OneOK.

Troy Vareberg, of Blue Rock Solutions, presented for consideration of approval an amendment to Contract G-055-110.

A. **G-055-110 "Well Site Thief Hatch Methane Detectors"** – Blue Rock Solutions; Principal Investigator: Troy Vareberg; Approved June 1st, 2022; Project Cost: $582,000; OGRP Share: $266,000
    1. Request to extend project duration by 6 months to July 1st, 2024
    2. Request for additional funding of $170,000 (from $266,000 to $436,000)

Contract G-055-110: "Well Site Thief Hatch Methane Detectors" was approved by the Commission in June 2022 with a 50% industry cost share. Approximately $137,834 of the NDIC project share has been paid to date. Blue Rock Solutions has indicated they are able to complete all project deliverables with a six-month extension to July 1st, 2024. However, they are needing additional funding to add the "HART" option as a method of communication for their methane sensor, which they are testing at the METEC (Methane Equipment Testing & Evaluation Center) facility in Colorado currently. They've also requested additional funding to incorporate a web portal (dashboard) and additional engineering design and software development.

Vicky Sund asked about the interface development, if it would be ready to go at the end of the testing, if the intent is to expand it to quantification rather than simply presence testing, and if this technology could be used to detect other gasses besides methane.

Mr. Vareberg responded that yes, the product would be ready and eventually the intent is to test quantification, although for now it's just presence. The sensors are just for methane detection now, but they could be changed for other gasses. He also confirmed that Continental is a committed partner for the field testing.

A motion was made by Ron Ness to amend contract G-055-110 to add an additional $170,000 to the original contract. The motion was seconded by Daryl Dukart.

On a roll call vote Daryl Dukart, Ron Ness, Steve Holen, Vicki Sund, Zac Weis, and Preston Page voted aye. Motion carried unanimously.

Mr. Jesse Beckers of the North Dakota Natural Resources Trust and Dr. Rebecca Phillips of Ecological Insights gave a project update on the Agricultural Carbon Capture in North Dakota Rangelands. They showed a video of the news coverage of the field tour held last August. Landowner Lewis Heaton explained in the video how natural Carbon Dioxide uptake can increase the value of rangelands. Dr. Phillips went on to explain the testing patterns on the grazing paddocks and how they will be different from 2023 to 2024 to increase diversity and give better results. State-of-the-art technology provided by the Oil & Gas Research Program funding is being used to continuously measure the concentration of CO_2 in eddies of air in these pastures. Preliminary data is showing an increase in the CO_2 uptake in the grazed field compared to the control field that was ungrazed, which shows promising results.

Mr. Reice Haase provided an update on the Carbon Capture and Utilization Education and Marketing Special Grant Round. Section 10 of House Bill 1014 appropriated $300,000 "to contract for carbon capture and utilization education and marketing", with $100,000 each coming from the Lignite Research Fund, the Oil & Gas Research Fund, and the Renewable Energy Development Fund. A special grant round with all three councils will be scheduled for early 2024 to hear proposals for this funding. Solicitation for proposals will be initiated later this afternoon.

The Ballots were handed out at this time to the voting members.

With a unanimous vote, the Oil and Gas Research Council voted to recommend funding the Energy and Environmental Research Center's grant application G-059-01 "IPIPE 3.0" for $3,000,000. A motion was made by Preston Page to pass this recommendation to the Industrial Commission at the December 18th, 2023 meeting. Daryl Dukart seconded the motion. Motion carried unanimously.

The next Oil and Gas Research Council's grant deadline is tentatively set for June 1, 2024.

The next North Dakota Industrial Commission meeting is scheduled for December 18, 2023.

With no other business, Chairman Weis adjourned the meeting.

The meeting adjourned at 2:29 p.m.

OIL AND GAS RESEARCH PROGRAM PROJECT MANAGEMENT REPORT

Reice Haase, Deputy Executive Director, NDIC

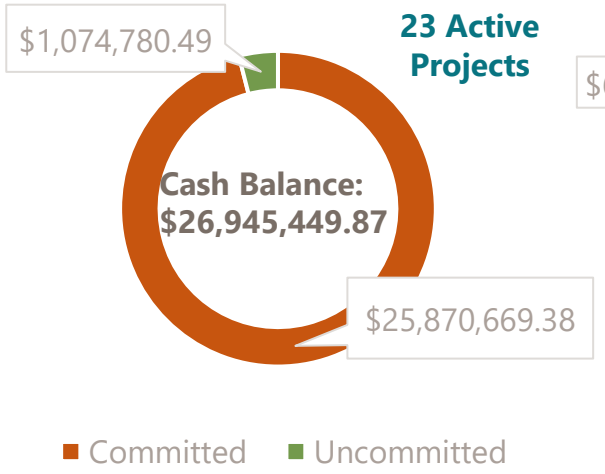
July 22, 2024

NORTH Dakota

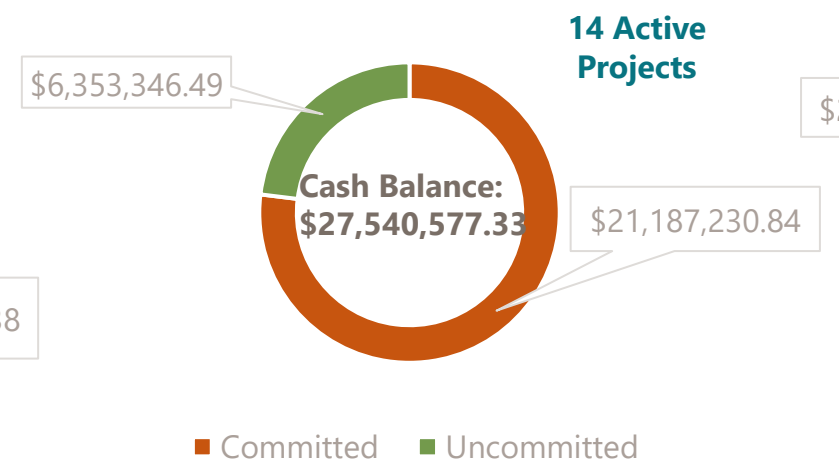
Be Legendary.™

INDUSTRIAL COMMISSION-MANAGED FUNDS

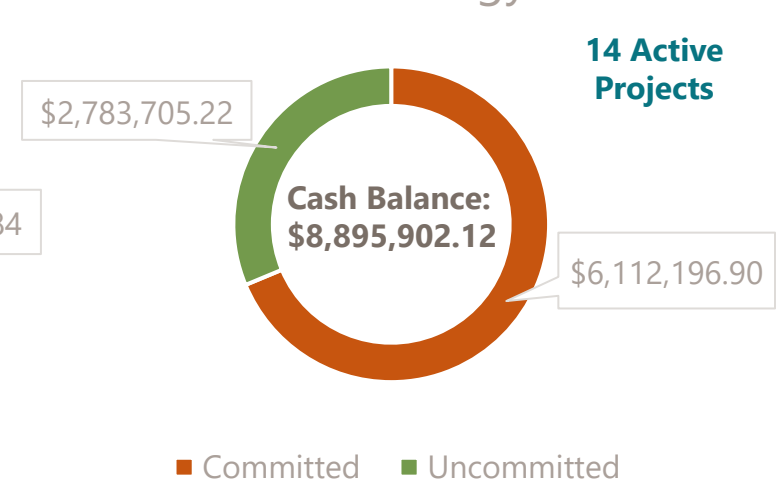
Lignite Research Fund



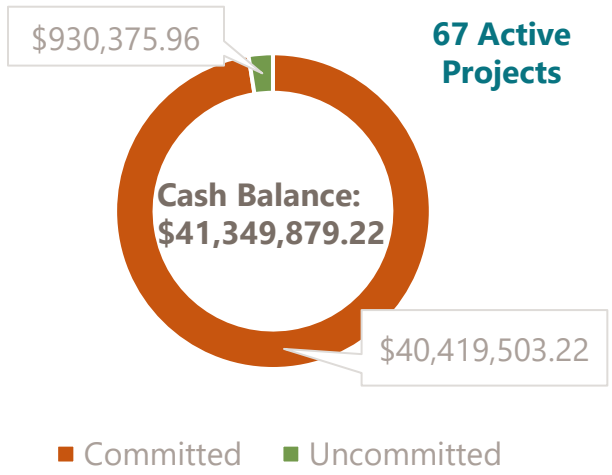
Oil and Gas Research Fund



Renewable Energy Fund

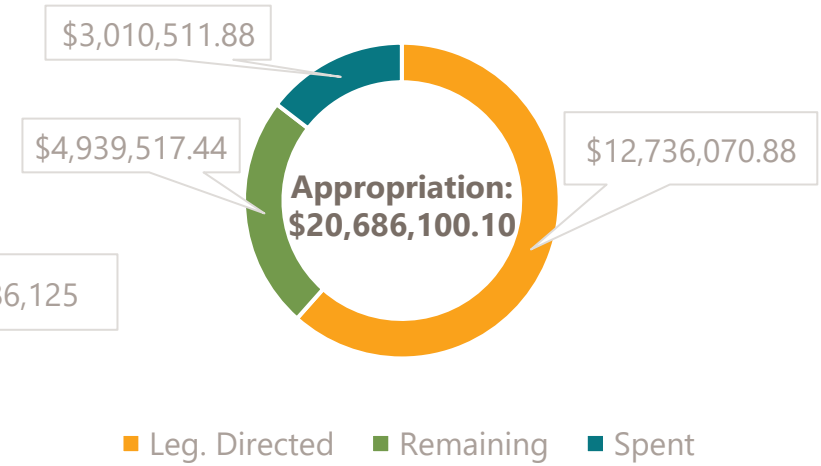


Outdoor Heritage Fund

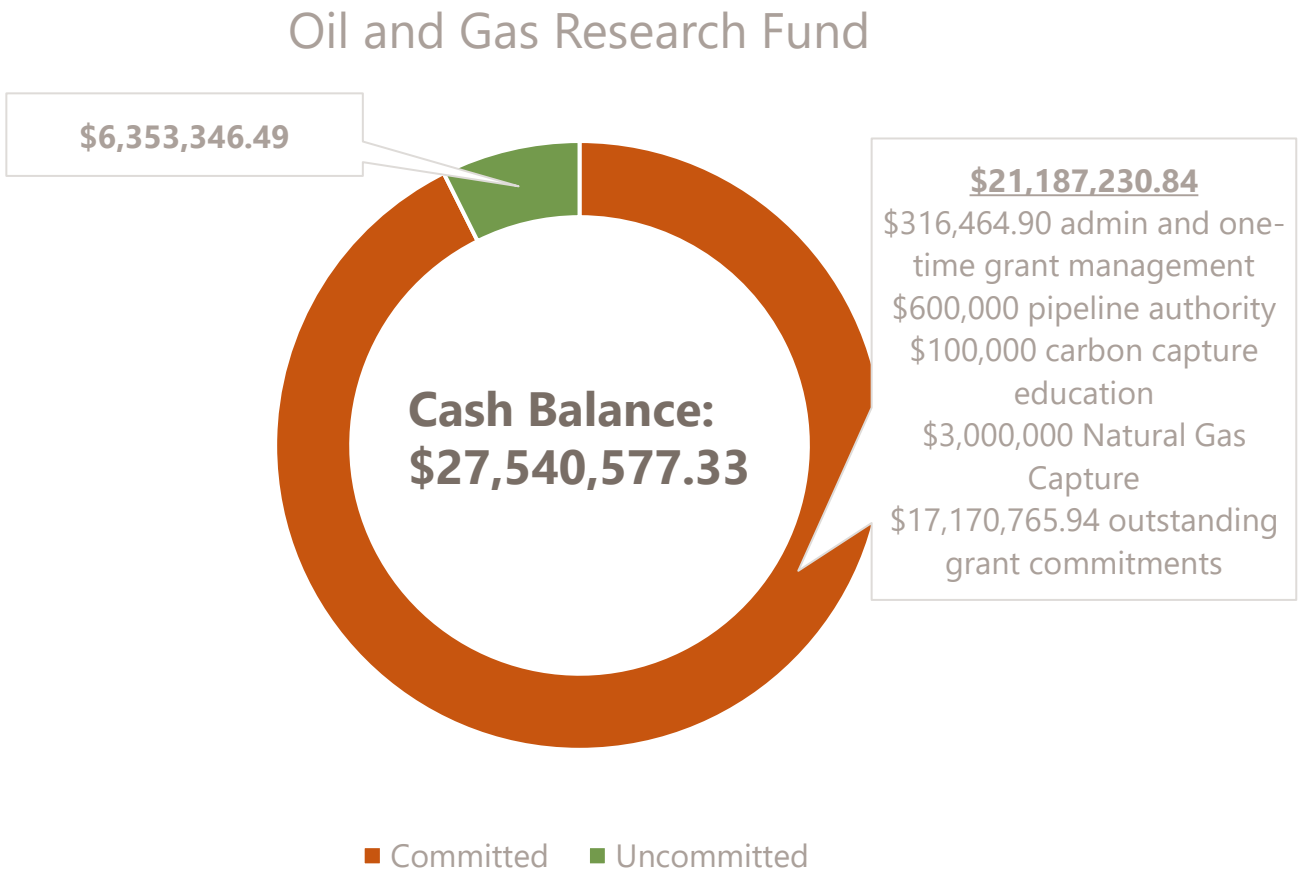


CSEA Fund*

SERC Fund



OIL AND GAS RESEARCH FUND BALANCE JUNE 24, 2024



Funding Source:
- **$17.5 million oil production and extraction tax**
- **$3 million SIIF for iPipe**

116 Cumulative Projects

14 Active Projects

Cumulative Value:
- **$93.2 million granted**
- **$530.5 million project value**

Project	Deliverable	Manager	Due Date	Budget	Paid Out	Notes
G-045-086(UnitizedOilFields	Status Report 1	EERC	1/31/2022	$ 3,000,000.00	$ 203,772.82	
	Status Report 2		4/30/2022	$ 2,796,227.18	$ -	
	Status Report 3		7/31/2022	$ 2,796,227.18	$ -	
	Status Report 4		10/31/2022	$ 2,796,227.18	$ -	
	Status Report 5		1/31/2023	$ 2,796,227.18	$ -	
	Status Report 6		4/30/2023	$ 2,796,227.18	$ -	
	Status Report 7		7/31/2023	$ 2,796,227.18	$ 1,325,039.84	
	Status Report 8		10/31/2023	$ 1,471,187.34	$ 332,347.65	
	Status Report 9		1/31/2024	$ 1,138,839.69	$ 269,138.32	
	Status Report 10		4/30/2024	$ 869,701.37	$ 389,247.84	
	Final Report		6/30/2024	$ 480,453.53		Final report under review
G-046-088(iPipe)	Status Report 1	EERC	7/31/2018	$ 2,600,000.00	$ 165,000.00	
	Status Report 2		10/31/2018	$ 2,435,000.00	$ 75,000.00	
	Status Report 3		1/31/2019	$ 2,360,000.00	$ 75,000.00	
	Status Report 4		4/30/2019	$ 2,285,000.00	$ 75,000.00	
	Status Report 5		7/31/2019	$ 2,210,000.00	$ 75,000.00	
	Status Report 6		10/31/2019	$ 2,135,000.00	$ 75,000.00	
	Status Report 7		1/31/2020	$ 2,060,000.00	$ 150,000.00	
	Status Report 8		4/30/2020	$ 1,910,000.00	$ 150,000.00	
	Status Report 9		7/31/2020	$ 1,760,000.00	$ 150,000.00	
	Status Report 10		10/31/2020	$ 1,610,000.00	$ -	
	Status Report 11		1/31/2021	$ 1,610,000.00	$ 300,000.00	
	Status Report 12		4/30/2021	$ 1,310,000.00	$ 150,000.00	
	Status Report 13		7/31/2021	$ 1,160,000.00	$ 150,000.00	
	Status Report 14		10/31/2021	$ 1,010,000.00	$ 150,000.00	
	Status Report 15		1/31/2022	$ 860,000.00	$ 150,000.00	
	Status Report 16		4/30/2022	$ 710,000.00	$ 150,000.00	
	Status Report 17		7/31/2022	$ 560,000.00	$ -	
	Status Report 18		10/31/2022	$ 560,000.00	$ 100,000.00	
	Status Report 19		1/31/2023	$ 460,000.00	$ -	
	Status Report 20		4/30/2023	$ 460,000.00	$ -	
	Status Report 21		7/31/2023	$ 460,000.00	$ 150,000.00	
	Status Report 22		10/31/2023	$ 310,000.00	$ 50,000.00	
	Status Report 23		1/31/2024	$ 260,000.00	$ -	
	Status Report 24		4/30/2024	$ 260,000.00	$ -	
	Status Report 25		7/31/2024	$ 260,000.00		
	Status Report 26		10/31/2024	$ 260,000.00		
	Final Report		12/31/2024	$ 260,000.00		
G-047-090(HistoryNDOil)	Status Report 1	NDPF	11/1/2019	$ 295,500.00	$ 54,000.00	
	Status Report 2		11/1/2020	$ 241,500.00	$ -	
	Status Report 3		11/1/2021	$ 241,500.00		
	Status Report 4		11/1/2022	$ 241,500.00		Extension Granted
	Status Report 5		11/1/2023	$ 241,500.00		
	Final Report		12/31/2024	$ 241,500.00		
G-049-094(WiseRoads)	Status Report 1	WDEA	11/1/2019	$ 310,000.00	$ -	
	Status Report 2		5/1/2020	$ 310,000.00	$ 163,125.63	
	Status Report 3		11/1/2020	$ 146,874.37		
	Final Report		5/1/2021	$ 146,874.37	$ 130,031.09	
	Turnback			$ 16,843.28		Project Complete
G-050-096(PCOR)	Qtr Report 1	EERC	2/1/2020	$ 2,000,000.00	$ -	
	Qtr Report 2		5/1/2020	$ 2,000,000.00	$ -	
	Qtr Report 3		8/1/2020	$ 2,000,000.00	$ 33,617.07	
	Qtr/Annual Report		11/1/2020	$ 1,966,382.93	$ 50,810.21	
	Qtr Report 5		2/1/2021	$ 1,915,572.72	$ 9,511.81	
	Qtr Report 6		5/1/2021	$ 1,906,060.91	$ 29,057.48	
	Qtr Report 7		8/1/2021	$ 1,877,003.43	$ 29,057.48	
	Qtr/Annual Report		11/1/2021	$ 1,847,945.95	$ -	
	Qtr Report 9		2/2/2022	$ 1,847,945.95	$ 339,203.62	
	Qtr Report 10		5/1/2022	$ 1,508,742.33	$ 149,084.47	
	Qtr Report 11		8/1/2022	$ 1,359,657.86	$ -	
	Qtr/Annual Report 1		11/1/2022	$ 1,359,657.86	$ -	
	Qtr Report 13		2/1/2023	$ 1,359,657.86	$ -	
	Qtr Report 14		5/1/2023	$ 1,359,657.86	$ 746,206.11	
	Qtr Report 15		8/1/2023	$ 613,451.75		
	Qtr/Annual Report 1		11/1/2023	$ 613,451.75	$ 107,660.02	
	Qtr Report 17		2/2/2024	$ 505,791.73	$ 41,613.88	
	Qtr Report 18		5/1/2024	$ 464,177.85	$ 30,473.14	
	Qtr Report 19		8/1/2024	$ 433,704.71		
	Final Report		11/1/2024	$ 433,704.71		
G-050-097(EOR)	Qtr Report 1	EERC	5/1/2020	$ 500,000.00	$ 20,460.13	
	Qtr Report 2		8/1/2020	$ 479,539.87	$ 9,035.15	
	Qtr Report 3		11/1/2020	$ 470,504.72	$ 30,288.49	
	Qtr Report 4		2/1/2021	$ 440,216.23	$ 11,171.97	
	Qtr Report 5		5/1/2021	$ 429,044.26	$ 12,818.90	
	Qtr Report 6		8/1/2021	$ 416,225.36	$ 2,919.17	

	Qtr Report 7		11/1/2021	$ 413,306.19	$ 2,220.76	
	Qtr Report 8		2/2/2022	$ 411,085.43	$ 6,016.00	
	Qtr Report 9		5/1/2022	$ 405,069.43	$ -	
	Qtr Report 10		8/1/2022	$ 405,069.43	$ -	
	Qtr Report 11		9/30/2022	$ 405,069.43	$ -	
	Qtr Report 12		11/1/2022	$ 405,069.43		
	Qtr Report 13		2/1/2023	$ 405,069.43		
	Qtr Report 14		5/1/2023	$ 405,069.43		
	Qtr Report 15		8/1/2023	$ 405,069.43		
	D3 Business Cases for Commercial Deployme		10/1/2023	$ 405,069.43		Contract Extensior
	Qtr Report 16		11/1/2023	$ 405,069.43		
	Qtr Report 17		2/2/2024	$ 405,069.43		
	Qtr Report 18		5/1/2024	$ 405,069.43		
	Qtr Report 19		8/1/2024	$ 405,069.43		
	Final Report		9/30/2024	$ 405,069.43		
G-053-103(BiosurfactantEOR)	Status Report 1	Creedence	6/1/2021	$ 205,750.00	$ -	
	Status Report 2		9/1/2021	$ 205,750.00	$ -	
	Status Report 3		12/1/2021	$ 205,750.00		
	Status Report 4		3/1/2022	$ 205,750.00		
	Status Report 5		6/1/2022	$ 205,750.00		
	Final Report		7/31/2022	$ 205,750.00	$ 181,394.34	
	Turnback			$ 24,355.66		Project Complete
G-055-106(ScaleRemoval)	Status Report 1	UND	1/1/2023	$ 451,427.00	$ -	
	Status Report 2		7/1/2023	$ 451,427.00	$ 140,019.16	
	Status Report 3		1/1/2024	$ 311,407.84	$ 157,607.63	Contract Extensior
	Final Report		8/1/2024	$ 153,800.21		
G-055-107(PetEngineeringResearch)	Status Report 1	UND	9/1/2023	$ 2,980,000.00	$ -	
	Status Report 2		3/1/2024	$ 2,980,000.00	$ 1,262,328.00	
	Status Report 3		9/1/2024	$ 1,717,672.00		
	Final Report		3/1/2025	$ 1,717,672.00		
G-055-108(iPipe2.0)	Qtr Report 1	EERC	7/31/2022	$ 400,000.00	$ 70,663.93	
	Qtr Report 2		10/31/2022	$ 329,336.07		
	Qtr Report 3		1/31/2023	$ 329,336.07		
	Qtr Report 4		4/30/2023	$ 329,336.07	$ 153,013.10	
	Qtr Report 5		7/31/2023	$ 176,322.97	$ 54,651.67	
	Qtr Report 6		10/31/2023	$ 121,671.30	$ 23,415.33	
	Final Report		6/30/2024	$ 98,255.97		Under review
G-055-110 (Thief Hatches)	Status Report 1	Blue Rock Solution	10/1/2022	$ 436,000.00	$ 32,376.77	
	Status Report 2		12/1/2022	$ 403,623.23	$ 24,446.09	
	Status Report 3		3/1/2023	$ 379,177.14	$ 38,515.74	
	Status Report 4		7/1/2023	$ 340,661.40	$ 42,495.24	
	Status Report 5		10/1/2023	$ 298,166.16	$ -	
	Status Report 6		1/1/2024	$ 298,166.16	$ 149,381.63	
	Status Report 7		4/1/2024	$ 148,784.53	$ 68,892.28	
	Final Report		7/1/2024	$ 79,892.25	$ 79,892.25	Project Complete
G-056-111 (Ag Carbon Capture	Status Report 1	ND Natural Resources Trus	2/28/2023	$ 500,000.00	$ 150,621.97	
	Status Report 2		9/1/2023	$ 349,378.03	$ 124,426.81	
	Status Report 3		2/29/2024	$ 224,951.22		Under review
	Status Report 4		9/1/2024	$ 224,951.22		
	Final Report		2/28/2025	$ 224,951.22		
G-057-112 (Outreach 2.0)	Status Report 1	NDPF	8/1/2023	$ 982,125.00	$ -	
	Status Report 2		12/1/2023	$ 982,125.00	$ 308,760.61	
	Status Report 3		8/1/2024	$ 673,364.39		
	Final Report		12/31/2024	$ 673,364.39		
G-058-113 (Roughrider Hub	Status Report 1	OneOK	6/30/2024	$ 525,000.00		Under review
	Status Report 2		1/31/2025	$ 525,000.00		
	Final Report		6/30/2025	$ 525,000.00		
G-058-114 (Madison EOR	Status Report 1	Cobra Oil and Ga	12/31/2023	$ 2,000,000.00	$ 1,141.00	
	Status Report 2		6/30/2024	$ 1,998,859.00		
	Status Report 3		12/31/2024	$ 1,998,859.00		
	Status Report 4		5/31/2025	$ 1,998,859.00		
	Final Report		10/31/2025	$ 1,998,859.00		
G-058-115 (BPOP 4.0)	Status Report 1	EERC	12/31/2023	$ 4,000,000.00	$ 443,604.41	
	Status Report 2		6/30/2024	$ 3,556,395.59		Under review
	Status Report 3		12/31/2024	$ 3,556,395.59		
	Status Report 4		6/30/2025	$ 3,556,395.59		
	Final Report		10/31/2025	$ 3,556,395.59		
G-059-116 (iPipe 3.0)	Status Report 1		4/30/2024	$ 3,000,000.00	$ 22,485.96	
	Status Report 2		7/31/2024	$ 2,977,514.04		
	Status Report 3		10/31/2024	$ 2,977,514.04		
	Status Report 4		1/31/2025	$ 2,977,514.04		
	Status Report 5		4/30/2025	$ 2,977,514.04		
	Status Report 6		7/31/2025	$ 2,977,514.04		
	Status Report 7		10/31/2025	$ 2,977,514.04		
	Final Report		12/31/2025	$ 2,977,514.04		


BLUE COMPLY
CONFIDENTIAL

FINAL REPORT

WELL SITE THIEF HATCH METHANE DETECTORS

ND Oil & Gas Research Program

Contract # G-005-110-C

LEADERSHIP TEAM

Troy Vareberg, PE

- President
- Registered Electrical Engineer

Emmy Vareberg, PE

- Vice President
- Registered Industrial Engineer

VAREBERG
ENGINEERING

BLUE
COMPLY

THIEF HATCHES

- ➔ Left Open (Process or Human Error)
- ➔ Not Latched (Human Error)
- ➔ Over Pressurization Relief
- ➔ Damaged Seals
- ➔ Obstruction (Failure)

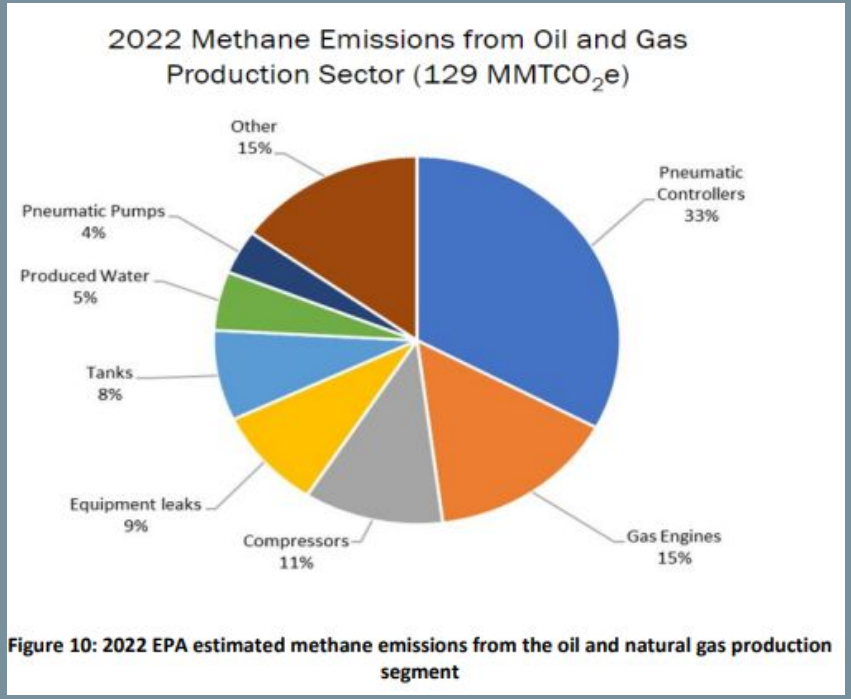
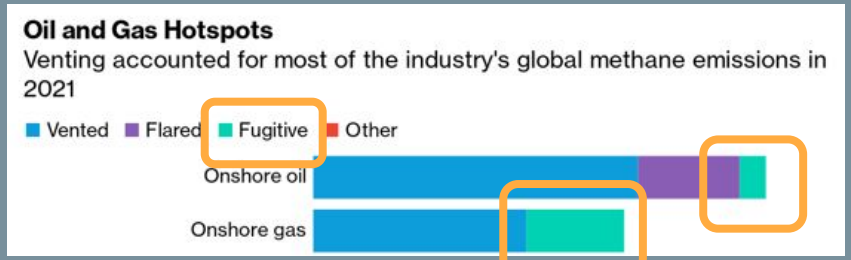


Figure 10: 2022 EPA estimated methane emissions from the oil and natural gas production segment



Source: Dept of Energy and EPA's FundOpp_0003256.

IMSA

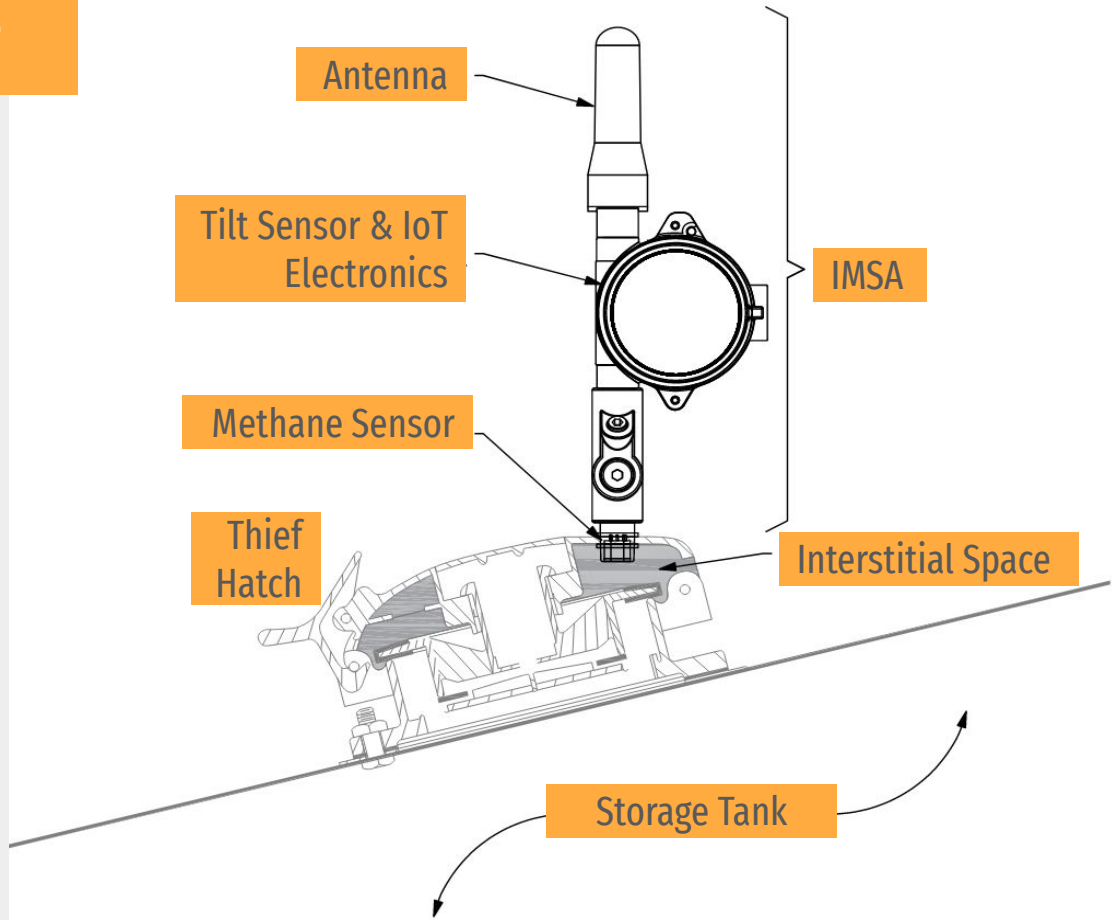
Internet-of-Things
Methane
Sensing
Apparatus

Deliverables: Device Design

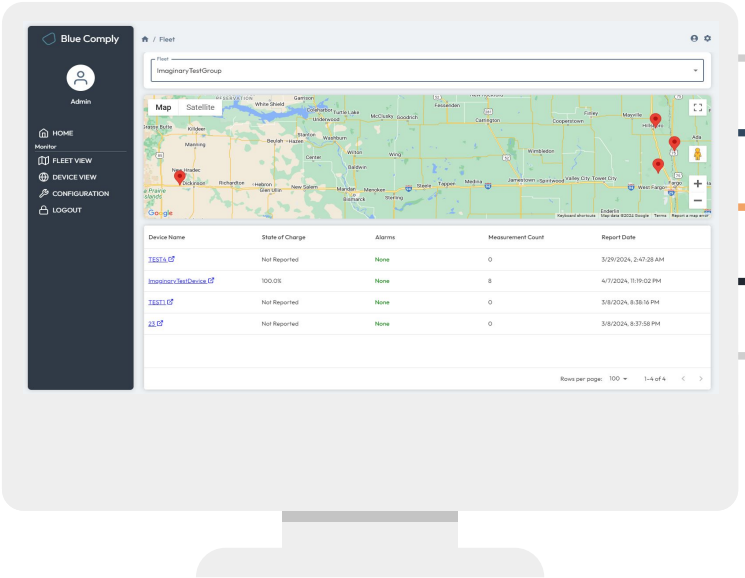
- **Device Design and Components**
  - Developed/Sourced explosion-proof and intrinsically safe components: IR gas sensor, component housing, lithium battery, electronics, and cellular antenna
- **Data Acquisition**
  - Communicates over cellular network to Blue Comply dashboard
- **Required Listings from NRTL**
  - Evaluation was performed by UL with action items for certification
- **Vendor Selection**
  - Established relationships with vendors for component selection and design

IMSA Features

- Cellular Communications
- Continuous Monitoring
- Explosion-proof
- Wireless
- Instantaneous Reporting
- Patented Design



IMSA DASHBOARD



- Web Application - Secured Cloud Processing
- Device View or Fleet View
- Notifications via Email & Text Messaging
- Downloadable Reports for Compliance
- User Roles & Permissions for 3rd Party Support

Blue Comply

Admin

HOME

Monitor

FLEET VIEW

DEVICE VIEW

CONFIGURATION

LOGOUT

/ DeviceView

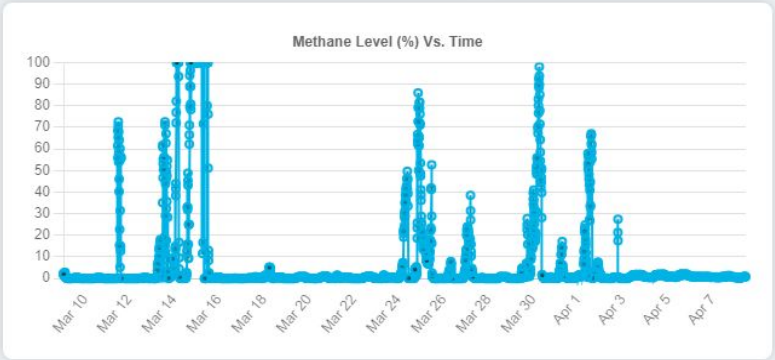
Fleet: Blue Comply

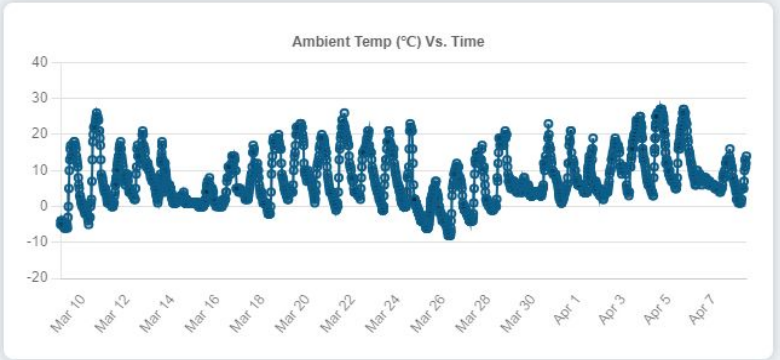
Device: 4.8.X2

Start Date: 03/09/2024

End Date: 04/08/2024

Device Name: 4.8.X2
State of Charge: 55.6%
Total Methane Reports: 7631
Total Methane Alarms: 692
Total Hatch Alarms: 0
Latest Methane Measurement: 0.7%
Latest Temperature Measurement: 14°C
FW Version: 1.2.2
Last Reported: 04/08/2024 15:52:11



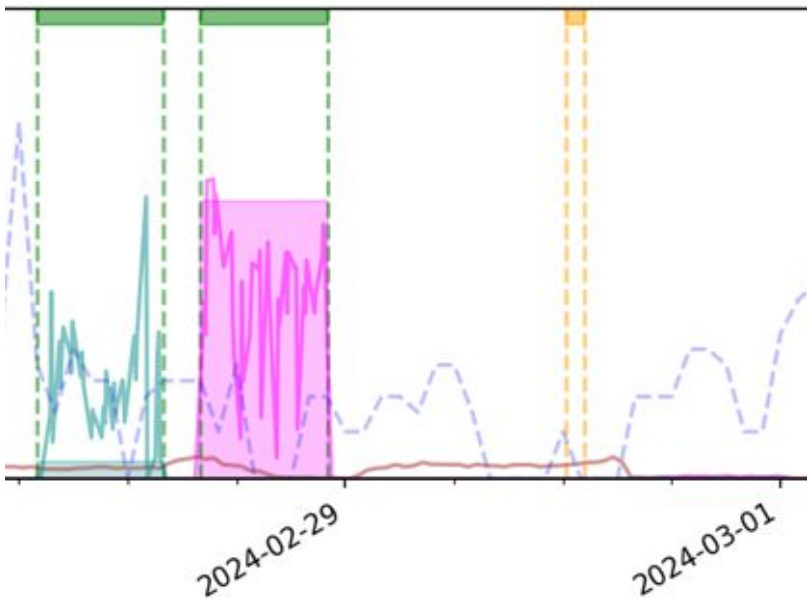


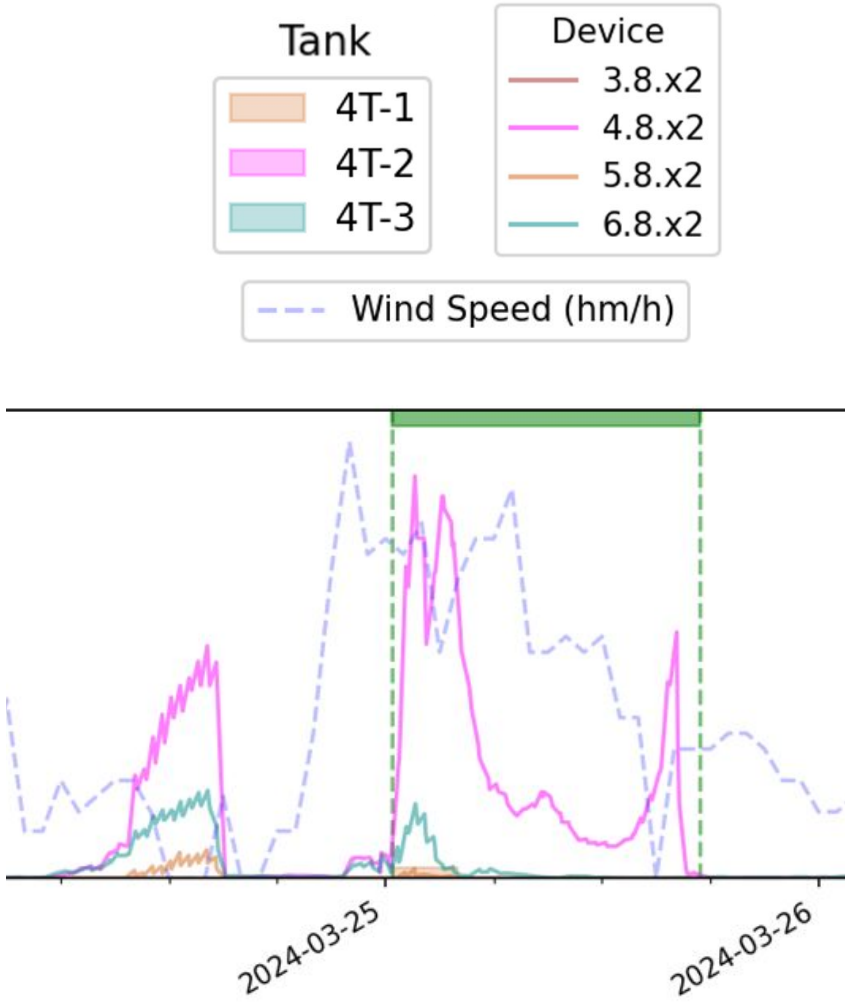
Deliverables: Device Testing

- **Fully-functional Prototypes**
  - Manufactured 25 devices for internal testing, field testing, and pilot projects
- **Pilot Program**
  - Completed METEC blind-test & collaborated with various oil/gas producers to develop pilot project plans
- **Rapid Detection of Leaks**
  - Adjustable detection polling periods

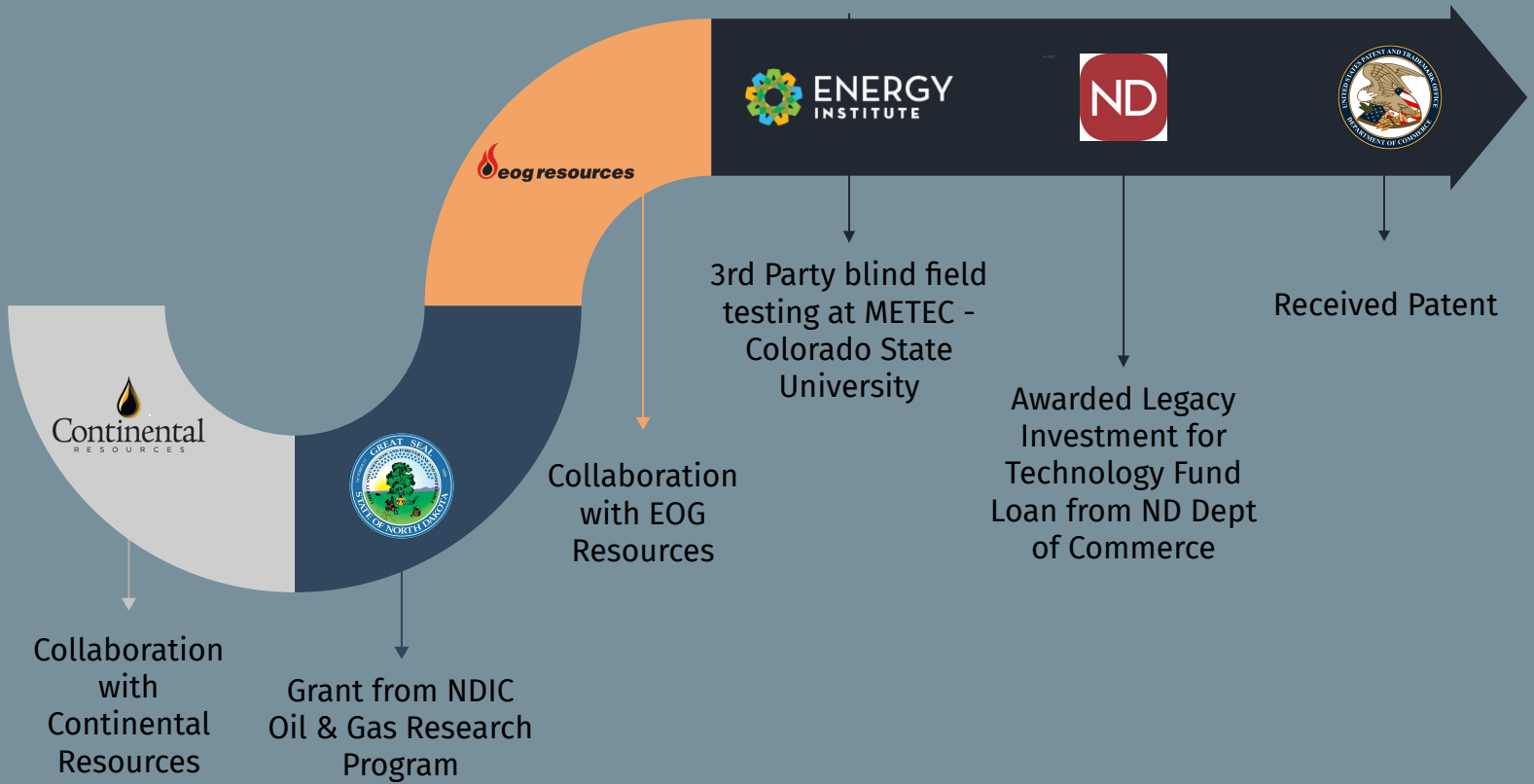
Third party blind testing at Methane Emission Testing Evaluation Center (METEC) at Colorado State University

METEC Sample Results





TRACTION


Continental RESOURCES
Collaboration with Continental Resources
Grant from NDIC Oil & Gas Research Program
Collaboration with EOG Resources
3rd Party blind field testing at METEC - Colorado State University
Awarded Legacy Investment for Technology Fund Loan from ND Dept of Commerce
Received Patent

THANK YOU!!

Phase II 


BLUE COMPLY
CONFIDENTIAL

Phase II Proposal

WELL SITE THIEF HATCH METHANE DETECTORS

ND Oil & Gas Research Program

CUSTOMER FEEDBACK

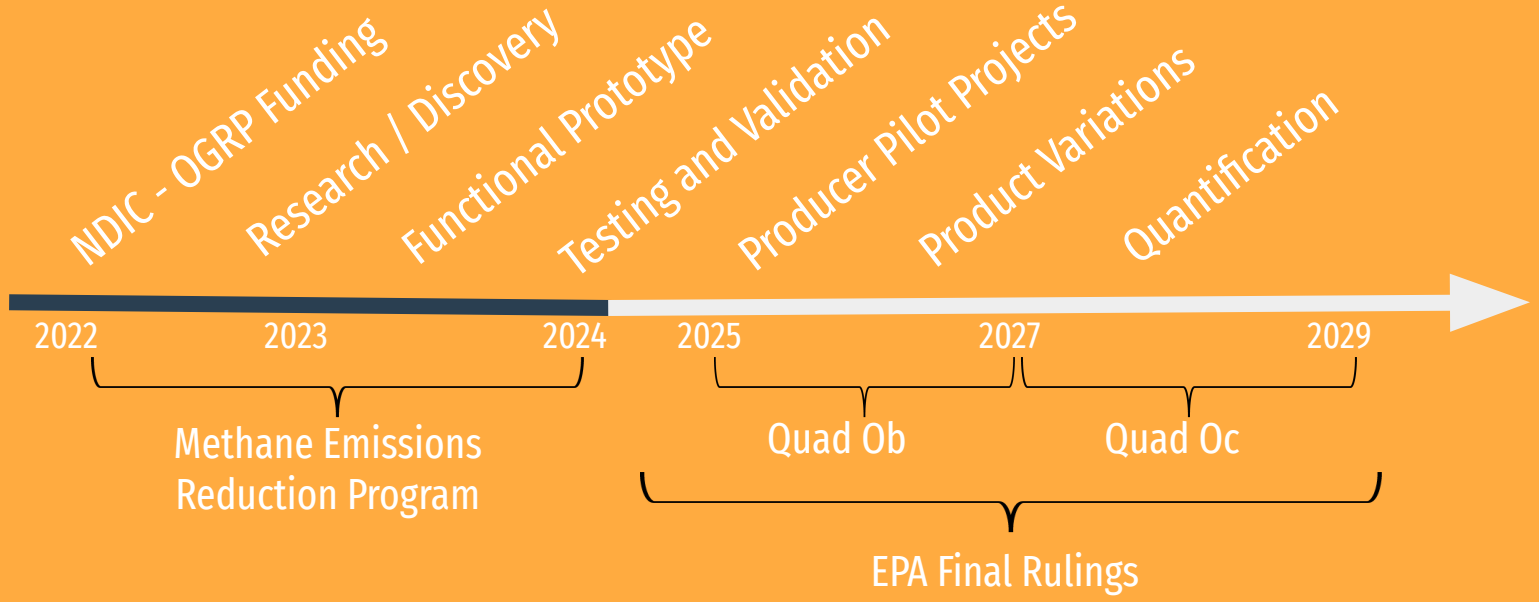
- Cost Scalability
- Power Capacity
- Data Pipeline

REGULATION UPDATES

Inflation Reduction Act

- Subpart W
  - Waste Emission Charge
- Quad Ob - New Source Performance Standards
  - Wells Constructed or Modified after December 6th, 2022
- Quad Oc - Emissions Guidelines
  - Existing wells prior to December 6th, 2022
  - State implemented plans

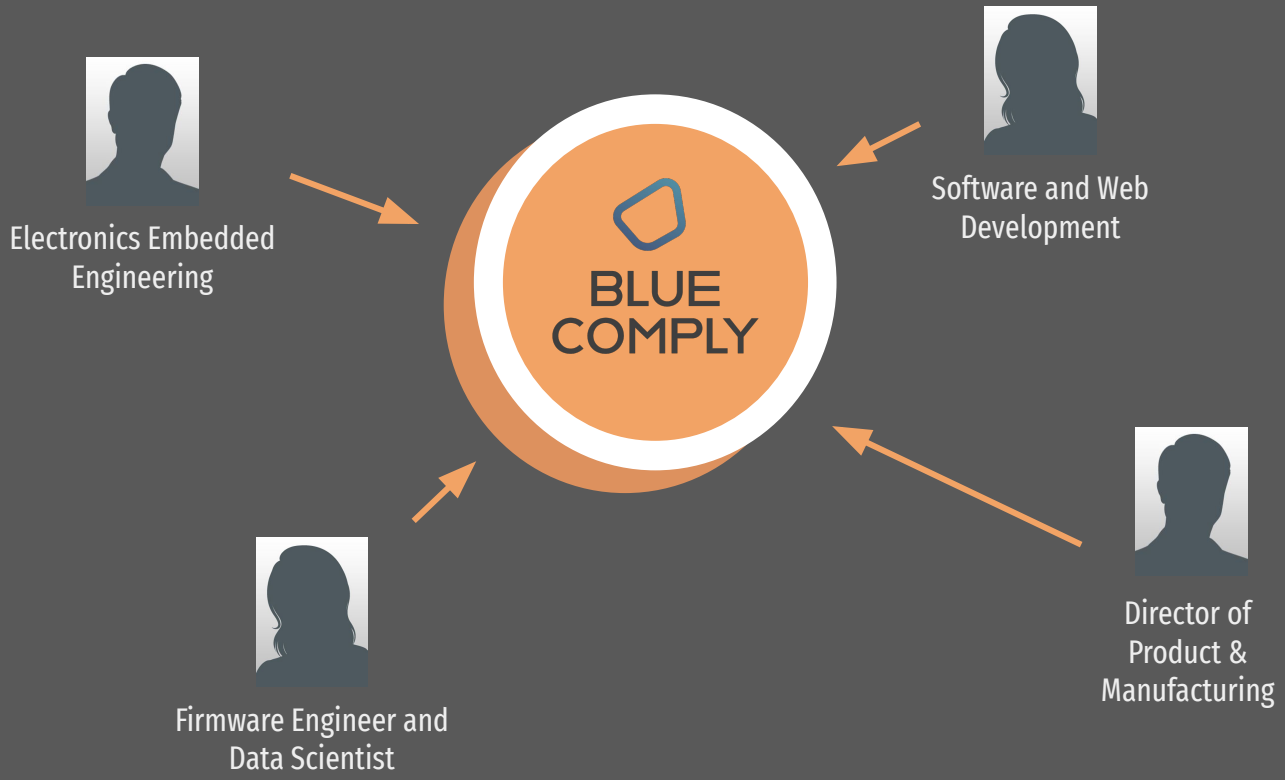
TIMELINE


NDIC - OGRP Funding
Research / Discovery
Functional Prototype
Testing and Validation
Producer Pilot Projects
Product Variations
Quantification
2022
2023
2024
2025
2027
2029
Methane Emissions Reduction Program
Quad Ob
Quad Oc
EPA Final Rulings

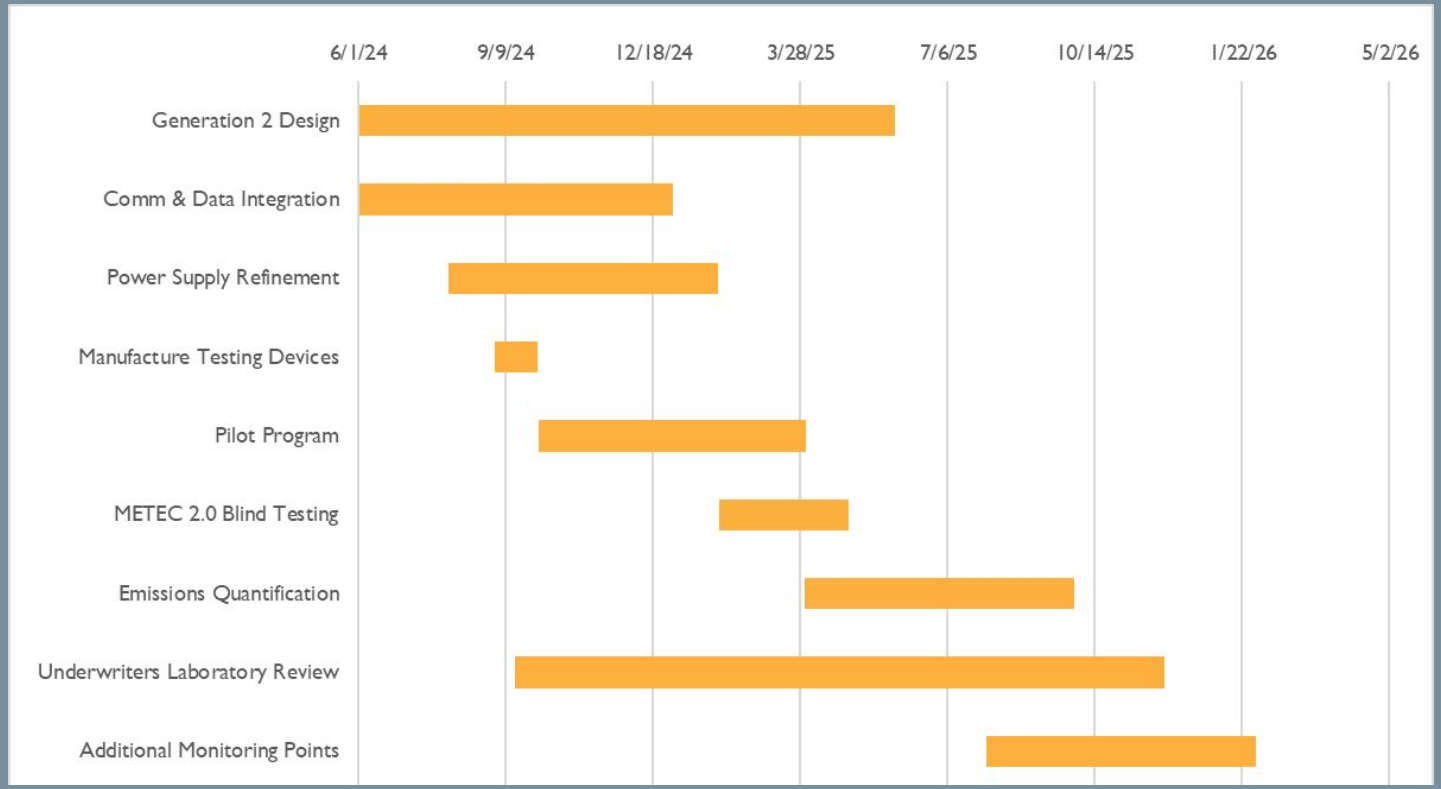
PHASE II - OBJECTIVES & GOALS

- **Kickoff Producer Pilot Project in Q4**
- **Develop device variation utilizing LoRaWAN (instead of cellular)**
- **Interface directly with Operator SCADA systems**
  - Develop gateway to connect end node devices to SCADA
- **Reduce overall cost per well**
  - Design intrinsically safe to eliminate need for Class I, Div 1 enclosure
- **Extend battery life/improve power supply performance**
  - Utilize intrinsically safe, rechargeable batteries with solar cells.
- **Investigate quantification options with Machine Learning / Artificial Intelligence**

NEW TEAM MEMBERS



PHASE II - TIMEFRAMES



PHASE II - BUDGET

BUDGET

Project Associated Expense	Total Costs	NDIC Share	Applicant Share (Cash)	Applicant Share (In-kind)	Other Project Sponsor Share
Power Supply Refinement	$150,000	$75,000	$37,500	$37.500	$0
Comm and Data Integration	$150,000	$75,000	$37,500	$37,500	$0
Additional Monitoring Points	$100,000	$50,000	$25,000	$25,000	$0
Emission Quantification	$250,000	$125,000	$62,500	$62,500	$0
Field Testing (METEC/Producers)	$100,000	$50,000	$25,000	$25,000	$0
Certifications (UL/FCC)	$150,000	$75,000	$37,500	$37,500	$0
TOTAL	$900,000	$450,000	$225,000	$225,000	$0

THANK YOU!!

QUESTIONS?

?

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DIRECTOR'S COMMENTS
G-60-02
Well Site Thief Hatch Methane Detectors – Phase II
Submitted by: Blue Rock Solutions, LLC, dba Blue Comply
Principal Investigator: Troy D. Varaberg, PE
Collaborators: Continental Resources
Request for: $450,000
Total Project Costs: $9000,000
Duration: 18 months

Description of the Project:
This project is to further expand the capabilities of an existing methane detection device & associated software created in Phase I (Well Site Thief Hatch Methane Detectors), also known as Industrial Internet of-Things Methane Sensing Apparatus (IMSA). This technology addresses the largest sources of methane leaks on an oil and gas production site - the storage tank thief hatches. This shall increase the reliability of gas monitoring, shorten response time for repairs, reduce liability for potential EPA charges and help with the public's perception of the environmental impacts by reducing emissions.

The outcome of this project is to achieve commercialization of the IMSA product. This can be accomplished by completing pilot projects with the Producers and fine tuning the product to their needs. Another result of this project is to learn more regarding quantification (estimation of gas being released). This will still be an exploratory idea but we will have narrowed down the pathway to estimating the gas. Evaluating other well site assets that this device could assist producers with detection and monitoring of methane gas emissions.

Participants:
Blue Rock Solutions, LLC, dba Blue Comply Continental Resources, Inc. College of Engineering - North Dakota State University Methane Emissions Technology Evaluation Center - Colorado State University

Technical Reviewers' Comments
Reviewer G-60-02A
I can only recommend considering funding the full application. I would likely change my recommendation to 'fund,' but only for the research components of the application (e.g., methane quantification). I agree with the applicant that identifying and quantifying wellsite emissions are top priorities for North Dakota's producers, and continued research in these areas is warranted. However, the application was limited in research and overly focused on commercialization. I recognize the importance of commercialization efforts for achieving widespread utilization of the applicant's product and its subsequent benefits to North Dakota. **Recommendation: Funding be Considered**

Reviewer G-60-02B
The ability to detect a leak is the first step towards eliminating an atmospheric leak. North Dakota has the ability to continue funding this grant to lead the way for the nation and globe in early detection and, therefore, early elimination of leaks..**Recommendation: Fund**

Reviewer G-60-02C
I believe the proposed work has significant value for the state and the oil and gas industry. I do believe there is a lack of detail on the budget, the milestone chart and I would have liked additional information on the devise that has been developed in the phase one activity. I believe the NDIC;s technical representative will need that information to adequately monitor the progress during the execution of this activity if selected for funding and will want to be appraised in the additional information noted by this reviewer. **Recommendation: Funding be Considered**

Director's Recommendation: Fund in the amount of $450,000

Technical Reviewers' Rating Summary

Proposal Number	**G-60-02**
Application Title	**Well Site Thief Hatch MethaneDetectors – Phase II**
Submitted By	**Blue Rock Solutions, LLC, dba Blue Comply**
Request For	**$450,000.00**
Total Project Costs	**$900,000.00**

Section A. Scoring

Statement	**Weight**	**G-60-02A**	**G-60-02B**	**G-60-02C**	**Avg. Score**
1. Objectives	9	3	4	4	33
2. Achievability	7	3	5	3	25
3. Methodology	8	3	4	4	29
4. Contribution	8	2	4	4	26
5. Awareness / Background	5	4	5	4	21
6. Project Management	3	2	2	2	6
7. Equipment / Facilities	2	3	4	2	6
8. Value / Industry - Budget	4	3	4	4	14
9. Financial Match - Budget	4	3	3	3	12
Avg. Weighted Score		**144**	**202**	**179**	**175**
OVERALL					
FUND			**X**		
TO BE CONSIDERED		**X**		**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 Phase II Well Site Thief Hatch Methane Detectors align well with the following two goals and purposes of the OGRP. •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-60-02A

- Rating: 3 (Clear)

“No additional comments”

- Applicant

“Blue Rock, Continental Resources, and the Universities are all well-versed in the submission of OGRC grant applications; there application reflects that knowledge. ”

- Reviewer: G-60-02B

- Rating: 4 (Very Clear)

“No additional comments”

- Applicant

“AS stated in the proposal a key issue for the oil and gas industry is a reduction in green house gas emissions. The proposed technology under development will assist with helping the industry in addressing this issue.”

- Reviewer: G-60-02C

- Rating: 4 (Very Clear)

“No additional comments”

- Applicant

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

“The applicant’s timeline and budget details were relatively short on specifics. There appear to be some carry-over items from Phase I that were incomplete (UL listing/field tests). Two of the six stated objectives were open-ended with no clear timeline. These open-ended items included: 'Explore other target areas of methane emissions such as gas cooling compressors, compressor buildings, etc.' and 'Initiate research related to quantification (estimation of gas being released measured as standard cubic feet per minute).”

- Reviewer: G-60-02A

- Rating: 3 (Likely Achievable)

“Additional details have been added to the budget. A timeline was inadvertently missed in the proposal and has been added. A brief summary of the methodology for proposed quantification and associated research has also been added.”

- Applicant

“All objectives appear achievable within the confines of the 18-month timeframe and proposed economics.”

- Reviewer: G-60-02B

- Rating: 5 (Certainly Achievable)

“Additional details have been added to the budget. A timeline was inadvertently missed in the proposal and has been added. A brief summary of the methodology for proposed quantification and associated research has also been added.”

- Applicant

“The budget proposed in this application does not provide much detail in the budget for the various partners noted. There is no line item for equipment purchases. Therefore, this reviewer would only rate as noted above.”

- Reviewer: G-60-02C

- Rating: 3 (Likely Achievable)

“Additional details have been added to the budget. A timeline was inadvertently missed in the proposal and has been added. A brief summary of the methodology for proposed quantification and associated research has also been added.”

- Applicant

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

“No significant omissions were observed, and I have no major concerns with the overall methodology presented in the proposal. However, additional details would have been helpful to support each of the individual stated objectives.”

- Reviewer: G-60-02A

- Rating: 3 (Average)

“A brief summary of the methodology for proposed quantification and associated research has been added.”

- Applicant

“.”

- Reviewer: G-60-02B

- Rating: 4 (Above Average)

“A brief summary of the methodology for proposed quantification and associated research has been added.”

- Applicant

“”

- Reviewer: G-60-02C

- Rating: 4 (Above Average)

“A brief summary of the methodology for proposed quantification and associated research has been added.”

- 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:

“The abstract on page 1 states that the expected result is 'to achieve commercialization of the IMSA product.' It appears that the majority of the scientific research was completed in Phase I, with finalizing commercial deployment being one of the principal objectives of Phase II. Along with product commercialization being the primary objective, the applicant notes the objective to 'initiate research related to quantification...,' which would make the most significant scientific contribution to OGRC goals.”

- Reviewer: G-60-02A

- Rating: 2 (Small)

“Reviewer G-60-02A provides good point on commercialization. The intention for this application is to focus on the remaining research and development related to addressing recent and upcoming regulations as well as producer feedback.”

- Applicant

“The oil and gas industry desires localized sensors and data transmission to operators without the presence of an operator on location. This consortium of applicants has perfected their methodology and proposal to achieve the desired result of automated tank emissions technology”

- Reviewer: G-60-02B

- Rating: 4 (Very Significant)

“Reviewer G-60-02A provides good point on commercialization. The intention for this application is to focus on the remaining research and development related to addressing recent and upcoming regulations as well as producer feedback.”

- Applicant

“The work as great potential to benefit but producers operating in ND and the state itself. The governor has challenged the industry to significantly reduce green house emissions by 2030 and the technology will assist in achieving this goal.”

- Reviewer: G-60-02C

- Rating: 4 (Very Significant)

“Reviewer G-60-02A provides good point on commercialization. The intention for this application is to focus on the remaining research and development related to addressing recent and upcoming regulations as well as producer feedback.”

- 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 assigned to complete the outlined work appears highly qualified to achieve the goals and objectives of the application. I have no concerns regarding the team's capability to successfully execute the proposed project.”

- Reviewer: G-60-02A

- Rating: 4 (Better Than Average)

“No additional comments”

- Applicant

“The devices' levels of modification and useful input from partners have led to increased knowledge of how best to achieve the desired results through the eyes of the State of North Dakota and the industry. This has been one the job training for Blue Rock Solutions, LLC and the university researchers, with assistance from industry partners. ”

- Reviewer: G-60-02B

- Rating: 5 (Exceptional)

“No additional comments”

- Applicant

“The principals in this activity appear well versed in the areas necessary to successfully complete development of the devices noted. ”

- Reviewer: G-60-02C

- Rating: 4 (Better Than Average)

“No additional comments”

- 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:

“As previously noted, the application lacked a detailed schedule with defined milestones. Financial plan details were not very well defined in the application. Regarding communications, I would suggest relying on past performance in Phase I with OGRC/NDIC staff.”
- Reviewer: G-60-02A
- Rating: 2 (Inadequate)
“A timeline was inadvertently missed in the proposal and has now been added.”
- Applicant
“I did not see a milestone chart ”
- Reviewer: G-60-02B
- Rating: 2 (Inadequate)
“A timeline was inadvertently missed in the proposal and has now been added.”
- Applicant
“There is no milestone chart provided. The text indicated the project lead would monitor progress to the milestones, but no specific milestones are noted.”
- Reviewer: G-60-02C
- Rating: 2 (Inadequate)
“A timeline was inadvertently missed in the proposal and has now been added.”
- Applicant

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

“Due to the limited budget details, it was challenging to fully assess the justification for any major expense category. However, no particular category raised significant concerns.”

- Reviewer: G-60-02A

- Rating: 3 (Justified)

“More details have been added to the budget table taking into account similarly incurred costs from Phase I.”

- Applicant

“The equipment appears to be modifications and improvements of the current design. Continental Resources and the universities provide facilities. There appears to be utilization of other producers well sites anticipated in phase 2, as well. ”

- Reviewer: G-60-02B

- Rating: 4 (Well Justified)

“More details have been added to the budget table taking into account similarly incurred costs from Phase I.”

- Applicant

“There is no line item in the budget material provided for equipment. The total costs to be incurred is all the information provided. This reviewer much prefers more detail in budget information in order to evaluate the adequacy of the budgeted amounts. ”

- Reviewer: G-60-02C

- Rating: 2 (Poorly Justified)

“More details have been added to the budget table taking into account similarly incurred costs from Phase I.”

- Applicant

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

“The proposed 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 context of current market conditions.”

- Reviewer: G-60-02A

- Rating: 3 (Average Value)

“No additional comments”

- Applicant

“This is a high-value project for the industry and the State of North Dakota. Detection of methane leaks is the paramount first step to maintenance to eliminate that leak and reducing GHG releases into the atmosphere. ”

- Reviewer: G-60-02B

- Rating: 4 (High Value)

“No additional comments”

- Applicant

“The successful completion of this activity will have significant value to both the industry and the state. The governor has challenged the industry to achieve CO2 neutrality by 2030. Thís is a challenge, and this activity should prove valuable in assisting industry in achieving that goal. ”

- Reviewer: G-60-02C

- Rating: 4 (High Value)

“No additional comments”

- Applicant

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

“The applicant’s overall financial commitment is right at the minimum 50% (25% cash / 25% in-kind). I am encouraged that pilot locations have been identified with Continental Resources, but it would have been nice to see some additional producer participation, even if only in-kind.”

- Reviewer: G-60-02A

- Rating: 3 (Average Value)

“Continental Resources has committed resources for installation and support during pilot projects (field testing and quantification studies). The budget has been updated to reflect this. We are also currently in active discussions with other producers and collaborators for additional pilot projects.”

- Applicant

“It needs to be clarified what portion of the applicant's share or applicant share (in-kind) is coming from Continental Resources. Perhaps this is fine as an aggregate, but typically, as the reviewer, I have been aware of the breakdown of financial commitments. the NDIC is only being asked to fund 50% of the total project so perhaps not necessary to understand the internal contributions of the project. ”

- Reviewer: G-60-02B

- Rating: 3 (Average Value)

“Continental Resources has committed resources for installation and support during pilot projects (field testing and quantification studies). The budget has been updated to reflect this. We are also currently in active discussions with other producers and collaborators for additional pilot projects.”

- Applicant

“The budget material provided shows the required one to one match is available for this project.”

- Reviewer: G-60-02C

- Rating: 3 (Average Value)

“Continental Resources has committed resources for installation and support during pilot projects (field testing and quantification studies). The budget has been updated to reflect this. We are also currently in active discussions with other producers and collaborators for additional pilot projects.”

- Applicant

General Comments

“I can only recommend considering funding the full application. I would likely change my recommendation to 'fund,' but only for the research components of the application (e.g., methane quantification).

I agree with the applicant that identifying and quantifying wellsite emissions are top priorities for North Dakota’s producers, and continued research in these areas is warranted. However, the application was limited in research and overly focused on commercialization. I recognize the importance of commercialization efforts for achieving widespread utilization of the applicant's product and its subsequent benefits to North Dakota. However, these efforts may be better suited for funding through the NDIC’s CSEA grant/loan programs.
”

- Reviewer: G-60-02A

“The ability to detect a leak is the first step towards eliminating an atmospheric leak. North Dakota has the ability to continue funding this grant to lead the way for the nation and globe in early detection and, therefore, early elimination of leaks. ”

- Reviewer: G-60-02B

“I believe the proposed work has significant value for the state and the oil and gas industry. I do believe there is a lack of detail on the budget, the milestone chart and I would have liked additional information on the devise that has been developed in the phase one activity. I believe the NDIC;s technical representative will need that information to adequately monitor the progress during the execution of this activity if selected for funding and will want to be appraised in the additional information noted by this reviewer. ”

- Reviewer: G-60-02C

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.

May 24, 2024

Mr. Reice Haase, Deputy Executive Director
North Dakota Industrial Commission
ATTN: Oil and Gas Research Program
State Capitol – 14th Floor
600 East Boulevard Avenue, Department 405
Bismarck, ND 58505-0840

Re: Proposal Entitled "Well Site Thief Hatch Methane Detectors – Phase II"

Dear Mr. Haase:

On behalf of Blue Rock Solutions, LLC, dba Blue Comply, we are pleased to submit the original proposal in electronic format and two (2) copies as directed. Also enclosed with the paper copies is the $100 Application Contribution. It is our hope that the proposed project will result in further development and commercialization of an alternate method to monitor fugitive emissions from oil and gas production site thief hatches that is more accurate, efficient and expedient than the current options available to oil and gas producers.

The Statement of Tax Liability as required:
Blue Rock Solutions, LLC does not have any tax liability owed to the State of North Dakota or any of its political subdivisions.

This transmittal letter represents a binding commitment by Blue Rock Solutions, LLC to complete the project described in this proposal. If you have any questions, please feel free to contact me at 701-361-0403, or by email at troy@bluecomply.com.

Respectfully submitted,

BLUE COMPLY

Troy D. Vareberg, PE

Oil and Gas Research Program

North Dakota Industrial Commission

Application

Project Title: Well Site Thief Hatch Methane Detectors – Phase II

Applicant: Blue Rock Solutions, LLC, dba Blue Comply

Principal Investigators: Troy D. Vareberg, PE

Collaborators: Continental Resources

Date of Application: May 24, 2024

Amount of Request: $450,000

Total Amount of Proposed Project:

$900,000

Duration of Project: 18 months

Point of Contact (POC): Troy D. Vareberg, PE

POC Telephone: 701-347-1250

POC E-Mail Address: troy@bluecomply.com

POC Address: 1331 32nd Ave S, Suite 2
Fargo, ND 58103

TABLE OF CONTENTS

ABSTRACT

Objective:

This project is to further expand the capabilities of an existing methane detection device & associated software created in Phase I (Well Site Thief Hatch Methane Detectors), also known as Industrial Internet-of-Things Methane Sensing Apparatus (IMSA). This technology addresses the largest sources of methane leaks on an oil and gas production site - the storage tank thief hatches.

This shall increase the reliability of gas monitoring, shorten response time for repairs, reduce liability for potential EPA charges and help with the public's perception of the environmental impacts by reducing emissions.

Expected Results:

The outcome of this project is to achieve commercialization of the IMSA product. This can be accomplished by completing pilot projects with the Producers and fine tuning the product to their needs. Another result of this project is to learn more regarding quantification (estimation of gas being released). This will still be an exploratory idea but we will have narrowed down the pathway to estimating the gas. Evaluating other well site assets that this device could assist producers with detection and monitoring of methane gas emissions.

Duration:

The project shall last approximately (18) months. This will consist of approximately six (6) months of research and development of design updates based on field testing & Producer comments; (6) months of pilot projects to test design changes and (6) months of implementing changes and scaling up final production tasks.

Total Project Cost:

The total cost of the project is expected to be $900,000. The amount requested from the NDIC Oil and Gas Commission is $450,000.

Participants:

It is anticipated that all entities previously involved in Phase I Development will participate in the project. These participants include

Blue Rock Solutions, LLC, dba Blue Comply
Continental Resources, Inc.
College of Engineering - North Dakota State University
Methane Emissions Technology Evaluation Center - Colorado State University

PROJECT DESCRIPTION

Background:

With the ever-increasing scrutiny of the world's production of Greenhouse Gases (GHGs), industries are placing additional emphasis on following Environmental, Social and Governance (ESG) criteria. From the environmental standpoint, this translates to reductions of GHGs such as carbon dioxide and methane being released into the atmosphere.

In the oil and gas industry, one of the largest sources of GHG emissions stems from methane leaks on the thousands of production sites located throughout the United States. It has been well documented that methane leaks are 28 times more potent than emissions of carbon dioxide.

Prior to 2024, federal, state and local regulations required each production site to be inspected for methane leaks on a quarterly basis. This was accomplished through the utilization of hand-held gas detectors. At that time, actual monitoring techniques or steps were outlined under the Environmental Protection Agency (EPA) Method 21- Determination of Volatile Organic Compound Leaks. This process was very time-consuming and required personnel to be on the production site, in very close proximity to potential hazards.

In 2008, an alternate method of detection was accepted by the EPA which allows the use of Optical Gas Imaging (OGI) cameras in lieu of the hand-held gas detectors. This option allows a camera operator to survey the entire site from a few select "safe" locations in a shorter time span than the previously accepted gas detectors. However, it still requires personnel to physically travel to each site.

Additional alternate methods have been under development over the last few years. These include, but are not limited to stationary OGI cameras, lasers, satellites and networked point detectors. These developments have more recently been given a higher priority due to the passing of the Inflation Reduction Act. A new set of stringent regulations from the EPA has been outlined through the implementation of the Methane Emissions Reduction Program or MERP. Expanding on the previous OOOO and OOOOa (Quad O and Quad Oa), in 2023 the EPA drafted a new rule to Quad Ob for New Source Performance Standards (NSPS) which are rules that apply to well sites built or modified after December 6th, 2022. For oil & gas facilities that have excess of 25,000 tons of CO2 equivalents, GHG reporting is a requirement under updated Subpart W. It will be the state's responsibility to set a plan that is equal or stronger than these EPA guidelines in Quad Oc for existing well sites built before December 6th, 2022. Transparency will also be targeted through the Super Emitter Program for events that exceed 100 kg/h. This all points to the need for more frequent and automated monitoring technology for oil & gas producers.

Project:

For this phase of the project, it is our main intent to continue refining the Industrial Internet-of-Things Methane Sensing Apparatus (IMSA) developed under Phase I. Demonstrations of the device to various producers resulted in multiple recommendations to improve the device and more effectively meet the Producers' requirements.

Prior Work (Phase I):

With the support of previous funding through the NDIC Oil & Gas Research Program, Blue Rock Solutions, LLC (Blue Comply) has spent the last two years finalizing the development and testing of a wireless methane detector with an integral hatch position monitor for oil and gas storage tank thief hatches. Results of these efforts include:

- Final design of wireless methane detection device that utilizes cellular communications.
- Award of US patent device design and utilization.
- Development of web-app dashboard to allow for monitoring and customization of device performance.
- Creation of device calibration procedures.
- Demonstrated the timely detection of methane emissions.
- Production of (25) fully functioning devices for use in field testing and pilot projects.
- Participation in a 12-week third party controlled blind test at the Methane Emission Technology Center (METEC), a nationally recognized facility supported by the oil and gas industry. (Refer to Figure 1)
- Commitment from (2) major oil producers for field testing opportunities.
- Presented final design to multiple producers and received feedback / recommendations on features and capabilities.
- Obtained initial summary reports from Underwriters Laboratories (UL) on feasibility of final design meeting requirements for being listed as Intrinsically Safe and Hazardous Location (CIDI) devices.

Figure 1: Typical Well Site Storage Tank with Device Installed

The following are the milestones that were not fully realized in Phase I:

- Full UL Listing for intrinsically Safe and Hazardous Location applications took longer than expected.
- Field Testing and Pilot Projects with actual Producers were delayed due to an opportunity for third party blind testing at METEC.

Objectives:

The primary objective of Phase II is to build on the Minimum Viable Product developed in Phase I to address recommendations and feedback received from Producers. Individual objectives include:

- Investigate and develop embedded system hardware to include industry standard wireless communication technologies/protocols, (i.e. WirelessHART, Bluetooth, LORAWAN), to allow for direct integration to existing and / or new Producer's SCADA systems.
- Investigate and develop additional power supply options to increase longevity through use of larger and higher capacity batteries, solar recharging and / or newly developed battery technologies.
- Build and deploy updated devices to various Producers as well as perform additional field testing at METEC (Methane Emissions Technology Evaluation Center – Colorado State University).
- Continue pursuit of Underwriters Laboratory and FCC certification for final products.
- Explore other target areas of methane emissions such as gas cooling compressors, compressor buildings, etc.
- Initiate research related to quantification (estimation of gas being released measured as standard cubic feet per minute).

Methodology:

Hardware Development

Modify existing circuit board, device housing assembly, and communication system using engineering optimization methods.

- Update circuit board to be compliant with Underwriters Laboratories initial report for intrinsically safe and hazardous location certification (ICECx/ATEX).
- Revise circuit design to reduce size and allow for more compact / efficient housing options.
- Incorporate network communication functionality into circuit board to directly interface with Producers' existing SCADA systems.
- Collaborate with sensor manufacturers to develop custom assembly to reduce cost and increase performance.

Firmware Development

Provide updates to the firmware to address recommendations from Producers.

- Develop machine learning algorithms to quantify emissions.
- Develop algorithms to differentiate between source point emissions from individual detection devices and larger site-wide emissions from a group of adjacent devices.
- Update algorithm to expand on existing process for determining thief hatch position and monitoring for emissions based on thief hatch position.

Software Development

Update communications protocol to expand on existing cellular communications and cloud-based technology.

- Update web-based application (dashboard) to expand on existing available information from the device and how it is displayed.
- Incorporate networking capabilities to allow for on-site direct communications of devices with Producer's SCADA systems.

Pilot Projects and Field Testing

Pilot projects and field testing shall continue in order to gain more feedback from various Producers and verify performance of any modifications.

- Bundling testing and calibration of updated devices shall be performed at North Dakota State University College of Engineering in Fargo, North Dakota.
- Pilot Projects are expected to be completed with the assistance of (2) major Producers in the Williston Basin and the Permian Basin.
- Additional field testing of devices developed under Phase II shall be performed at the Methane Emissions Technology Evaluation Center (METEC) facility at Colorado State University in Fort Collins, CO.

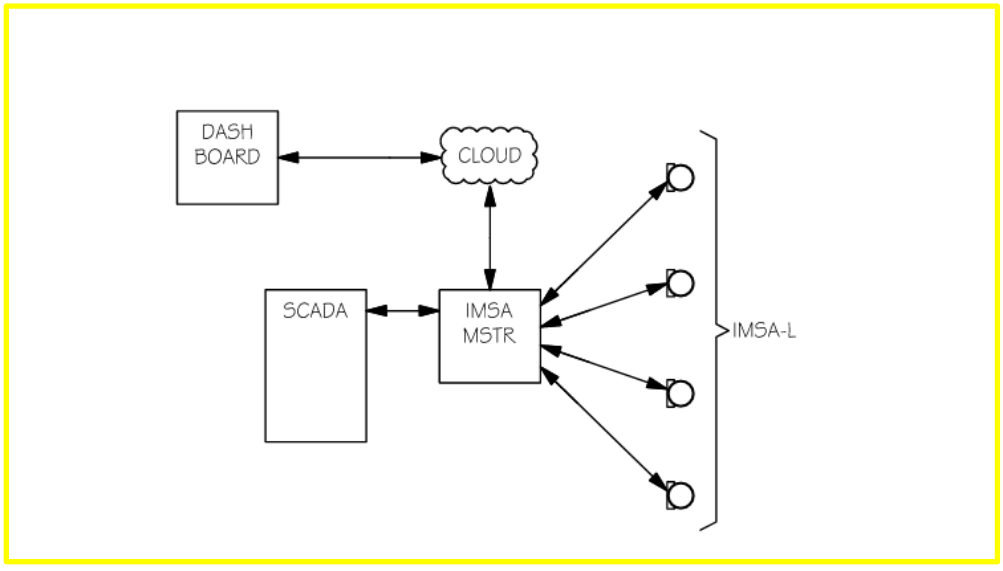

Figure 2: Topology of the proposed methane sensor communications.

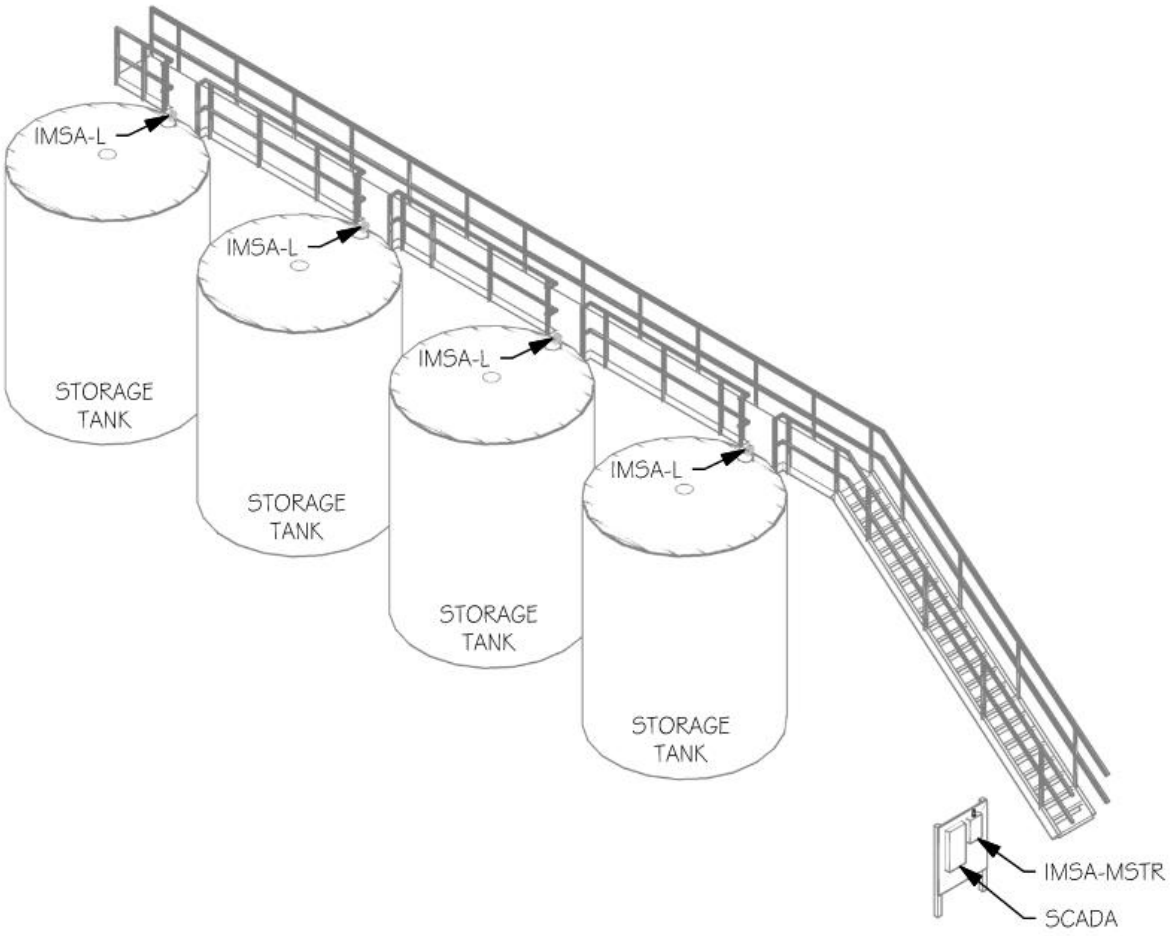

Figure 3: Methane Sensor and Master Controller Layout

Anticipated Results:

The goals of this project include:

- Develop a wireless network communications system that allows direct interface with Producer's SCADA system.
- Optimize power supply selection based on final device configuration.
- Conduct additional field tests to validate updated device capabilities and configuration.
- Demonstration of how the proposed system will detect leaks and emissions at a much faster rate than traditional monitoring and how that will reduce emissions from oil and gas production sites.
- Progress on development of quantification of gas emissions.

Resources / Facilities:

Blue Comply currently has an office facility in Fargo, North Dakota and a staff of (4) engineers. In addition, the following resources are planned for use on this project.

Hardware / Software Revisions:	Blue Comply TBD North Dakota Company
Circuit Board Fabrication:	TBD North Dakota Company
Engineering Support:	Vareberg Engineering, Ltd.
Field Testing:	METEC, Fort Collins, Colorado
Pilot Projects:	Continental Resources – 2 Williston Basin sites
Device Testing and Calibration:	NDSU College of Engineering, Fargo, North Dakota Blue Comply

Techniques to Be Used, Their Availability and Capability:

Phase II is based on utilizing pre-existing methane detection devices and supplementing with automation and communication capabilities. The basic components are commercially available and already meet anticipated performance specifications. Each newly created device shall be intrinsically safe and shall be suitable for the environment for which they are installed.

Environmental and Economic Impacts while Project is Underway:

It is anticipated that there will be little to no environmental or economic impacts during this phase of the project.

Ultimate Technological and Economic Impacts:

Automation in the oil and gas production industry is beginning to take hold and is showing great promise for increasing production, safety and reliability. Phase II is an expansion of these capabilities by automating a historically time-consuming process of monitoring gas emissions.

Lessons learned from this phase of the project shall also help accelerate the growth of utilizing additional sensors throughout an entire production site. While localized sensors are not the ultimate answer to tackling the fugitive emission problem, it is another tool for Producers to use in a broader, all-encompassing program. Incorporating the information provided by these sensors into a Producer's SCADA infrastructure can only enhance the reporting efficiency of Greenhouse Gas emissions and reduce Waste Emission Charges.

Why the Project is Needed:

This Project is needed to help develop economically and technically feasible alternatives to the existing time consuming and costly options of monitoring for fugitive gas emissions. With constantly increasing pressure from government agencies and the general public, high-level monitoring and control of fugitive emissions will become a necessity. Newly enacted regulations, specifically the Waste Emission Charges, found within the Inflation Reduction Act legislation will be imposing penalties on Producers that do not properly monitor and control fugitive emissions.

STANDARDS OF SUCCESS

With the well-documented detrimental effects of greenhouse gases on the environment, along with the increase in ESG legislation and criteria, any reduction of fugitive emissions from oil well production sites would be considered a success.

As a result of this project, it will be technically feasible to significantly reduce the overall leakage or emissions from each site. Such a reduction will have definite financial benefit for the Producers in both increased revenue and lowered maintenance / remediation costs. Producers could also use the results of this project to expand on the use of "big data" to predict and address failures before they occur.

The successful completion of this project will also help keep the State of North Dakota at the forefront of the US Energy arena and help with the Governor's goal of carbon neutrality by 2030. Continued development in the areas of gas monitoring, emission control and remediation could have a profound impact in North Dakota, the Bakken and throughout the United States.

With approximately 19,000 active wells currently in North Dakota and plans to more than double that quantity, the devices developed under this Project have the potential of capturing nearly 200,000 tonnes of methane annually. That is equivalent to the removal of nearly 1,000,000 passenger cars from the roads annually.

BACKGROUND/QUALIFICATIONS

Blue Comply

Blue Rock Solutions, LLC, dba Blue Comply is a North Dakota company specializing in custom engineering solutions for the energy and industrial sectors. It was founded by the partners of Vareberg Engineering, Ltd. as an entity dedicated to product design and development:

Troy D. Vareberg, PE received his B.S. degree from North Dakota State University (NDSU) in Electrical and Electronics Engineering (1990). He has been involved with electrical design in the built environment since 1985, including (4) years as the primary electrical engineer for the Department of Energy at Ames Laboratory in Ames Iowa. He has been the President of Vareberg Engineering, Ltd. since its inception in 1997. In that time, he been involved in the design of well production sites for the past 17 years. Primarily, design has included power systems and control system wiring for more than 190 well sites throughout the Williston and Powder River Basin. Additionally, his expertise includes the analysis and documentation of more than 600 well sites for electrical deficiencies and arc flash hazards.

Emmy L. Vareberg, PE earned her B.S. degree from North Dakota State University (NDSU) in Industrial Engineering and Management (1993). With over two decades of experience in the design consulting field since 1997, she has continually demonstrated her expertise and leadership. Currently serving as the Vice President of Vareberg Engineering, Ltd., Emmy oversees project management for various endeavors while also handling the day-to-day operations. In addition to her professional responsibilities, she actively contributes to the engineering community as a member of the North Dakota Board of Professional Engineers and Land Surveyors (NDPELS). She remains deeply connected to her alma mater, NDSU, by serving on the College of Engineering Advisory and Advancement Board.

Cooper Bierscheid earned his B.S. degree from North Dakota State University in Manufacturing Engineering. After spending time as a capital project engineer at 3M, he founded his first company, Protosthetics in 2014. He later co-founded Fargo Additive Manufacturing Equipment 3D (FAME 3D) in 2019 which acquired the assets of LulzBot, Fargo 3D Printing Repair, and Protosthetics. In 2024, he joined Blue Comply as the Director of Product.

Nile J. Morecraft, PE earned his B.S. degree from South Dakota State University (SDSU) in Electrical Engineering (2017) as well as his M.S. degree from Montana State University (MSU) in Electrical Engineering (2024). He has been involved in the electrical consulting field since 2017 which included the design of electrical power distribution systems, and control system wiring infrastructure for oil production well sites. For his master's thesis, he developed a new design method and current control strategy for fast charging Lithium-Ion batteries which was implemented in hardware using the LLC resonant power converter topology.

Vareberg Engineering

Vareberg Engineering, Ltd. is a reputable North Dakota company specializing in electrical engineering design services catering to both local and regional clients. Established with a commitment to excellence, Vareberg Engineering has successfully undertaken projects across 42 states, showcasing its versatility and proficiency. With a diverse portfolio spanning various industries including oil & gas, hospitality, education (both secondary and higher), industrial, healthcare, commercial,government and retail facilities, Vareberg Engineering has earned a reputation for delivering innovative solutions tailored to each client's needs. The company's electrical services encompass a wide spectrum, including the design of power distribution, control systems, lighting, life safety, and communications infrastructure.

Continental Resources

Continental Resources is a major energy producer in the United States. They are known for operating their company at the highest ethical and environmental standards. With their numerous assets in the Bakken (and elsewhere), they are always eager to step up to the forefront and participate in the development of additional tools for the monitoring of fugitive gases. This has been demonstrated already with continuous reductions in Greenhouse Gas emissions from their sites over the last 5 years.

Methane Emissions Technology Evaluation Center

The Methane Emissions Technology Evaluation Center (referred to as METEC) is a unique and renowned test and research facility for emissions leak detection and quantification (LDAQ) technology development, field demonstration, hands-on LDAQ equipment training, and protocol and best practices development. The METEC facility is operated by the Energy Institute at Colorado State University (CSU) and is located on CSU's foothills campus.
The five-year METEC 2.0 project funded by the Department of Energy, will extend the life and capability of DOE-funded assets that have been developed at the METEC facility since 2016 to speed deployment of next-generation leak detection and quantification technology solutions.

North Dakota State University

North Dakota State University is a distinguished land grant institution, which holds the prestigious R1 research classification located in Fargo, North Dakota. Within its academic landscape, the College of Engineering at NDSU offers a rich array of opportunities, boasting 13 majors and 19 graduate programs in 8 distinct departments. The engineering programs and research initiatives are geared toward addressing the evolving needs of society.

> Chad A. Ulven received his B.S. degree in Mechanical Engineering from NDS (2001) and M.S. and Ph.D. degrees in Materials Engineering from the University of Alabama at Birmingham (2003 & 2005). He has been a faculty member in the Mechanical Engineering Department at NDSU since August of 2005. He has been involved in the research of polymer matrix composites (PMCs) for various commercial and defense applications for the past 18 years. He has co-authored 6 book chapters, 70 journal articles, and over 100 conference papers related to PMCs. He has been a co-author of 5 patent applications which have led to 2 patents awarded and 2 spin-out companies

(c2renew inc. and c2sensor corp.). Most recently he was awarded a multi-million-dollar research project to help develop advanced composite material 3D printers for Army applications.

Benjamin D. Braaten received the Ph.D. degree in electrical and computer engineering from NDSU (2009). During the 2009 Fall semester, he held a Postdoctoral Research position at the South Dakota School of Mines and Technology in Rapid City, SD. He is currently a Professor in the Department of Electrical and Computer Engineering, North Dakota State University. His research knowledge includes printed antennas, conformal self-adapting antennas, microwave devices, topics in EMC, wireless sensing technology and methods in computational electromagnetics. Dr. Braaten received the College of Engineering and Architecture Graduate Researcher of the Year Award. He also serves as an Associate Editor for the IEEE Antennas and Wireless Propagation Letters and the IET Microwaves, Antennas and Propagation journal.

MANAGEMENT

The Project Manager, Troy Vareberg, will be working directly with all parties to guarantee objectives and milestones are met. During the design phase, bi-weekly meetings shall be held to review the progress of each participant. Short-term and long-term schedules shall be adjusted (accelerated or extended) as needed for the project to continue towards the desired outcomes. Tasks shall be assigned to each participant and documented for review at the subsequent meeting. Any deviations from the schedule (planned or unplanned) and /or assigned tasks will be discussed among all participants and either resolved or adopted in a timely manner.

During the continued testing and pilot project phases, the Project Manager will coordinate the installation of the sensors with METEC, Continental Resources, EOG Resources and other Producers. Team members from Blue Comply and each Producer shall then meet on-site on a monthly basis to inspect the installed devices to verify proper performance and to verify their capabilities to withstand the various environmental factors found on site.

All parties of the team will also have access to data obtained and transmitted via the system in order to monitor the site in real time and develop methods to collect and interpret data.

For documentation of project progress, the Project Manager shall file quarterly reports to indicate current status, milestones met, deviations from timeline, necessary adjustments and projections for the next report. Within each quarterly report, the progress of the project shall be evaluated based on the following:

- Were milestones met?
- Were there any unanticipated roadblocks in the process of meeting those milestones?
- What lessons were learned to help reduce any future roadblocks?
- Are costs in line with the published grant application?
- With the results obtained to this date, does the project continue to present itself as a viable solution to effectively monitor methane gas leaks?

BUDGET

Project Associated Expense	Total Costs	NDIC Share	Applicant Share (Cash)	Applicant Share (In-kind)	Other Project Sponsor Share
Power Supply Refinement	$150,000	$75,000	$37,500	$37.500	$0
Comm and Data Integration	$150,000	$75,000	$37,500	$37,500	$0
Additional Monitoring Points	$100,000	$50,000	$25,000	$25,000	$0
Emission Quantification	$250,000	$125,000	$62,500	$62,500	$0
Field Testing (METEC/Producers)	$100,000	$50,000	$25,000	$25,000	$0
Certifications (UL/FCC)	$150,000	$75,000	$37,500	$37,500	$0
TOTAL	$900,000	$450,000	$225,000	$225,000	$0

CONFIDENTIAL INFORMATION

There is currently no confidential information related to this project.

PATENTS/RIGHTS TO TECHNICAL DATA

A patent was issued by the United States Patent & Trade Office for the methane detection devices being utilized for this project.

STATUS OF ONGOING PROJECTS

This project (Phase I) previously received funding from the NDIC - OGRF that was in place from June 1, 2022 through May 31, 2024.

APPENDIX A

LETTERS OF SUPPORT

Please see the attachments.

Continental RESOURCES

May 15, 2024

Troy Vareberg
Blue Comply
1331 32nd Avenue South
Fargo, ND 58103

Subject: Well Site Fugitive Emissions Monitoring Devices

Dear Mr. Vareberg,

This letter serves to confirm Continental Resources' support for Blue Comply's efforts to develop an offering of well site fugitive emissions monitoring devices that would enable early detection of fugitive emissions from select sources. Such devices could have the potential for reducing fugitive emissions from common sources by facilitating rapid response and repair programs, ultimately minimizing site emissions.

Continental Resources remains committed to maintaining and improving industry best practices for minimizing emissions and look forward to exploring reasonable and practical solutions with Blue Comply.

Kevin Turner
Emissions Program Manager
Continental Resources