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November 1, 2021

Clean Sustainable Energy Authority  
North Dakota Industrial Commission  
State Capitol – 14<sup>th</sup> Floor  
600 East Boulevard Ave Dept 405  
Bismarck, ND 58505-0840

**RE: Transmittal Letter for Midwest AgEnergy Group application for Clean Sustainable Energy Authority grant.**

To Al Anderson and the Clean Sustainable Energy Authority:

Please find enclosed an application for a grant from the Clean Sustainable Energy Authority to assist Midwest AgEnergy Group in bringing a geological sequestration project into commercial operations in McLean County. Our project intends to capture and permanently sequester in deep saline formations about 200,000 tons per year of carbon dioxide from the Blue Flint Ethanol facility.

Also included is a certificate of good standing within the state of North Dakota.

The potential use of CSEA grant dollars provides MAG a unique opportunity to advance our project on an aggressive schedule and serve as potential template for potential future larger projects. It could also provide an excellent example of utilization of CSEA dollars to advance shovel ready projects.

If you have any questions regarding the application, please contact Adam Dunlop of my staff. He can be reached at 701-442-7503 or [adunlop@midwestagenergy.com](mailto:adunlop@midwestagenergy.com).

Sincerely:

A handwritten signature in black ink, appearing to read "Jeff Zueger".

Jeff Zueger  
CEO  
Midwest AgEnergy Group

Clean Sustainable Energy  
Authority

North Dakota Industrial  
Commission

## Application

Project Title:

Commercial Deployment of Carbon Dioxide Capture &  
Geological Sequestration in McLean County

Applicant:

Midwest AgEnergy Group

Date of Application:

November 1, 2021

Amount of Request

Grant: \$5,200,000

Loan:

Total Amount of Proposed Project:

\$58,782,260

Duration of Project:

Eighteen Months

Point of Contact (POC):

Adam Dunlop

POC Telephone:

701-442-7503

POC Email:

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## ABSTRACT

### **Objective:**

The objective of this project is to bring a CO<sub>2</sub> sequestration project into commercial operations in central North Dakota. This project will capture emissions from the Blue Flint Ethanol facility and permanently place them in saline formations deep underground. It will demonstrate that CO<sub>2</sub> can safely and permanently be stored in McLean County potentially enabling larger scale projects. It will enhance the financial viability of ethanol production and associated businesses in the region.

### **Expected Results:**

This project will result in a carbon capture compression and dehydration facility being constructed and brought into operations. It will complete and place into operations a CO<sub>2</sub> injection well and deploy a monitoring well into the injection formation. It will build a CO<sub>2</sub> transport line to connect the capture facility to the injection well. The project will secure the appropriate permits and regulatory approvals necessary to advance the project and monetize the revenue streams. A baseline and operational environmental monitoring program will also be deployed.

During construction the project will inject millions of dollars into the economy and provide jobs associated with build out of new assets. Upon completion and commencement of operations the project will protect existing energy jobs, provide new jobs operating and maintaining the facilities, provide additional tax revenue to the local community and the State, demonstrate feasibility of carbon capture technologies and reservoir storage capabilities, and protect the environment by significantly reducing carbon emissions.

### **Duration:**

The project is expected to require 18 months to complete.

### **Total Project Cost:**

Total project costs are approximately \$58,782,260. In this application we are asking the Clean Sustainable Energy Authority for a \$5,200,000 grant which is about 8.85% of the total project costs. Midwest AgEnergy will supply the balance of cash required to complete the project.

### **Participants:**

Midwest AgEnergy will be managing the project with technical and regulatory assistance provided by project partners and consultants such as Carbon America and the Energy and Environmental Research Center (EERC). Various qualified contractors and service providers will be used for design and construction services including Fagen Inc. and Salof LTD.

## PROJECT DESCRIPTION

### Objectives:

The objective of this project is to bring a CO<sub>2</sub> sequestration project into commercial operations in central North Dakota. This project will capture emissions from the Blue Flint Ethanol facility and permanently place them in saline formations deep underground. It will demonstrate that CO<sub>2</sub> can safely and permanently be stored in McLean County potentially enabling larger scale projects. It will enhance the financial viability of ethanol production and associated businesses in the region.

The production of renewable fuels has had a marked impact on the economy of the state of North Dakota. The ethanol industry contributes \$623 million annually to the state's economy and over \$11 million in taxes while providing over 10,000 good paying jobs to rural regions of the state. These facilities also provide a value-added market to agricultural producers. Multiple reports demonstrate that ethanol production increases corn basis values back to corn producers by 45 cents per bushel across all bushels produced in the United States.

There are numerous markets for biofuels that have aggressive carbon reduction goals. This translates into a financial opportunity for renewable fuel producers who can reduce the carbon intensity of the fuel they produce. Ethanol production via fermentation of grains produces a relatively pure stream of carbon dioxide (CO<sub>2</sub>). The ability to capture and permanently sequester this CO<sub>2</sub> stream is the single largest opportunity to reduce the carbon intensity (CI) of fuel produced. This CI advantage, along with the 45Q tax code benefit, greatly enhances the financial incentives to permanently sequester CO<sub>2</sub>. Success in such an endeavor would ensure market access and enhance the financial stability of existing biorefineries, their feedstock suppliers, and spur economic development in a variety of industries that have Environmental Social and Corporate Governance (ESG) criterion.

The Blue Flint Ethanol (BFE) facility is co-located with the Coal Creek Station a 1200 MW coal fired power plant in McLean County ND. McLean County is known to contain over 1.5 billion tons of economically recoverable lignite. A project that demonstrates carbon dioxide storage in close proximity to vast coal reserves enhances the long-term value of those reserves in a carbon constrained economy.

Significant due diligence has already been performed on this project. The key activities remaining to ultimately bring CO<sub>2</sub> sequestration into commercial application include:

1. Finalize engineering and design; build Capture Compression & Dehydration Facility (CCDF)
2. Finalize Design and Complete Injection Well
3. Finalize Design and Complete Monitoring Well
4. Finalize Design and Construct a CO<sub>2</sub> transport line (gathering line) from CCDF to Injection Well
5. Secure Regulatory approvals necessary to advance project and monetize benefits.
6. Complete and Implement Baseline Environmental Monitoring Program

## Methodology:

To bring CO<sub>2</sub> sequestration into commercial application a diverse set of tasks must be completed. For the past several years MAG and our various project partners have been evaluating the potential for permanent CO<sub>2</sub> storage in a safe and cost-effective manner. We have followed a stage gate process identifying potential project risks and gathering information to inform us on project viability. We have invested over \$10 million to date. We believe the project is sufficiently developed to move to commercial scale operations. Project activities we have already completed that demonstrate feasibility and warrant advancement to project execution phase include:

1. *Feasibility Assessment of subsurface potential for CO<sub>2</sub> storage through evaluation of existing well data.* MAG commissioned EERC to evaluate offset wells and inform on potential formations suitable for CO<sub>2</sub> storage. Several formations were identified for additional evaluation.
2. *2D Seismic survey and source testing to determine best seismic source for data acquisition in a combination of mined and undisturbed soils.* Due to the complex surface conditions including mined and virgin soils, a test was required to determine the most effective manner to collect seismic data. MAG contracted Breckenridge Geophysical to complete the survey and EERC to evaluate the data and recommend seismic acquisition protocols most suitable for this environment.
3. *FEL 2 Level Engineering on Capture and Compression Plant.* MAG commissioned Kiewit Engineering to evaluate the CO<sub>2</sub> emissions from fermentation scrubber at ethanol plant and determine most practical manner to capture, compress, dehydrate and pump liquified CO<sub>2</sub> to an injection well. This phase produced a Process Flow Diagram, General Arrangement Drawings, Major Equipment List, and capital construction cost estimate, as well as a Mass Energy Balance for future operations enabling estimates of operational expenses.
4. *3D Seismic survey over approximately 9 square miles surrounding the Blue Flint location.* MAG hired SAE Exploration to conduct a 3D Geophysical Seismic survey over a little more than 9 square miles surrounding the ethanol facility. The processed data was evaluated by EERC to ensure continuity of potential target formations and evaluate viable locations for drilling of a stratigraphic test well that could potentially be re-purposed as an injection or monitoring well.
5. *Drilling of a Stratigraphic Test well to collect subsurface core samples and logs required to accurately model the quality and capacity of CO<sub>2</sub> storage reservoirs.* MAG commissioned Geostock Sandia to design and drill a stratigraphic test well approximately 2 miles from the Blue Flint Ethanol facility. The formations believed to be amendable to CO<sub>2</sub> storage were cored and logged. The well was cased through the Inyan Kara formation and temporarily abandoned. MAG commissioned the EERC to define formation porosity and permeability based on physical samples and logs collected. The information was put into subsurface modeling and simulations to characterize the potential size of CO<sub>2</sub> plume, capacity of target formations for storage, and define any leakage risk points. Approximately 80% of the technical information required to submit a Class VI injection permit was completed as part of this phase.
6. *Capture Plant Engineer Procure & Construct (EPC) Proposal.* MAG hired Fagen Inc, supported by IC Thomasson and Associates Engineering, and Salof Inc. to put together a full turn-key proposal on Capture Compression and Dehydration facility. Engineering required to get to lump sum

price has been completed as part of this task as well as development of Mass Energy Balance, Process Flow Diagrams, General Arrangement Drawings, Civil, Structural, and Electrical engineering, Utility Interconnects, and development of P&ID drawings.

7. *Financial Modeling*- A financial model has been created which incorporates the capital and operational expenses along with the value creation from low carbon fuel standards and section 45Q tax credits associated with CO<sub>2</sub> storage project adjacent to the BFE facility. Modeling indicates this is an attractive project to pursue. It also suggests implementation prior to anticipated inflation of construction costs and predicted erosion of low carbon fuel values is required to achieve a reasonable return threshold.

Through the activities described above, geological experts have concluded there are at least two deep saline formations available which can safely and permanently sequester carbon dioxide for this project. MAG and our project partners are currently completing a final evaluation to determine if the project will inject into the Inyan Kara formation or the Broom Creek formation.

To bring CO<sub>2</sub> sequestration into commercial application a diverse set of tasks must be completed. The following six bullets provide a high-level description of the key project tasks/deliverables identified and methodology we plan to utilize to facilitate completion. Additional information on tasks is provided in the Facilities Section, Techniques Section, and various appendices.

1. *Complete detailed design work and build Capture Compression & Dehydration Facility (CCDF)*. MAG and our project partners intend to negotiate and sign a contract which for a fixed price would complete detailed engineering, finalize design, and execute full buildout of infrastructure required to capture CO<sub>2</sub> from the wet scrubber at the ethanol production facility and transform it into a liquid ready to be pumped to the sequestration site and into the subsurface through an injection well.
2. *Finalize Design and Complete Injection Well*. MAG has already drilled one well and left it in a condition such that it could be re-purposed as an injection well. Upon selection of injection horizon, we will either complete the well as an injector or drill a new well to be utilized as injector. Detailed engineering and design work on injection well specifications will be followed by permitting and ultimately well completion.
3. *Finalize Design and Complete Monitoring Well*. MAG has already drilled one well and left it in a condition such that it could be re-purposed as a monitoring well. Once a final decision is made regarding formation for injection, we will either complete the well as a monitoring well or drill a new well to be utilized for monitoring. Detailed engineering and design work on monitoring well specifications will be followed by permitting and ultimately well completion.
4. *Complete gathering (distribution) line from CCDF to injection well*. MAG envisions that the liquified CO<sub>2</sub> from the CCDF would be pumped via a buried pipe to the injection well head. This phase of the project will complete final detailed engineering and design work required to procure the pipeline and any leak monitoring system materials and subsequently complete the construction of the gathering line.

5. *Secure Regulatory Approvals necessary to inject CO<sub>2</sub> and monetize project benefits.* There are several critical regulatory approvals required to inject CO<sub>2</sub> and be able to fully realize the financial drivers of the project. For this project they include:
- *Obtain Storage Facility Permit (SFP) -Class VI permit from North Dakota Industrial Commission (NDIC) Department of Mineral Resources (DMR).* ND is the first state to receive primacy over Class VI (CO<sub>2</sub> injection) wells from the EPA. We believe this will enable timely review of our substantially complete application. At this time, we have completed or are finalizing all required components of a Class VI storage permit and will be prepared to submit in a matter of months. Major permit components include:
    - Pore Space Access
    - Geological Exhibits and Explanations
    - Area of Review
    - Supporting Permits and Plans (Include financial assurance, testing and monitoring, worker safety, emergency response, plugging and postclosure)
    - Injection Well and Storage Operations Procedure
    - CO<sub>2</sub> Storage Modeling and Simulations
    - Quality Assurance and Surveillance Plans
  - *Submit Monitoring Reporting and Verification (MRV) Plan to EPA.* To be eligible for 45 Q tax benefits a CO<sub>2</sub> sequestration project must provide a MRV plan to the EPA. There is significant overlap with the regulatory requirements of the Class VI permit application.
  - *California Air Resource Board (CARB) Permanence Protocol.* To fully monetize the value of low carbon fuel produced at MAG biorefineries, pathways into specific low carbon markets must be obtained reflecting CO<sub>2</sub> sequestration. The most prevalent of these markets is the CARB Low Carbon Fuel Standard. The Permanence Protocol has many similarities with the SFP but also contains additional requirements.
6. *Complete Baseline Monitoring Program.* The regulatory approvals described above all include various requirements for soil and groundwater sampling to be conducted prior to injection of CO<sub>2</sub>. Water samples from the deepest underground source of drinking water (USDW) formation need to be collected and analyzed both prior to and during injection operations. This will require drilling an additional water monitoring well into the Fox Hills formation near the injection well. Any groundwater wells currently in operation proximate to the injection well or CO<sub>2</sub> plume will be sampled to establish a baseline prior to commencing injection. Characterization of gasses present in soils surrounding the project will also be completed.

### Anticipated Results:

We anticipate successful execution of the six key tasks identified above, resulting in a fully operational commercial project. Through design, construction, and operation the project will:

- Inject millions of dollars into the local economy
- Protect existing jobs in the energy industry
- Provide additional jobs in construction and operational phases
- Yield environmental benefits associated with reduced carbon emissions

- Provide tax revenue to State
- Provide new revenue stream to pore space owners
- Provide proof of concept and inform design of potential future storage projects
- Demonstrate integration of CCDF w/ cyclic CO<sub>2</sub> production from ethanol plant
- Demonstrate feasibility of class VI permit protocols for projects that expand the edge of well-defined geology

The subsequent **Standards of Success** section elaborates on the anticipated results of this project.

### Facilities:

Midwest AgEnergy Group (MAG) owns and operates the Blue Flint Ethanol facility near Underwood, ND. Blue Flint purchases about 25 million bushels of corn from approximately 500 local corn producers and produces over 70 million gallons of ethanol each year along with about 200,000 tons of dry distillers grains and about 10 tons of corn oil. A byproduct of fermentation at the facility is carbon dioxide (CO<sub>2</sub>). Blue Flint produces about 200,000 tons per year of CO<sub>2</sub>, which is currently scrubbed and released to the atmosphere. MAG has explored many opportunities to put this CO<sub>2</sub> to beneficial use and believes geological sequestration now provides the best opportunity for the biorefinery, the State, and the environment. The CCDF will be located on Blue Flint plant property. More information about MAG facilities is provided in APPENDIX A

The Capture Compression and Dehydration Facility will utilize a proven and bankable Salof liquefaction design. The Plant is designed to capture CO<sub>2</sub> vapor which is discharged during the production of ethanol. The CO<sub>2</sub> Liquefaction Plant will compress, dehydrate and liquefy the CO<sub>2</sub> before again compressing to a super-critical state and superheating the CO<sub>2</sub> to meet pipeline specs. The plant is designed to meet these design conditions under worst case design supply temperature and pressure conditions. In addition, the plant is normally able to operate at a 50% turndown ratio. An overview and process flow for the liquefaction plant is provided in APPENDIX B.

The injection and monitoring wells final design will be informed by the ultimate injection horizon. In general, the wells will be designed with a 16" conductor to 80', and 10 3/4" surface casing to 1330' in the Pierre Shale to adequately isolate all USDWs. A 7" casing will extend beyond the target formations, and all casing will be cemented to surface. For the production string, appropriate CO<sub>2</sub>-resistant materials will be selected, with the shoe to be placed at 4900' in the Amsden formation to cover both the Broom Creek and Inyan Kara formations.

The CO<sub>2</sub> gathering (transmission) line will connect the CCDF with the injection well. The line will have ample capacity to deliver the full volume of CO<sub>2</sub> liquified to the well head and be equipped with the appropriate level of leak detection equipment. The final specifications for pressure and flow are to be based off pressure required for injection, pump capacity at CCDF facility, and hydraulic, route length, and line friction calculations. The line will be a buried line following the safest commercially viable route.

## **Resources:**

Midwest AgEnergy will be reliant on various project partners, technical experts, professional contractors, and service providers to complete the project.

Subsurface technical expertise along with modeling and permitting assistance will be provided by or contracted through Carbon America and the EERC.

The CCDF will utilize engineering, design, and construction subcontractors such as Fagen, I.C. Thomasson, and Salof.

The gathering line and well drilling components will be awarded via competitive bid process of competent and pre-qualified professional contractors.

## **Techniques to Be Used, Their Availability and Capability:**

The CCDF facility utilizes proven technology that has been deployed at multiple ethanol facilities in the US which sell CO<sub>2</sub> for industrial purposes. For this project, the technology needs to be modified slightly to accommodate a higher CO<sub>2</sub> capture percentage at the scrubber than deployed at other locations. The design incorporates additional measurement and variable frequency drives to accommodate the cyclic variable of CO<sub>2</sub> production in batch fermentation process used at BFE and minimize electrical energy consumption requirements. APPENDIX C contains a redacted proposal from Fagen Inc describing the project execution plan for CCDF construction.

Design of CO<sub>2</sub> injection and monitoring wells have been demonstrated on other projects. Class II wells are similar in nature and design and common throughout western ND. This project will incorporate the required criterion of a Class VI well into site and formation specific design to provide safe and compliant injection and monitoring wells. Interconnection of CCDF and well head will utilize commonly deployed technologies in the oil and gas pipeline industry appropriate for this service.

The regulatory approval process for a Class VI permit in ND has been demonstrated on one other project. This project will follow as similar application template and incorporate learnings gleaned from other applicants into our submittal.

## **Environmental and Economic Impacts while Project is Underway:**

### *Environmental Impacts-*

A construction permit for CCDF will be required. Little environmental impact is expected from construction as it will be located within an existing industrial facility.

Environmental impacts during the drilling/completion of injection and monitoring well drilling are similar to that of drilling an exploratory oil well. Established best management practices already being used in ND for drilling wells for oil production or waste disposal will be employed. A closed loop mud system will be utilized, and all solid and liquid wastes will be collected and disposed according to ND regulations.

Surface disruption will be required to bury the CO2 transport line. The route will be evaluated to avoid any environmental or culturally sensitive areas. Best management practices will be followed to minimize impacts during construction.

#### *Economic Impacts-*

Maintaining continuous operations at BFE during challenging market conditions has a significant impact on the economy of central ND. Midwest AgEnergy employs just under 100 staff and has annual payroll of about \$10.5 million per year. Corn purchases at BFE will likely exceed \$141 million in 2021.

In addition to the economic impacts of sustained ethanol production, this project will require nearly \$59 million be spent to reach commercial production. During construction, businesses providing skilled contract work will be needed. Industries such as hospitality and tourism will see additional customers as contract workers will be required hotel, fuel, and amenities. The project will also include real property components which will generate additional value to support local county and school districts. Once installed and operating the additional equipment will require about \$6 million per year in new operating and maintenance related activities.

#### **Ultimate Technological and Economic Impacts:**

*Commercial Scale operation proves technology viability* – Blue Flint produces about 200,000 tonnes per year of CO2. Much larger sources of CO2 exist in central ND. This project will undoubtedly produce valuable knowledge which could enable future endeavors. The process for securing injection well permits, pore space amalgamation, and injection well design and operations from this project will provide a template for potential future projects.

*Improved viability of ethanol plants* - The US fuel ethanol industry is challenged by the supply/demand fundamentals for fuel ethanol. The US Energy Information Administration estimates that domestic ethanol production capacity stands at 17.5 billion gallons per year. Domestic demand for fuel ethanol averaged 14.1 billion gallons per year in the three years prior to 2020, when COVID disrupted our markets. During that same period, US exports of non-beverage ethanol averaged 1.5 billion gallons per year. This leaves over 10% of our industry production capacity subject to shut-ins in an average year. For MAG plants to remain viable in an oversupplied market it is critical to differentiate our products and to create new customers for our products beyond the commodity demand for fuel ethanol. We believe decreasing carbon intensity of ethanol through CCS is the best opportunity to differentiate the commodities we produce from those of other producers and position our company assets to operate at full capacity for years to come.

*Economic Impact to farmers providing corn to BFE-* BFE and our sister plant in ND have contributed much to farm economics. Since 2007, the year before BFE commenced operations, corn production in ND has virtually doubled. Prior to the introduction of ethanol demand in our state, farmers had no reliable market for corn beyond their own feed use and volatile export demand. Swings in export demand created a boom-and-bust cycle in ND corn prices that discouraged farmers from expanding their corn acreage and denying them the opportunity to diversify their agronomic and price risk. In this setting, BFE has provided a vital outlet for western ND farmers' output. The ND Ethanol Council

estimates that our ND plants consume 40-60% of ND's corn crop each year. Locally, BFE consumes an average of 74% of the corn produced in the North Central, Northwest and West Central crop districts in ND. We compare our corn settlement records at BFE to the USDA Prices Received report that is issued monthly. Over the last eleven years, BFE has paid an average of \$0.09 per bushel more than the ND corn price received by farmers. That means we have injected an extra \$19 million in crop revenue into the local economy over those eleven years. In summary, BFE provides a reliable market that pays a price premium to western ND farmers. We have become a vital cog in the local farm economy by creating high quality corn demand and also supplying high quality feed at competitive prices to our local livestock producers.

*Economics to Surface/Pore space ownership-* Because the State has primacy regarding regulation of CO2 injection wells, ND is becoming a popular target for Carbon Capture and Storage (CCS) projects. In a carbon-constrained future, CCS projects are believed to be one mechanism by which ND could continue to supply energy from our diverse fuel sources to the nation. Thus, assets within the state and from outside are investigating storage opportunities with a primary focus being on the western and central regions. In ND, the subsurface pore space is considered the property of the surface owner. Therefore, to inject CO2 financial consideration must be given to the surface owner. Payments to property owners will serve as an investment in the rural economy.

### Why the Project is Needed:

Completion of this project will demonstrate the ability to safely store CO2 in formation in the eastern most portion of the Williston Basin. Prior to the feasibility efforts of this project there was little known about the geology in this area. The formations thickness, quality, and suitability for injection were uncertainties we have assessed and mitigated such that we are now confident in advancing the project. The factors of thinner formations, thinner cap rock, and scarcity of knowledge of continuity of formations all present opportunities for this project to address and demonstrate that CO2 can be stored in this area of our state. We believe this will be a critical factor for additional potential projects for this area both now and into the future.

Midwest AgEnergy has been developing this project since 2019 and has invested over \$10 million into feasibility. During this time, we have refined the capital and operating costs associated with the project. We now have a project ready to advance to completion.

As we have advanced the project and refined business model, we have experienced significant price increases in costs of materials of construction, labor resource costs, and lead time on equipment deliveries. Skilled wage rates have increased at about 3.5% each of the last two years and structural steel has increased about 30% over the last six months according to DNR Magazine. Copper has seen a 90% increase over the last year based on COMEX copper index. The producer price index for stainless steel pipe is up 28% year on year and carbon steel pipe has gone up 58% in last six months based on data published by Bureau of Labor Statistics. These cost and schedule impacts affect the projected return on investment for the project.

The return on investment for this project will come from two sources. The first is Section 45Q tax credits and the second is monetization of low carbon fuel or other voluntary carbon reduction credits. There are several risks associated with both income sources for this project. As it relates to Section 45Q tax credits- this program could be altered to reduce the benefit or additional regulations put in place that could result in loss of this income source. In addition, MAG's business structure cannot currently utilize the 45Q benefits internally, therefore we will be working with a tax equity partner to monetize the benefit. This structure further reduces the "face value" of these credits.

One of the significant risks with the projected income associated with low carbon fuel values projected in our financial model is the potential development of larger scale CO<sub>2</sub> gathering, and storage projects from renewable fuel plants. If completed these projects will have a negative impact on this project's return-on-investment projections by increasing the supply of lower carbon fuel and thereby putting downward pressure on the premium for low carbon fuels. There are limited markets that pay premium prices for low carbon fuels. The current market will support approximately 1.5 billion gallons of low carbon renewable ethanol. Should additional projects move forward and bring to market billions of additional gallons of low carbon renewable ethanol, we will have made significant progress towards reducing carbon emissions into the environment, but concurrently will also have substantially commoditized and diminished the financial value of low carbon fuels through oversupply.

We are requesting grant support to assist in ensuring that we can continue to advance the project to completion while minimizing some of the financial risk that supports the investments needed to complete this important project. We believe this project is at an ideal time in its life cycle to validate support by the Clean Sustainable Energy Authority as a model on how we can improve the state's economy, support and sustain high paying jobs, create new jobs, all while improving the environment.

## STANDARDS OF SUCCESS

*Emissions reduction and reduced environmental impacts* - Measuring success against an emission reduction goal for this project is easy and straight forward from a measurement standpoint when compared to other projects. EPA specifies measurement techniques and calculations to ultimately track the amount of carbon dioxide stored. This project will sequester approximately 200,000 tons of CO<sub>2</sub> per year from fermentation, which is the equivalent to taking about 43,500 cars off the road each year. Over its planned lifespan this project will prevent more than 4 million tons of CO<sub>2</sub> emissions from reaching our atmosphere. We believe opportunity exists to expand the project and provide even larger reductions if incentives and regulations to minimize CO<sub>2</sub> emissions are maintained or increased.

*Increased energy sustainability* - Ethanol is a renewable fuel. It is already the most widely accepted and cost-effective alternative to increase sustainability in liquid transportation fuels. The CO<sub>2</sub> emitted from the fermentation process is the same CO<sub>2</sub> that corn originally captured from the atmosphere during photosynthesis. Therefore, CCS from ethanol fermentation could be viewed as removing CO<sub>2</sub> from the atmosphere while concurrently producing a sustainable liquid transportation fuel. There is approximately a 40% reduction of carbon intensity of the ethanol production process when deploying Carbon Capture.

*Value to North Dakota*- Midwest AgEnergy spends approximately \$275M per year. Most of that money is spent in the local ND economy. We employ just under 100 people, slightly over half of which work at the Blue Flint facility near Underwood. According to RFA calculations<sup>1</sup> the Blue Flint facility supports over 1,000 full time jobs. The Blue Flint facility has utilized waste steam off a turbine generator of the adjacent power plant for over 13 years. Providing low carbon intensity transportation fuel has been a foundational element of the business model for Midwest AgEnergy. A sequestration project will solidify the financial future for the organization, its employees, and the local suppliers who rely on Midwest AgEnergy to be a purchaser or supplier of goods and services.

The Ethanol industry has substantial economic effects on the overall economy of ND. About half of the corn grown in ND is utilized in ethanol production. The North Dakota ethanol industry contributes \$623 million annually to the state's economy. In addition, state and local tax revenues contribute more than \$11 million annually.<sup>2</sup> North Dakota ethanol plants employ more than 230 workers directly in high-paying positions. The industry also supports nearly 7,000 jobs across all sectors of the economy. Both Agricultural and Energy leaders recognize the value of this project to ND. Letters of support can be found in Appendix D.

The results of this project will provide Midwest AgEnergy a full-scale CO2 sequestration project in McLean County. McLean County is home to an estimated coal reserve of 1.5 billion tons of economically mineable lignite.<sup>3</sup> A project that successfully demonstrates that carbon dioxide storage is possible situated near vast coal reserves enhances the value of those assets in a carbon constrained world. Technologies continue to emerge that will continue to enhance the value of lignite as both an economical energy source and a low carbon energy option.

Lignite coal is a critical resource for North Dakota's economy. The Lignite Energy Council reports that the North Dakota lignite industry is responsible for about 14,000 jobs in the state and \$5.7 billion in economic activity.<sup>4</sup> The potential of future carbon legislation and/or regulations could significantly impact the ability for coal to contribute to North Dakota's economy and the livelihood of people working in the industry.

*Explanation of how the public and private sector will make use of the project's results, and when and in what way*- Governor Burgum has set a goal for the state of ND to be carbon neutral by 2030. "Of all the opportunities, perhaps none has more potential than carbon capture and storage," he said on May 15, 2021<sup>5</sup>. Successful execution of this project will exemplify steps and strategies others can follow to help

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<sup>1</sup>

[https://www.dropbox.com/sh/2gp9bhatpembiyf/AACvnbX94r8\\_zFOtkVc\\_q\\_zga?dl=0&preview=ND\\_Infographic.pdf](https://www.dropbox.com/sh/2gp9bhatpembiyf/AACvnbX94r8_zFOtkVc_q_zga?dl=0&preview=ND_Infographic.pdf)

<sup>2</sup> [https://b3358ed0-933b-4e3a-a5f5-66189e78bb29.filesusr.com/ugd/1fd290\\_8317e15b7a7f4cedb1285a6dc740087c.pdf](https://b3358ed0-933b-4e3a-a5f5-66189e78bb29.filesusr.com/ugd/1fd290_8317e15b7a7f4cedb1285a6dc740087c.pdf)

<sup>3</sup> ([https://www.dmr.nd.gov/ndgs/documents/Publication\\_List/pdf/RIseries/RI-104.pdf](https://www.dmr.nd.gov/ndgs/documents/Publication_List/pdf/RIseries/RI-104.pdf))

<sup>4</sup> (<https://lignite.com/coal-strong/benefits-of-north-dakotas-homegrown-lignite-coal/>)

<sup>5</sup> <https://www.naturalgasintel.com/north-dakota-governor-sets-carbon-neutral-goal-by-2030/>

ND reach this goal through “innovation not regulation”. This innovative commercial scale project will provide a clear roadmap for similar projects currently under development.

*The potential commercialization of the project’s results.* This IS a commercial project.

*How the project will enhance the research, development and technologies that reduce environmental impacts and increase sustainability of energy production and delivery of North Dakota’s energy resources–* This project will be a full-scale demonstration that sequestration can occur on what is perceived to be the boundary of suitable geology. This project will improve upon existing CCDF design to improve the percentage of CO2 captured as well as the energy efficiency of this design. This project will provide injection well, monitoring well, and CO2 distribution line designs that can be utilized in future similar projects.

*How it will preserve existing jobs and create new ones-* The completion of this project will help ensure rural ND, where population is on the decline, has access to high paying jobs. It ensures the existing MAG workforce of nearly 100 employees have sustained employment. Construction of the compression plant, CO2 transport line, and injection and monitoring well facilities will require several hundred contractors over the one to two years required to complete the project. Following the completion of this project, the operating assets will need additional labor services and contractors to operate, maintain, monitor, inspect, and perform workover services. This will create new jobs for both skilled and unskilled labor.

## BACKGROUND/QUALIFICATIONS

*Please provide a summary of prior work related to the project conducted by the applicant and other participants as well as by other organizations. **This should also include summary of the experience and qualifications pertinent to the project of the applicant, key personnel, and other participants in the project.***

**Midwest AgEnergy Group, LLC** has successfully developed two bio refineries in ND. Blue Flint Ethanol located at Underwood, ND, and Dakota Spirit AgEnergy at Spiritwood, ND. MAG commenced operations in 2007 and has produced over 1 billion gallons of ethanol refined from ND corn. Our businesses are recognized as technological leaders in the biofuels industry, starting with our innovative Combined Heat and Power plant design which utilizes steam from co-located power production facilities. Both facilities have pathways into low carbon fuel markets and as an organization we have long term objectives to continue to reduce the carbon intensity of the fuels we produce. The single largest opportunity to reduce carbon intensity is through capturing and permanently sequestering the CO2 produced from the fermentation process. Such a project could result in 40% reduction of site carbon scores.

Midwest AgEnergy has completed multiple feasibility level efforts to demonstrate safe and permanent storage of CO2 adjacent to its Blue Flint Ethanol facility is plausible. Under the direction of Adam Dunlop, the Regulatory and Technical Services Director, MAG has successfully completed:

1. *Feasibility Assessment of Subsurface potential for CO2 storage through evaluation of existing well data*
2. *2D Seismic survey and source testing to determine best seismic source for data acquisition in a combination of mined and undisturbed soils*
3. *FEL 2 Level Engineering on Capture and Compression Plant*
4. *3D Seismic survey over approximately 9 square miles surrounding the Blue Flint location.*
5. *Drilling of a Stratigraphic Test well to collect subsurface core samples and logs required to accurately model the safety and capacity of CO2 storage reservoirs*
6. *Capture Plant Engineer Procure & Construct (EPC) Lump Sum Estimate*

MAG is currently leading a 2D Seismic Acquisition project near the Dakota Spirit plant in Stutsman County to understand the potential for CO2 storage in eastern ND. This project is collecting data 50 miles further east in ND than any previous seismic work. If storage in Stutsman County is determined not to be feasible an evaluation will occur to understand possibility the CO2 from Dakota Spirit ethanol could be transported to McLean County for storage.

Additional technical expertise to the project will be provided by various contractors, service providers and prospective project partners. Organizational descriptions and expertise of key project partners and service providers can be found in the following appendices:

- APPENDIX E - EERC
- APPENDIX F - Carbon America
- APPENDIX G - Fagen Inc.
- APPENDIX H - Salof LTD

## MANAGEMENT

*A description of **how** the applicant will manage and oversee the project to ensure it is being carried out on schedule and in a manner that best ensures its objectives will be met, **and a description of the evaluation points to be used** during the course of the project.*

MAG has deployed a stage gate process throughout the feasibility phases to bring the project up to the current execution phase. The project's aggressive timeline will require management of multiple aspects of the project to occur concurrently. This could be viewed as adding additional risk to project. For example, in a more perfect timeline, a Class VI permit would be obtained prior to investing in long lead time equipment. Our assessment is that potential cost inflation of labor and materials described in the *Why Project is Needed* section, along with the significant delay of financial benefits of an operating project, present a higher risk.

Most components of the project are inter-related and have material influence on the design and timeline of other tasks. To manage risks associated and prevent rework a detailed project management plan and schedule are being created. This plan will have a matrix or similar visual mechanism to illustrate the interrelationship of project tasks, sequence of activities, and duration of tasks.

Key decision and evaluation points for the early stage (Phase 1) of project execution will include:

1. Final selection of injection horizon and assimilation of any outstanding data requirements
2. Approval of EPC design and schedule resulting in contract with CCDF provider
3. Injection and Monitoring wells final design
4. Storage Facility Permit (SFP) pre-submittal review for final completion
5. Internal approval of design of baseline monitoring plan

Based on evaluations and decisions of Phase 1 the project will advance to Phase 2. Key decision and evaluation points during Phase 2 of project execution will include:

1. Execution of CCDF construction plan
2. Request for Proposals and contractor selection for injection and monitoring wells
3. SFP submittal and public hearing
4. Finalize design/Execute contract for construction of CO<sub>2</sub> gathering line
5. Execution of sample collection for Baseline monitoring plan

The final phase of the project will involve completion, commissioning, and proving satisfactory operations of new assets. Key decision and evaluation points during Phase 3 of project execution will include:

1. Commissioning and performance guarantee testing of CCDF
2. Completion and testing of injection and monitoring wells
3. Receipt of Class VI permit and approval of MRV plan
4. Commissioning and testing of CO<sub>2</sub> flow line
5. Commencement of monitoring strategies for operational project

## TIMETABLE

*Please provide a project schedule setting forth the starting and completion dates, dates for completing major project tasks/activities, and proposed dates upon which the interim reports will be submitted.*

MAG has assembled an overall project timeline based on schedules and proposals for the various tasks described in the Methodology and Project Description sections. This compilation has the injection commencing near the end of Q1 2023. We believe this to a very aggressive - yet achievable timeline.

Three tasks are primarily associated with the critical path to project completion: completing CCDF, regulatory approvals/permitting, and baseline monitoring. The CCD facility has long lead time equipment for compression which is sourced overseas creating the potential for shipment delays. The regulatory approval timeline assumes that all applications are deemed complete on original submissions and don't require extensive rework or significantly longer turn times than current applications require to process. One year of baseline monitoring is required prior to commencing injection. Significant delay in the commencement of sample collection could extend the time to startup.

A Gantt chart indicating key tasks and timelines is provided in APPENDIX I.

## BUDGET

Total remaining project costs are estimated at \$58,782,260. We are asking the CSEA to support us with \$5,200,000 which is about 8.85% of the total. Midwest AgEnergy and our prospective project partners will supply the balance of cash required to complete the project. Significant cost increases recently viewed in construction cost proposals have challenged the overall project economics. The requested grant dollars are based on controlling capital expenses such that the project provides suitable return on investment of about 10% as described in Appendix J (confidential). Without grant funding the project will likely be delayed as terms with 45Q tax equity partners will require reevaluation and additional loans may be required. Depending on the outcome of this grant request MAG, may choose to pursue a CSEA Loan in a subsequent application.

Task	Project Associated Expense	Total Cost	NDIC's Share Grant	NDIC's Share Loan	Applicant's Share (Cash)
1	Capture and Compression Plant	\$ 31,200,000	\$ 2,761,200	TBD	\$ 28,438,800
2 & 3	Monitoring & Injection Well Completion	\$ 7,900,000	\$ 699,150	TBD	\$ 7,200,850
2 & 3	Well and Seismic Data Collection & Interpretations	\$ 3,500,000	\$ 309,750	TBD	\$ 3,190,250
4	CO2 Distribution Line	\$ 2,400,000	\$ 212,400	TBD	\$ 2,187,600
5	Permitting & Regulatory Approvals	\$ 926,000	\$ 81,951	TBD	\$ 844,049
6	Baseline Monitoring	\$ 1,295,000	\$ 114,608	TBD	\$ 1,180,393
*	Legal, Insurance, Finance, Financial Assurance, Stakeholder Engagement	\$ 6,035,600	\$ 534,151	TBD	\$ 5,501,449
	Contingency (10%)	\$ 5,325,660	\$ 486,791		\$ 4,838,869
	Project Management (internal)	\$ 200,000			\$ 200,000
	Project Total	\$ 58,782,260	100%		
	NDIC Total Request	<b>\$ 5,200,000</b>	8.85%		
	Applicant Cash Total	\$ 53,582,260	91.15%		

*Please use the space below to justify project expenses and discuss whether the project's objectives will be unattainable or delayed if less funding is available than requested.*

Project costs have been assimilated from proposals, quotes, and discussions from professional resources and are generally allocated towards tasks identified in the project objectives section. Task 1 is based on EPC lump sum offer from technology provider. Task 2&3 are derived from estimates from various entities currently involved in drilling and completing injection and monitoring wells. Task 4 is based on cost estimates from pipeline engineering professionals. Task 5 is a compilation of quotations and estimates from consulting agencies currently engaged to provide permitting assistance. Task 6 includes estimates for drilling Fox Hills USDW well and laboratory analysis of soil and water samples taken once per quarter for a year.

A final line has been added to describe multiple project expenses associated with project development and finalizing business agreements. To reach commercial operations requires various legal resources be enlisted to perform activities such as advance permit application process and draft agreements with tax equity partners capable of monetizing 45Q. This line also includes costs associated with bonding, insurance, public outreach, and engineering consultants required by lenders.

## CONFIDENTIAL INFORMATION

*An applicant may request confidentiality for any information in the application packet which the applicant wants to be kept confidential (such as business plans, historical financial information, and budgeted projections.)*

MAG has included confidential information regarding the project business plan containing historical company financial statements and project budget projections and investment returns in Appendix J.

MAG is a privately held entity. It's MAG's policy to not release financial and other sensitive information to the public. The management of MAG is charged with the responsibility to comply with and maintain this code of conduct as defined in the Company's policy. An executed confidentiality agreement or non-disclosure agreement is required for third parties to view MAG's confidential and sensitive information.

## PATENTS/RIGHTS TO TECHNICAL DATA

*Any patents or rights that the applicant wishes to reserve must be identified in the application. If this does not apply to your proposal, please note that below.*

Not Applicable.

## STATE PROGRAMS AND INCENTIVES

*Any programs or incentives from the State that the applicant has participated in within the last five years should be listed below, along with the timeframe and value.*

In the past 5 years, MAG and its subsidiaries have participated in the following state programs and incentives:

- JSDC Incentive Grant: \$665,000 - documents executed July 2014; funded 2015; proceeds recognized into income in 2019
- NDIC's Grant to study BPC market analysis: \$83,810 – approved July 2018, funded 2018 (Jul and Oct), recognized into income in 2018
- NDIC Renewable Energy Fund Grant for 3D phase of CCS: awarded (to project partner Great River Energy) Nov 2019, funded \$619,347 through 2020 recognized into income 2020
- Agricultural Products Utilization Commission (APUC) grant to study feasibility of utilizing wheat straw as a process fuel to a Biomass boiler for Blue Flint Ethanol; awarded \$155,000 in July 2020.
- NDIC LRC Grant to drill stratigraphic test well: awarded 2020; \$3,388,000 + up to \$250,000 (amend #1); \$2,903,349 funded in March 2021; \$734,651 remains available; to 3/31/21
- NDIC Renewable Energy Program Grant for Seismic Survey to Advance Potential CO2 Storage in Eastern North Dakota; awarded \$324,460 in 2021. Survey activity is currently underway.

## APPENDICES

APPENDIX A  
MAG COMPANY INFO



Together, with our partners, we are building a renewable energy future for the country and bringing prosperity to our communities.



**Blue Flint—ethanol biorefinery near Underwood, ND**



**Dakota Spirit —ethanol biorefinery near Spiritwood, ND**

## **MISSION**

We provide clean energy for a better world.

## **VALUES**

We: are accountable, act professionally, behave ethically, serve customers passionately, communicate candidly, and perform safely.

## **EMPLOYEE COMPETENCIES**

The following competencies describe desired behaviors that support our values:

Engaged ∞ Ownership ∞ Communication ∞ Customer Relations ∞ Teamwork ∞

Innovative ∞ Decision Making ∞ Continuous Learning ∞ Flexibility

[www.midwestagenergy.com](http://www.midwestagenergy.com)



Midwest AgEnergy is an upper Midwest biofuels enterprise consisting of Blue Flint near Underwood, ND and Dakota Spirit near Spiritwood, ND.

Midwest AgEnergy is owned by Great River Energy and other accredited investors, including banks and international, agricultural and industrial businesses.

## Blue Flint location Underwood, ND

Blue Flint is a 73 million gallon per year ethanol biorefinery located near Underwood, ND. Blue Flint is the first co-located directly integrated biorefinery in the United States, purchasing steam from the adjacent Coal Creek Station. Its combined heat and power (CHP) design and co-location are key factors in making Blue Flint one of the most cost-effective, energy efficient and environmentally friendly plants in the country. Since Blue Flint began producing ethanol and dried distillers grains in February 2007, the plant has evolved into a biorefinery, integrating corn oil production and an E85 blending station. In addition, Blue Flint serves premium markets by achieving low-carbon designation for its ethanol.

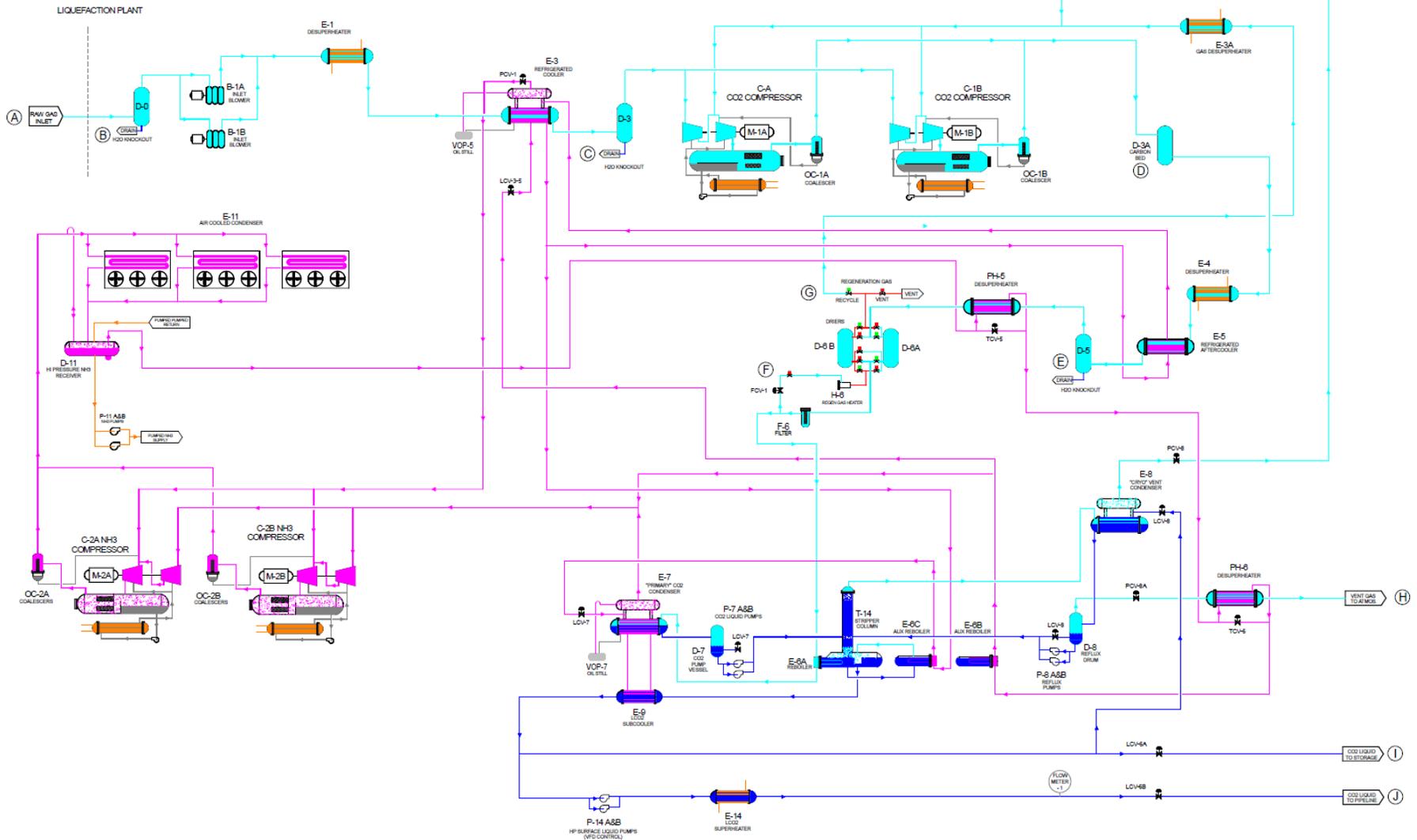
## Dakota Spirit location Spiritwood, ND

Dakota Spirit is a 75 million gallon per year ethanol biorefinery located near Spiritwood, ND. The successful operating approaches that have been proven at Blue Flint have been replicated at Dakota Spirit. The biorefinery utilizes steam and other utilities provided by Spiritwood Station to produce 70 million gallons of ethanol per year, distillers grains, and corn oil. Dakota Spirit began production in 2015 and the plant features many energy efficiencies not found in the industry, including a highly integrated distillation, dehydration, and evaporation system, making it one of the most energy efficient plants in the industry. Dakota Spirit has several low carbon certifications providing ethanol into those premium markets.

**2841 3rd St SW  
Underwood, ND 58481  
701-442-7500**

## APPENDIX B

### CCDF PROCESS FLOW DIAGRAM



■ VAPOR CO2 ■ AMMONIA ■ LUBRICANT  
 ■ LIQUID CO2 ■ PUMPED NH3  
 (A) SEE SUMMARY MASS FLOW NOTE: PUMPED PUMPED LOOP NOT SHOWN



**BLUE FLINT ETHANOL**  
**626 TPD CO2 CONDENSING PLANT**  
 PROCESS FLOW DIAGRAM - "CRYO LOOP" - REV 3  
 AUGUST 5, 2021

APPENDIX C  
FAGEN CCDF PROPOSAL

(REDACTED)



**Midwest AgEnergy**  
Blue Flint Ethanol CO2 Capture  
Underwood, ND  
October 4, 2021

**FAGEN**  
 **INC.**  
Team is what it takes.®



Team is what it takes.®

FULL SERVICE INDUSTRIAL CONTRACTOR

October 4, 2021

Mr. Adam Dunlop  
Midwest Ag Energy  
Blue Flint Ethanol  
2841 3<sup>rd</sup> St SW  
Underwood, ND 58576

**Subject: Blue Flint Ethanol CO2 Capture Project**

Dear Adam:

Fagen, Inc., along with our process partner, Salof LTD., is pleased to submit to Midwest AgEnergy, our proposal for the CO2 Capture project to be located at Blue Flint Ethanol, Underwood, ND. This proposal has been prepared based on the engineering investigation and design work conducted by Salof, I.C.Thomasson and Fagen Engineering as a result of a limited notice to proceed agreement on behalf of Blue Flint Ethanol. This team has developed a preliminary project design that has facilitated the preparation of this proposal.

From the beginning, the objective has been to provide MAG with the best, cost-effective CO2 processing solution to meet not only your operational performance goals but to also help meet your CI score targets at your plant with minimal environmental impact. We believe this system is the best approach to meeting these objectives.

Fagen, Inc's experience in ethanol plant construction, Salof's experience in CO2 processing system design and supply, and IC Thomasson's utility engineering experience is the perfect team for this project. This experience, combined with our attention to detail and collaborative approach, will ultimately lead to the most cost effective and successful project delivery for Midwest AgEnergy.

In closing, Fagen, Inc. is confident that we are the right contractor for your project and are very motivated to continue this partnership that will exceed your expectations. This proposal offers opportunities for discussion around key parts that could facilitate changes in scope and cost. If you have any questions, please reach out to our team.

Sincerely,

A handwritten signature in black ink, appearing to read "John Handel", written in a cursive style.

John Handel

# PRELIMINARY PROJECT EXECUTION PLAN



## Midwest AgEnergy

Blue Flint Ethanol CO2 Capture

Underwood, ND

October 4, 2021



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- 1.2 Project Description
- 1.3 Key Project Objectives
- 1.4 Preliminary Activities
- 1.5 Division of Responsibilities
- 1.6 Safety
- 1.7 Quality Assurance & Quality Control
- 1.8 Engineering
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### 2.0 PROJECT CONSTRUCTION

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- 3.3 Training for Plant Personnel
- 3.4 Mechanical Completion / Substantial Completion



## 1.0 EXECUTIVE OVERVIEW

### 1.1 PURPOSE

This preliminary Project Execution Plan (PEP) defines the strategies and methods used by Fagen, Inc. to execute the CO2 Capture project. This PEP is designed to delineate responsibilities, foster accountability, outline the work scope, and provide an overview of planned activities for which Fagen, Inc. is responsible. This document will be finalized by the Fagen, Inc. Operations Department upon award of project.

This PEP has been developed per the requirements of the following document(s):

- Fagen, Inc. Policy & Procedures Manual
- Fagen, Inc. QC Procedures Manual
- Fagen, Inc. Safety & Health Procedures Manual

### 1.2 PROJECT DESCRIPTION

The Blue Flint CO2 project is located in Underwood, North Dakota. The work for the CO2 package as outlined in this Project Execution Plan is anticipated to be awarded 11-1-21, substantially complete 4-1-23. The package shall include the scope as defined in the contract.

A high level scope of services associated with this project includes:

- The CO2 system will be installed in a new building located on the north side of the ethanol plant, adjacent to an existing ammonia tank. The new building will be approximately 70'-0" by 170'-0", with a total area of approximately 11,900 ft<sup>2</sup>. A low voltage electrical room will be included at one end of the building. The operating floor of the plant will be heated and ventilated, and the electrical room will be heated, ventilated, and cooled. CO2 will be routed from an existing scrubber just south of the new CO2 building. Liquid CO2 from the CO2 system will be routed from the new building to a tie-in point on the south side of the ethanol plant, near the railroad spur.

Additional detailed execution strategies and the Fagen, Inc. work plan are further detailed in the following sections of this document.

### 1.3 KEY PROJECT OBJECTIVES

A successful project is the result of a team approach based on achieving shared goals. Special emphasis must be placed on the following major goals to ensure a successful project.



## **SAFETY**

Safety must be continually and diligently monitored and enforced during all construction activities on the project. The Fagen, Inc. Health & Safety Procedures Manual is the guiding program for our employees, subcontractors and visitors to follow to ensure safe practices. Site Specific Safety plans and training provide additional guidance. Preplanning activities and adherence to our safety program is critical to ensuring day-to-day safety. Our safety goal is to execute and attain an accident/injury free project.

## **QUALITY**

Quality standards for the project are detailed in the Fagen, Inc. Quality Control Procedures Manual. This manual outlines all aspects of construction pertaining to quality fabrication and installation, through Project Substantial Completion. Our quality goal is to construct a project that demonstrates reliability, operability and maintainability for our Client.

## **SCHEDULE**

A detailed project schedule will be created around the contract milestones to ensure project success. Ongoing monitoring and evaluation of the schedule, along with analysis of the critical path, may provide the opportunity to mechanically complete the project early and allow the Client to start production. Our goal is to be on or ahead of schedule dates.

## **RISK ASSESSMENT & MANAGEMENT**

As this project progresses, the Fagen, Inc. Project Manager, Safety Director and supporting Field Management Staff will create and coordinate risk assessment analyses and reports. Critical path activities and equipment will be identified and discussed with all Field Management Staff and necessary Client contacts. The Project Manager will notify the Client of any issues and will also address how Fagen, Inc. will mitigate and/or handle the issue safely and correctly. Fagen, Inc. and the Client must work together to identify, plan and address all issues in a timely manner so as not to affect construction performance, goals or schedule.

### **1.4 PRELIMINARY ACTIVITIES**

Immediately upon project award, Fagen, Inc. will begin the pre-job planning process at our Corporate Office in Granite Falls, MN. Activities will include providing the resources necessary for administrative support, estimating, operations, safety, accounting, equipment, human resources, recruitment, etc. A project kickoff meeting will be held at the Corporate Office and will involve all applicable project team members. This project kickoff meeting will establish project execution strategies, communication and authority. Our estimate and all other information leading up to project award will also be discussed during this project kickoff meeting.

Upon Limited Notice to Proceed, Fagen, Inc. and our engineering partner will commence with activities that are critical to project success and schedule adherence.



Upon receipt of the Notice to Proceed, Fagen, Inc. and our engineering partner will commence with the full detailed engineering design and start of procurement. Blue Flint Energy will be included in the design and procurement process. Any of the preliminary designs as well as the submittals from vendors will be passed along to BFE to review and comment before finalizing the designs and equipment selection. During this phase of the project information from selected equipment vendors will be implemented into the Balance of Plant detailed engineering design to allow completion of design for the foundations, electrical distribution and piping. Also, during this period our engineering partner will prepare specifications for all of the Balance of Plant equipment and vendor packages which are required to be prepared. Upon completion of the equipment specifications, the Fagen, Inc. Procurement Department will proceed to create bid packages and solicit pricing for the Balance of Plant equipment. Our engineering partner will utilize the submittals from awarded vendors and use the data to create final detailed designs for the project.

## 1.5 DIVISION OF RESPONSIBILITIES

The general functions and responsibilities of the key Fagen, Inc. project management members are summarized below. Establishing lines of communication with these points of contact and understanding the duties and responsibilities of management staff will provide a framework for a successful project.

### Chief Operating Officer and Corporate Project Manager:

- Ultimate authority for managing all aspects of construction activities
- Coordinate labor and non-labor resources for all construction activities
- Oversee adherence to Fagen, Inc. scheduling methods and monitor scheduling reports
- Review and approve budgets, pay applications, and overall project forecasts
- Maintain positive relationships and interaction with Client, community, vendors and subcontractors
- Develop, authorize, approve, and monitor implementation the Project Execution Plan
- Enforce the Fagen, Inc. Safety and Health Procedures Manual and Site-Specific Safety Management Plan
- Enforce the Fagen, Inc. Policy & Procedure Manual
- Enforce the Fagen, Inc. Quality Control Procedures Manual and Site-Specific QA/QC Manual

### Project Manager:

- Manage and oversee all on-site activities
- Coordinate with Client on-site representatives
- Coordinate on-site procurement with Corporate Procurement Staff
- Oversee all self-performed and subcontracted work
- Manage and forecast all construction costs
- Verify accurate coding of timesheets and purchase orders
- Oversee adherence to Fagen, Inc. scheduling methods and monitor scheduling reports
- Generate and maintain all necessary reports and monthly updates
- Keep appropriate Corporate Office departments informed on all necessary information



- Maintain positive relationships and interaction with Client, community, vendors and subcontractors
- Coordinate turnover of the completed project per contract obligations
- Maintain and enforce the Project Execution Plan
- Enforce the Fagen, Inc. Safety and Health Procedures Manual and Site-Specific Safety Management Plan
- Enforce the Fagen, Inc. Policy & Procedure Manual
- Enforce the Fagen, Inc. Quality Control Procedures Manual and Project Inspection and Test Plan (ITP)

**Corporate Scheduling Department:**

- Develop and maintain the overall project schedule
- Develop payment schedules per contractual requirements
- Schedule material purchases with Procurement Department
- Oversee adherence to Fagen, Inc. scheduling methods and monitor scheduling reports
- Generate look-ahead reports per project requirements
- Create project performance projections per Fagen, Inc. and project requirements
- Monitor costs and develop project cost projections

**Corporate QA/QC Manager and the on-site QA/QC team:**

- Ensure construction operations comply with all applicable codes, standards, contracts, specifications, and good construction practices
- Oversee and coordinate quality tests and testing procedures
- Oversee and coordinate quality inspections
- Oversee and coordinate quality procedures
- Oversee and coordinate quality record keeping
- Enforce the Project Execution Plan
- Enforce the Fagen, Inc. Safety and Health Procedures Manual and Site-Specific Safety Management Plan
- Enforce the Fagen, Inc. Policy & Procedure Manual
- Enforce the Fagen, Inc. Quality Control Procedures Manual and Project Inspection and Test Plan (ITP)

**Corporate Safety Director and Site Safety Directors:**

- Develop and implement the Site-Specific Safety Management Plan
- Monitor and oversee the Site-Specific Safety Management Plan(s) from approved subcontractors
- Oversee all safety aspects of the project and assure all direct and indirect employees comply with established site safety policies and procedures
- Conduct continuous safety audits of the work areas to identify and correct safety concerns
- Conduct all site safety orientations, training, and instructions, for all direct and indirect employees
- Maintain all required safety documents for the project
- Enforce the Project Execution Plan
- Enforce the Fagen, Inc. Safety and Health Procedures Manual and Site-Specific Safety Management Plan



- Enforce the Fagen, Inc. Policy & Procedure Manual
- Enforce the Fagen, Inc. Quality Control Procedures Manual and Project Inspection and Test Plan (ITP)

**Project Engineer(s):**

- Track all quantities for the project
- Coordinate all site testing
- Coordinate distribution of all project documents
- Maintain all as-built project documents
- Oversee self-performed work (assist PM)
- Verify accurate coding of timesheets and purchase orders (assist PM)
- Assist with building and maintaining the master Primavera schedule
- Administer and grade Foreman exams and Journeyman/Helper craft exams
- Oversee the completion of all Client turnover documents per contract obligations
- Enforce the Project Execution Plan
- Enforce the Fagen, Inc. Safety and Health Procedures Manual and Site-Specific Safety Management Plan
- Enforce the Fagen, Inc. Policy & Procedure Manual
- Enforce the Fagen, Inc. Quality Control Procedures Manual and Project Inspection and Test Plan (ITP)

**Logistics Project Engineer:**

- Initiate and maintain local vendor relationships
- Derive a cost effective plan (in accordance w/ drawings and specifications) to purchase required material with assistance from Craft Superintendents
- Coordinate, forecast and oversee the delivery and use of all tools, equipment and materials required for the project in accordance with the master schedule
- Inspect for damage, quality and quantity materials received
- Unload, unpack, tag, record, and stock staged/warehoused materials received
- Monitor equipment rental costs for the project
- Enforce the Project Execution Plan
- Enforce the Fagen, Inc. Safety and Health Procedures Manual and Site-Specific Safety Management Plan
- Enforce the Fagen, Inc. Policy & Procedure Manual
- Enforce the Fagen, Inc. Quality Control Procedures Manual and Project Inspection and Test Plan (ITP)

**Craft Superintendents:**

- Oversee all craft activities
- Ensure construction is in accordance with the engineered plans and specifications
- Determine crew sizes within the project schedule and budget
- Order equipment and materials as needed to complete the scope of work
- Constantly monitor productivity and adjust accordingly



- Oversee and serve as direct contact for specific craft employees on-site
- Derive the most cost effective plan in accordance with the drawings and specifications to build the scope of work
- Assist in building and maintaining the project schedule
- Build and maintain specific craft work packages
- Assist the Project Engineer in quantity tracking and reporting
- Enforce the Project Execution Plan
- Enforce the Fagen, Inc. Safety and Health Procedures Manual and Site-Specific Safety Management Plan
- Enforce the Fagen, Inc. Policy & Procedure Manual
- Enforce the Fagen, Inc. Quality Control Procedures Manual and Project Inspection and Test Plan (ITP)

**CORPORATE CONTACTS:**

Name	Responsibility	Email
Evan Fagen	Chief Operating Officer	<a href="mailto:efagen@fageninc.com">efagen@fageninc.com</a>
Mark Neu	Corporate Safety Director	<a href="mailto:mneu@fageninc.com">mneu@fageninc.com</a>
Heath Wells	Corporate QA/QC Manager	<a href="mailto:hwells@fageninc.com">hwells@fageninc.com</a>
Amy Johnson	Corporate Procurement Manager	<a href="mailto:ajohnson@fageninc.com">ajohnson@fageninc.com</a>
Jeremy Corner	Corporate Warranty Manager	<a href="mailto:jcorner@fageninc.com">jcorner@fageninc.com</a>

**1.6 SAFETY**

Safety for this project shall be managed per the Fagen, Inc. Safety and Health Procedures Manual, which is the ultimate reference for any safety concern or situation. This procedural manual is utilized by Fagen, Inc. staff to identify, plan and manage safety during the execution of construction activities. The manual is a living document that helps ensure all construction activities are performed in a manner that will meet and often exceed OSHA standards and guidelines.

The manual will establish an outline of expectations for Fagen, Inc. employees and subcontractors and their roles and responsibilities regarding safety interfaces, safety program requirements, site-specific requirements, special plans, auditing requirements, and reporting requirements.

Fagen, Inc. understands that an open line of communication and careful planning between the Client and Fagen, Inc. is essential to safe and effective project construction. Fagen, Inc. will adhere to the Client’s operational and safety standards/requirements and our own safety requirements for the duration of this project.



Fagen, Inc. will ensure safe work practices are maintained in all areas of the project, for the duration of the project, by all employees, subcontractors and visitors. All personnel and visitors will be trained and accounted for before they are allowed to enter the work site.

The Corporate Safety Director reports directly to the COO of Fagen, Inc. The Corporate Safety Director oversees project Safety through on-site Safety Directors.

A Lead Safety Director will be assigned to the project. The Lead Safety Director will assist the Corporate Safety Director with establishing a strong safety culture for the project. The Lead Safety Director will work as part of the Fagen, Inc. Field Management Staff team, but will ultimately answer to and work directly for the Corporate Safety Director.

Safety is the responsibility of every person that enters the project site. Fagen, Inc. expects that personnel on the project will follow the safety rules and guidelines established for the project, with reinforcement provided by supervisors. The Project Safety Team will perform daily audits of the work practices being performed. Any safety issues discovered during the audits will be addressed and corrected immediately by the responsible individual(s), and Field Management Staff (FMS) will be notified. Any incidents (whether minor or serious) will be reported to the Client, COO, President/CEO, CPM, Project Manager, and Corporate Safety Director. Investigation reports will follow in a reasonable timeframe. A resolution will be included in the incident reports issued to the Client, COO, President/CEO, CPM, Corporate Safety Director and Project Manager.

Fagen, Inc. has established a Positive Safety Recognition Program (PSRP) for its employees. The program encourages employees who recognize a potentially hazardous safety situation outside their craft to report their observation to the on-site Safety staff. If the situation meets program guidelines, that employee will be entered into a weekly, monthly & potentially annual prize drawing.

The Corporate Safety Director will conduct (at a minimum) monthly safety audits and inspections of the project. The Corporate Safety Audit will be conducted in the similar manner as the site daily audits, and will include in-depth field inspections and record auditing to ensure proper documentation is maintained and established field construction practices are being followed.

Each Fagen, Inc. new hire, rehire, transfer individual coming on site will be drug tested prior to start of safety orientation and training, which includes but is not limited to the following: fall protection, pinch points, line of fire, fire extinguisher use, ladders, sign signals & barricades, LO / TO / TRY (as needed), observation training (spotters), laser level, trenching & excavating, crystalline silica, specific equipment training (as needed), hazcom / GHS, site specific requirements, and emergency action plan (EAP). The EAP is in effect once Fagen, Inc. has mobilized on site.

Daily safety training and meetings are held with all employees on site followed by stretches. A different safety topic will be discussed each day. Safety topics will be determined by relevant on-going site activities, corporate information, local/national events, etc., and will involve employee interaction. The Project Manager will also



address any relevant issues during this meeting. In addition, daily Field Management Staff meetings are held to discuss safety related issues, two-week look-aheads, weather, upcoming hire-ins, and safety orientations/trainings for Fagen, Inc. employees, subcontractors or visitors.

After the daily Fagen, Inc. safety meeting is complete, each crew will conduct a daily Job Safety Task Analysis (JSTA) Meeting. These meetings must focus on the specific activities that each crew will be performing that day. JSTA's are specific for each task employees are working on. The meetings must address all tools and equipment that will be required, along with the daily weather, EAP updates, and all dangers and hazards that must be avoided and minimized. A JSTA form will be completed during the meeting. This form will describe all work and the procedures utilized for that work. Work activities will not be modified or varied from the JSTA without following the rules and guidelines established for JSTAs in the Fagen, Inc. Safety and Health Procedures Manual. The Project Manager, Project Engineer(s), and Safety Director will rotate to different crew JSTA meetings daily to ensure that safety topics are thoroughly discussed by each craft team.

## 1.7 QUALITY ASSURANCE & QUALITY CONTROL

Fagen, Inc. is committed to building projects at the highest quality standards of the industry. Our Quality Assurance/ Quality Control (QA/QC) program has been developed to assure compliance with federal, state and local regulations that apply to our construction operations. Our employees are knowledgeable of these standards and implement quality control rules and measurements.

Through a system of measurements, tests, gauges, comparisons, and documentation, our QA/QC Program ascertains compliance with all applicable codes, standards, contracts, specifications, and/or construction practices. Our Quality Control Procedures Manual includes a checklist for each major area of construction requiring inspection. The manual defines specific areas where records and reports will be maintained and provides applicable forms. Inspections are documented so that the results will be accountable to subsequent reviews and audits. As early as possible, defects, deficiencies, discrepancies, or violations of accepted good construction practices are reported to the responsible supervisor. These reports are accompanied by suggestions for corrective action.

The Corporate QA/QC Manager is a member of the Corporate Operations Department. The Corporate QA/QC Manager oversees the project QA/QC through on-site QA/QC representative(s) who coordinate with qualified Field Management Staff. Each Craft Superintendent on a project is responsible for quality tests, inspections, procedures, and record keeping as it pertains to his or her craft. An on-site Quality Control representative is responsible to ensure all policies and procedures established in the Fagen, Inc. Quality Control Procedures Manual are followed. The site Project Engineer(s) are responsible for maintaining the cumulative documentation for the entire project.

The Corporate QA/QC Manager will conduct (at a minimum) monthly inspections of the project. The inspections include visual checks of all aspects of the project, as well as meetings with Field Management Staff to discuss



issues pertaining to quality. Fagen, Inc. will ensure all self-perform work will be in compliance with the guidelines and rules established in the respective QA/QC Manual(s).

A Site Specific Inspection and Test Plan will be initiated upon project mobilization. This plan will include activities requiring inspection, frequency of inspection, and responsibilities of all applicable parties associated with the project. The Inspection and Test Plan will be followed for the entire duration of the project to ensure that all work is completed within the project specifications and contract documents.

Goals for the Blue Flint CO2 project are as follows:

- Create a thorough inspection and test plan which will incorporate all applicable codes, industry standards, and project specifications.
- Establish guidelines to follow for all construction activities to minimize construction deficiencies.
- Provide a complete Client Turnover Package at project completion.
- Achieve Final Completion without any construction warranty claims.

The Client shall receive quality assurance binders that will provide documentation for the quality craftsmanship of the finished project. The binders will be a complete and accurate representation of the installed product(s) showing all levels of construction completed.

## 1.8 ENGINEERING

Fagen, Inc. will work closely with the Client to establish communication protocols for receipt of drawings, transmission of documents, submission of RFIs, maintenance of drawing logs, and creation of red line drawing records through the use of Procore Documentation Manager. At project completion and in accordance with the contract requirements, Fagen, Inc. will turn over the engineering redlines of the facility.

### Design Phase Services

- 1.1. Attend a virtual kick-off with BFE personnel to review the design criteria and establish procedures for execution of the project.
- 1.2. Review submittals from the Suppliers during the equipment design and manufacturing.
- 1.3. Mechanical process, HVAC, plumbing, and fire protection design services for the project, including the following.
  - 1.3.1. Develop Piping and Instrumentation Diagrams (PID) for ethanol plant interface to the CO2 system.
  - 1.3.2. Develop site plan and detail drawings illustrating the distribution of compressed air, wastewater, power, and CO2.



- 1.3.3. Develop general arrangement plan and section drawings illustrating the location of all new equipment, components, piping, and ducts within the CO2 building.
- 1.3.4. Develop piping plan, section, and detail drawings illustrating compressed air, wastewater, and CO2 to and from the Salof system.
- 1.3.5. Develop piping support plan and detail drawings illustrating the location of all piping supports, and the details of construction for the pipe supports.
- 1.3.6. Develop a life safety plan for the CO2 building.
- 1.3.7. Develop fire protection plans, sections, and detail drawings illustrating the fire protection requirements for the CO2 building.
- 1.3.8. Develop fire protection schedules for the sprinkler system.
- 1.3.9. Develop underground plumbing plan and detail drawings illustrating the underground drain piping for the CO2 building.
- 1.3.10. Develop aboveground plumbing plan and detail drawings illustrating the aboveground plumbing for the CO2 building.
- 1.3.11. Develop plan, section, and detail drawings illustrating all new Heating Ventilation and Air Conditioning (HVAC) systems for the CO2 building.
- 1.3.12. Develop mechanical schedules for the equipment and supporting systems.
- 1.3.13. Develop technical specifications for the mechanical process systems, HVAC, fire protection, and plumbing portions of the project.
- 1.4. Electrical design services for the project including the following.
  - 1.4.1. Develop medium voltage electrical one-line drawings illustrating the medium voltage switchgear design and relaying specifications and interconnection to the existing site distribution.
  - 1.4.2. Develop low voltage electrical one-line drawings illustrating the new low voltage switchgear; Motor Control Centers (MCC); and power distribution to the new motors, distribution panels, DC battery system and Uninterruptible Power Supply (UPS) within the CO2 building.
  - 1.4.3. Develop site utility plan and detail drawings illustrating the duct bank routing from the CO2 building to the existing sub-station.
  - 1.4.4. Develop electrical power plan drawings illustrating conduit and wiring from the MCC to the new motors, and from distribution panels to the HVAC equipment, lighting, and receptacles in the CO2 building.
  - 1.4.5. Develop MCC layout drawings.
  - 1.4.6. Develop electrical schedules for all power distribution panels, MCC, and lighting fixtures.



- 1.4.7. Develop motor control schematics for the motor starter controls, as necessary.
- 1.4.8. Develop electrical site plans and details illustrating exterior lighting around the CO2 building.
- 1.4.9. Develop site grounding plans for the CO2 building.
- 1.4.10. Develop interior lighting plans for the CO2 building.
- 1.4.11. Provide fault current studies, protective device coordination studies, and develop preliminary relay settings for the final selected equipment within the CO2 building.
- 1.4.12. Develop technical specifications for the electrical portion of the project.
- 1.5. Instrumentation and controls design services for the project including the following.
  - 1.5.1. Develop a control system architecture drawing illustrating the network layout for the control system and general control panel requirements.
  - 1.5.2. Develop instrument plan drawings illustrating the location of all instrument field devices and wiring to the control panels, and network wiring connections for control systems and control consoles.
  - 1.5.3. Develop control system loop diagrams for the interconnection to remote I/O panels.
  - 1.5.4. Develop instrument installation detail drawings for field devices.
  - 1.5.5. Develop instrument data sheets for all field devices not included in vendor packages.
  - 1.5.6. Develop instrument and wire lists for all field instruments.
  - 1.5.7. Develop technical specifications for the instrumentation and controls portion of the project.
- 1.6. Participate in design coordination and progression conference calls every week with Fagen BFE personnel.
- 1.7. Participate in two (2) virtual design review meetings with BFE personnel. Design review meetings will be conducted at the conclusion of the Design Development (60%) and Construction Documents (100%) phases of the design.

#### **Construction Administration Phase Services**

- 2.1. Respond to written Requests for Information (RFI) during the construction phase of the project.
- 2.2. Review submittals during the construction phase of the project.
- 2.3. Participate in weekly construction progress conference calls with BFE personnel.
- 2.4. Three (3) trips to the construction site, for one day on site each trip, to observe the installation during construction. Each trip will be scheduled to coincide with the regularly scheduled construction progress meetings. After each on-site visit, a job observation report will be submitted that identifies any items discovered by the observer that are not in accordance with the construction documents.



- 2.5. Provide electronic CADD files in AutoCAD® and Adobe® format, of record drawings at the conclusion of construction. The record drawings will include any changes marked on the drawings by the installing contractors during the construction.

## 1.9 PROCUREMENT

Fagen, Inc. follows a defined set of internal policies and procedures that govern our procurement practices for all projects. The Fagen, Inc. Corporate Procurement Department is ultimately responsible for implementation of these procedures. The Procurement Department coordinates with Field Management Staff to procure subcontracts and materials that ensure a successful project. Our standard contractual documents are made project specific when purchasing begins. The following departments sign-off on documentation pertaining to their department: QA/QC, Safety, Warranty, and Scheduling for lead times, etc. Fagen, Inc. consistently purchases on budget, on schedule and to the specifications of the project.

### OBTAINING BIDS

The Procurement Department will solicit quotations from prequalified vendors for items and subcontracts that are being purchased.

The Fagen, Inc. Field Management Staff with purchasing authorization can issue purchase orders up to \$50,000.00 in the field. The authorized field buyer may purchase consumables, electrical materials and bulks. The authorized field buyer will not purchase any major equipment or tagged items. All items purchased in the field up to \$50,000.00 will require sign-off by the Project Manager and Procurement Department Manager. All field items over \$50,000.00 are handled by the Corporate Procurement Department and are signed off by the following staff: Corporate Project Manager, Project Manager and Procurement Department Manager. Depending on what is being purchased, the following individuals/departments may also have to sign off: COO, EVP/QC Manager, Safety Director, Warranty Manager, Estimating Lead and Scheduling Lead.

A commercial review will be completed by the Procurement Department on all major purchases to compare the offering from the bidders. The commercial/technical review will be combined for the sake of time. The following items will be reviewed: bid tabs, actual proposals, what is being offered versus project specifications, any supplier-suggested alternates, lead times, pricing, freight, taxes, cut sheets, data sheets and drawings if applicable. All will be submitted together as a package and will be emailed through Procure before the award of the package. Final drawings/cut sheets will be submitted after award through the submittal tab in Procure and released for manufacturing upon approval as appropriate per the contract.

All material purchased will meet the specifications of the project, along with meeting the project schedule.



### **SUBCONTRACTS & PURCHASE ORDER DOCUMENTATION**

The Fagen, Inc. standard subcontract agreements will be used for subcontracts. Fagen, Inc. will enter into written agreements with our subcontractors and suppliers with the required flow-down provisions per the contract agreement. Purchase orders and subcontracts will be released upon appropriate approvals.

### **CHANGE ORDER PROCESS**

Throughout the duration of a project, it may be necessary for Fagen, Inc. or a subcontractor to deviate from the original scope of work or contractual requirements. When this occurs, a change order is used to modify the contract amount and/or contract time. Any Client change orders that occur during the procurement process will follow the contract agreement. No material purchase orders or subcontracts will be issued by Fagen, Inc. for changes in scope unless there is a mutually acceptable signed change order in hand.

### **TECHNICAL REVIEW / SUBMITTALS**

All submittals, RFI's and transmittals associated with technical reviews, commercial reviews and engineered deliverables will be submitted through Procore and logged in our system. Once all items are approved and purchased, a final submittal will be sent, stored in Procore and distributed as appropriate. No equipment will be released for manufacturing until drawings/cut sheets, etc. are approved by the Engineer of Record. Typical turn around for Engineered Deliverables is 10 working days.

### **DELIVERABLES FOR PURCHASE ORDERS & SUBCONTRACTS**

The following deliverables (if applicable) are required for contracts with Fagen, Inc.:

- O&M manuals
- Site Specific Safety Management Plan
- Drug screen results
- QA/QC Procedures Manual
- Electrical schematics
- SDS sheets
- Storage requirements
- First fill requirements
- Test procedures
- Test reports
- Reporting practices
- As-builts / redlines
- Calibration sheets
- Spare parts listing
- Warranty information
- Shipping data
- Schedule



- Commodity curve reporting
- Quantity reporting
- Manpower curves
- Contractor qualifications

#### **TRACKING EQUIPMENT & MATERIAL PURCHASES**

Fagen, Inc. tracks the status of all equipment (whether purchased by Fagen, Inc. or by the Client) from purchase to delivery. Fagen, Inc. utilizes an equipment spreadsheet to track this status. This form is created by our Corporate Procurement Department and stored in Procore. From there it is continually updated and maintained by both the Corporate Procurement Department and by authorized Field Management Staff. It is updated by the authorized field buyer with any and all comments on delivery, O&M manual updates, storage notes, and when the item is sent to the field to be installed. The Procurement Department updates the document with shipping information, purchase order information, contact information and anything else applicable to the item being purchased.

#### **RECEIVING AND STORAGE OF EQUIPMENT**

The Fagen, Inc. receiving team and QA/QC team provide support for proper storage and preservation of all equipment on site. Policies are in place for all permanent plant equipment. Permanent equipment is defined as equipment and/or material used as part of the permanent facility, or having a direct impact on the quality of completed work and/or field services. Our procedures account for storage of material and components delivered to the site and provide maintenance practices for all permanent plant equipment and/or material to be incorporated into the final product.

### **1.10 SCHEDULING & REPORTING**

Fagen, Inc. scheduling policies and programs ensure that our projects meet all deadlines. The Corporate Scheduling Department utilizes the latest in scheduling software, Primavera P6 version 16.2, to develop the initial project schedule. The Primavera scheduling software allows us to issue PDF copies directly to the Client per the project requirements. The Corporate Scheduler gathers input from the Client, Engineering, Project Manager, Chief Operating Officer, Corporate Project Manager, Procurement Department, Superintendents, Engineering Manager, Project Engineers, subcontractors and vendors.

The Project Team will develop the project's Work Breakdown Structure (WBS), planned sequence of activities, major milestones, and project master schedule. After the WBS is established, the project will be broken down by major areas, sub-areas, craft, or combination of the three.

The project schedule is a dynamic tool that allows Fagen, Inc. to effectively schedule and coordinate activities in the most effective manner for this project per the contract terms. It will provide a time-line of the entire project including any baseline schedules that could be used to compare current project progress with an original target schedule.



Upon completion of the project estimate, the Lead Estimator will issue their detailed breakdown in a Microsoft Excel format which can be uploaded into the P6 schedule. This information will establish a base set of quantities and manhours which will be used to track rates of progress against the baseline project schedule.

During construction, the Project Scheduler will maintain and update the project schedule on a weekly basis. The Corporate Operations Department has access to view and monitor the schedule. The Project Scheduler will gather information from the vendors and subcontractors weekly and update as necessary.

Subcontractors on the project site will be responsible for developing their initial schedule(s). These schedules must be built using the master project schedule format to ensure uniformity. The subcontractor milestones will be loaded into the master schedule. All subcontractors must provide updated schedules weekly to the Project Scheduler. For any subcontractor activity that may result in a delay, the subcontractor will be required to submit a schedule recovery plan. All schedule recovery plans must be accepted by the Project Manager.

Before the project is mobilized, the fully manloaded schedule is used to build the production tracking sheet and to build the time tracking sheet for the project. At the start of the project, it is established that all activities from here on out will be planned and tracked using this document. All information traces back to the schedule. This ensuring uniform tracking, which allows us to compare the project's performance to schedule and budget. The sites can update one document, which can translate back to our schedule and production tracking. From here various reports are produced weekly including, but not limited to, our Earned Value Summary Curves, Project 3-Week Look ahead, Overall Project Schedule, and Top Three Critical Path. Issuing these documents weekly allows all team members on the project to review and verify progress on the project, and using our Earned Value system allows us to verify the project schedule is maintained. In addition to p6, we utilize Deltek Acumen Fuse, which can perform a review to the quality of our schedule and also produce virtually any contractual report required by Owners, Investors, banks, etc.

### **1.11 COST CONTROL/EARNED VALUE ANALYSIS**

Upon completion of the project estimate, the Corporate Scheduler will enter the budgeted manhours into the respective activities within the schedule, providing a fully manloaded schedule. From here we will export from p6 and develop a Production Tracking spreadsheet to be used for monitoring of actual progress to date vs. spent progress to date.

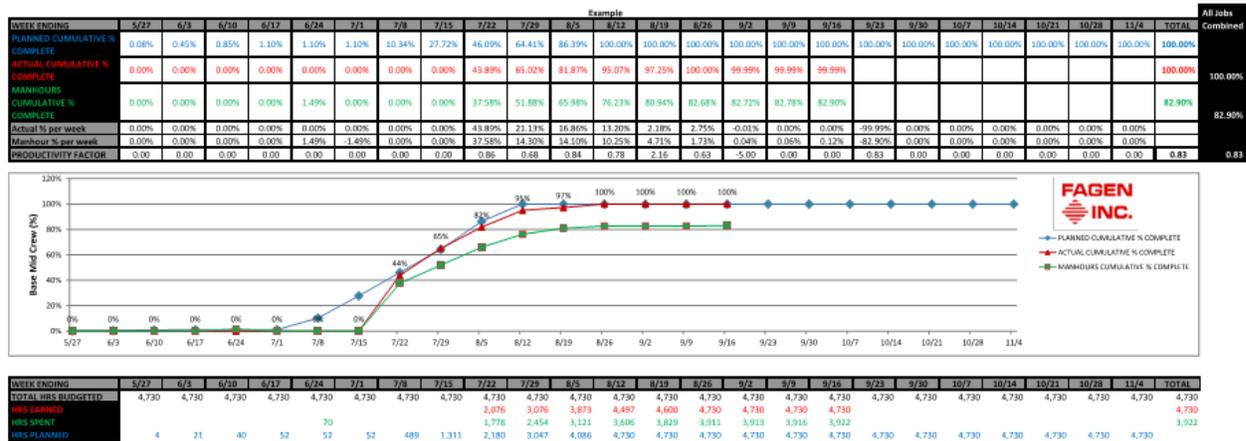
Using this spreadsheet, we develop a "smart code" for our timesheets. The timesheets are entered daily and total hours spent can be input back into the Production Tracking sheet at any given time, but weekly at a minimum.

Using progress curves developed from the manloaded schedule, we input actual progress earned and spent to compare performance to the baseline schedule. This information is distributed to the project team weekly and submitted monthly on the Monthly Report.



The key to Project Controls is to have an established WBS on the project, and all inputs must be built following this WBS. Communication during the development of the schedule and estimate allow our teams to work toward the same goal. This step is closed up by tracking our time and production to the same WBS, allowing us to review and trend not only budget performance, but also schedule performance on all of our projects.

Below is an example of the Earned Value Summary Graph produced weekly for the site teams.



### 1.12 CHANGE MANAGEMENT

The Fagen, Inc. team will use every resource necessary to limit and avoid possible scope changes and change orders. While we understand that sometimes changes are unavoidable, we have developed a uniform procedure for processing changes that will help eliminate frustration and confusion that can often happen with projects of this type and size. First of all, as established in this PEP and the Fagen, Inc. Policy & Procedure Manual, no change of work shall occur without written authorization from the Client. Additionally, as changes in the scope reveal themselves, the Client will be notified per the terms of the Contract. Whether the change in work is requested or discovered by the Client or Fagen, Inc., the same procedures and steps will be followed to ensure consistency and uniformity.

### 1.13 DOCUMENT CONTROL

Fagen, Inc. will utilize Procore for the document control management system. The Project Engineer will access all construction documents from Procore and issue those to the appropriate supervision for construction.

Drawings will be received via electronic document software by Corporate Document Control, which is responsible to distribute and catalog these drawings in Procore. Drawings will be organized by



Engineer/Discipline/Equipment as appropriate by the project nomenclature so drawings are easy to locate for procurement and construction. Corporate Document Control will be responsible for distributing these drawings via electronic transmittal on Procore to appropriate project personnel upon receipt.

The Project Engineer will be responsible for maintaining a hard copy set of drawings and distributing hard copy drawings to each of the craft superintendents and subcontractors as appropriate.

Record and as-built drawings are maintained at all times during construction. The set of marked-up drawings (as-built or redlines, per the contract), as marked by Fagen, Inc. will be retained in the Project Hard Copy File. At project completion, the Project Engineer will submit a set of as-built or redline drawings to the appropriate Client contact per contractual obligations. Redline documents will be electronic PDF documents clearly showing all red-lines in red.

All construction and as-built/redline drawings are maintained, tracked, and distributed through our onsite Document Control Center. Fagen, Inc. has developed uniform procedures for the receipt, distribution, and maintenance of all project technical documents. While the Project Engineer will administer these procedures, the Project Manager is ultimately responsible for the implementation and adherence of these procedures on the project.

The Project Engineer is responsible for the day-to-day coordination of the document control procedures. The Project Engineer will verify all received documents for the proper approvals and then date stamps and files the documents. The Project Engineer is responsible for distributing the approved new or revised drawings to the appropriate Craft Superintendent. The Project Engineer continuously audits all sets of drawings to ensure that all sets are current.

## 1.14 COMMUNICATION & TRAINING

Fagen, Inc. believes that the success of our employees is directly related to our commitment to great communication, training and employee advancement opportunities within our organization. The Operations Department employs a number of strategies to ensure that policies and procedures are understood and adhered to at the project level, such as hands-on position training, annual position specific training, Field Management Staff training, and craft testing. This translates into projects that are managed safely, cost-effectively, and with quality craftsmanship.

The Corporate Office will conduct monthly inspections of the Project. The inspections are generally conducted by the Corporate Project Manager, Quality Control & Assurance Manager, Corporate Safety Director, and Corporate Scheduler. The inspections include visual checks of all aspects of the project, as well as meetings with Field Management Staff to discuss project status and production rates.

The Operations Department and Safety Department also publish newsletters for Field Management Staff that address common topics and provides direction for improved performance.



### 1.15 PERMIT COMPLIANCE & LICENSING

Prior to project mobilization, Fagen, Inc. shall obtain and provide all applicable federal, state, and local licenses and necessary local construction permits to perform the scope of work per the project requirements. While the license and permit process is initiated by the Corporate Licensing Manager, the Project Manager is responsible to follow through and maintain compliance with all licensing and permitting requirements. Fagen, Inc. currently possesses all necessary licenses to perform this scope of work.

### 1.16 INVENTORY & EQUIPMENT STORAGE, MAINTENANCE & CONTROL

Fagen, Inc. has established uniform procedures for receiving, inspecting, tagging and tracking all materials and equipment. Field Management Staff maintain daily logs, reports and inspection records on these transactions and reports this information to the Project Manager. The Logistics Project Engineer and assistants are responsible for the laydown and staging yard areas. Equipment and material that is to be temporarily stored within those limits will be inventoried upon arrival and inventoried upon release to the field for installation.

The Logistics Project Engineer and other Project Engineers will share responsibility to ensure that the QC requirements are maintained for all equipment and materials under the control of Fagen, Inc. Before we accept possession of any piece of equipment or material, it will be inspected for deficiencies. All storage requirements will be noted on an inspection document to ensure proper care is maintained up to and through installation.

### 1.17 PROJECT REFERENCE SYSTEMS

Project reference systems will be standardized as much as possible. The project reference systems are:

- Primavera for scheduling
- Procore for Project Document Control
- ECMS for accounting and project cost reports
- Lotus Notes for email

### 1.18 STAFFING REQUIREMENTS

At Fagen, Inc. we believe our people make the difference. Our Field Management Staff is comprised of professional, experienced and dedicated Project Managers, Project Engineers, Project Schedulers, QA/QC Managers, Office Managers, Craft Superintendents, Safety Directors and Crane Operators. These management teams have worked on several Fagen, Inc. projects, from mobilization to startup. They have the expertise to deliver a project on time and on budget.



Our policy of zero tolerance for drugs, along with our high selection standards, aids us in recruiting only the finest craft workers in the industry. Our large database of current and past employees from across the country gives us the flexibility to mobilize a qualified workforce quickly. Centralized recruiting gives us total control over placement issues. With tight control we are less likely to have repeat workers compensation and personnel issues that can affect a project.

Centralized recruiting also gives us the advantage to mobilize personnel to the project in an expedient manner. The schedule will provide a manpower curve which will be issued to personnel recruiters in the Human Resource Department. This provides an estimate of manpower requirements as the project progresses. If the project requires additional manpower to complete a task early or recover from delays, the Project Manager and Craft Superintendent will include the number of workers required in their recovery/schedule modification plan and submit to the personnel recruiters.

Our Field Management Staff and craft workers have many years of heavy industrial construction experience, including wind farms, ethanol, conventional power, biomass power, and multiple other industrial markets. Most of our management staff has been promoted from within and have worked on Fagen, Inc. projects for many years, sometimes decades. This results in highly qualified crews that are familiar with Fagen, Inc. safety and quality standards.

## 2.0 PROJECT CONSTRUCTION

### 2.1 MOBILIZATION & PRE-CONSTRUCTION

Fagen, Inc. will achieve the mobilization date required to maintain the established schedule. Upon mobilization, the Fagen, Inc. Field Management Staff will begin the setup of temporary facilities and the notification of vendors, local authorities, utilities, etc. The Fagen, Inc. Information Technology Department will assist with mobilization to the project site so the proper networks can be set up and ready for use within the first week of mobilization. During mobilization, only limited staff will be on site working from trucks.

Key factors to an expedient mobilization are as follows:

- Team assembly and job placement notifications
- Establishing temporary facilities, including the following:
  - Office trailers
  - Laydown yard installation
  - Power
  - Internet and phone lines
  - Computer and associated hardware
  - Office Supplies



- Document Control Center

Fagen, Inc. will use our vendor database and current contacts to assist in establishing accounts and project suppliers for typical mobilization requirements. Due to our past projects in the vicinity, we have already established which vendors and suppliers are reliable, cost effective, and efficient. This will shorten the technical side of mobilization and ease the pressure of securing quality service and equipment.

Prior to full mobilization to the site or any ground disturbance, Fagen, Inc. will invite the Client, engineering, subcontractor management teams, major equipment suppliers and Fagen, Inc. staff to a pre-construction meeting located either near the site or another agreed-upon location.

In this pre-construction meeting we begin with safety discussions to ensure that all parties understand the safety requirements of the project and what will be expected of them. We will discuss any culturally sensitive areas, BLM land and locations, endangered species, wetlands, project boundaries, land owner restrictions or rules, possible fire hazards and mitigations and any underground or overhead known utilities on the project. These areas will be identified either by barricades or installed signs as reminders and regular discussion topics at our daily onsite meetings.

Also, during this pre-construction meeting, all project delivery and concrete truck routing will be reviewed and finalized by the Client and Fagen, Inc. Signs and traffic control will ensure that approved routes will be followed during construction of the site.

## 3.0 PROJECT COMPLETION

### 3.1 PREPARING FOR DEMOBILIZATION

As each craft completes their scope of work, preliminary punch lists will be generated by each Craft Superintendent, Project Engineer, and finally the Project Manager. These deficiency lists will consist of aesthetic appearance, quality assurance, and engineering conformity.

Our strategy for this project will be to complete demobilization tasks as work progresses. As the work progresses and enters into different stages, manpower and equipment will be released. This will provide a more efficient demobilization. After completion of the project, Fagen will meet with the appropriate client contacts to assure all project obligations have successfully been met.



### 3.2 COMMISSIONING

Based on the schedule developed during the planning stages of the project, a date will be determined for mobilization of the Commissioning Team. The Commissioning Manager will develop a turnover sequence for the project based on the plant's system startup schedule. This turnover sequence will be implemented into the overall project schedule. Each turnover package will be marked up on the P & IDs. As the installation nears completion, commissioning teams for each discipline will mobilize. The Craft Superintendent for each discipline will be responsible for turning over documentation to the Commissioning Team for each package upon completion.

The commissioning phase of the project will start off with the implementation of daily commissioning meetings. The Commissioning Manager will lead these meetings and update construction and plant operations on the plan of the day. These meetings will be an opportunity for BFE personnel to gain hands-on knowledge of where the activity will be each day as the plant comes online.

During the commissioning phase, the commissioning team (under direction of the Commissioning Manager) will walk down each construction turnover package to verify completion and assist in the creation of a punchlist. The outstanding punchlist will become part of the overall project punchlist.

Upon verification of completion of work, the Commissioning Team will then proceed to complete loop checks, lube oil flushes, verification of motor rotation and coordinating with equipment vendors for services necessary to bring the plant on line. As commissioning tasks are completed, they will be documented in the Startup Turnover packages. The Startup Turnover packages will include all the necessary documentation to show a system has been commissioned per the operation and maintenance manual and that a system is safe and ready to operate. Upon completion of a system startup, the Commissioning Team will submit the Startup Turnover packages to the BFE operations personnel. At this point the system will be declared commissioned and ready to operate.

### 3.3 TRAINING FOR PLANT PERSONNEL

During the pre-commissioning phase of the project, a training program will be implemented. Training will include both proper operation of equipment and necessary maintenance. The training program for the Blue Flint CO2 project will be assembled based on input from along with recommendations from equipment vendors.

Fagen, Inc. will assign a Training Coordinator who will serve as part of the Commissioning Team to coordinate the schedule and logistics of training. The training will include both classroom instruction and plant walk downs. Classroom sessions will start with the BOP engineer providing a week-long class introducing the plant operators and maintenance personnel to the overall plant design and how the plant is intended to operate.

This will be followed up with additional training sessions by each of the major equipment vendors. These training sessions will include a mixture of both classroom time and field time as determined by each vendor.



Blue Flint plant maintenance staff will be given hands-on training on proper maintenance of the equipment by each major vendor. Durations for each vendors training will be determined as part of the EPC agreement.

### **3.4 MECHANICAL COMPLETION/ SUBSTANTIAL COMPLETION**

Upon Project Mechanical Completion being accepted, Blue Flint and Fagen, Inc. will conduct a project-wide punchlist prior to Project Substantial Completion. The Punchlist will be agreed to by both parties and attached to the Project Substantial Completion Certificate upon submission.

Once Substantial Completion is deemed to be accepted, Fagen, Inc. will diligently complete any remaining punchlist items to achieve Project Final Completion.

Complete job books of all installed work, along with all installation checklists, testing information and OM manuals for BOP equipment, will be turned over to the Client per the terms of the agreement.

Fagen, Inc. will meet with the appropriate Client contacts to ensure all project obligations have been successfully met.

APPENDIX D  
LETTERS OF SUPPORT



STATE OF NORTH DAKOTA  
DEPARTMENT OF AGRICULTURE  
600 E BOULEVARD AVE, DEPT 602  
BISMARCK, ND 58505-0020

DOUG GOEHRING  
COMMISSIONER

October 11, 2021

Mr. Al Anderson  
Executive Director  
Clean Sustainable Energy Authority  
State Capital 14<sup>th</sup> Floor  
600 East Boulevard Ave. Dept 405  
Bismarck ND 58505-0840

Dear Mr. Al Anderson:

I am writing in support of the grant application from Midwest AgEnergy Group that will allow for completion of their project at the Blue Flint Ethanol facility to sequester CO<sub>2</sub> into permanent underground storage. As the North Dakota Agriculture Commissioner this project is important to the long-term viability of Blue Flint Ethanol and the farming economy in North Dakota.

Midwest AgEnergy Group has invested significant resources into feasibility studies, a stratigraphic test well, and subsurface modeling to demonstrate that this project will be successful in achieving safe long term underground storage of CO<sub>2</sub>. Their project is well developed and positioned to be at the forefront of demonstrating underground CO<sub>2</sub> storage in central North Dakota. Midwest AgEnergy has a strong history of innovation and production of low carbon biofuels. We have observed their positive impacts to the farming community by providing a consistent market for corn and quality feed products.

We support Midwest AgEnergy's Clean Sustainable Energy Authority grant application that will aid in assisting completing and commissioning a Class VI storage well and associated capture, compression, dehydration equipment needed to complete the project. The success of this project will be incredibly valuable to the agricultural producers in North Dakota and provide proof of concept to advance future carbon storage efforts across our state in all energy sectors.

Developing long-term strategies to mitigate CO<sub>2</sub> emissions, such as this project, is an integral part of our nation's energy and agriculture future.

I give this project my support and look forward to its completion. If you have any questions, please feel free to contact me at 701-391-3367.

Sincerely,

Doug Goehring

North Dakota Agricultural Commissioner



PO Box 2136 • 1415 12th Ave SE  
Jamestown, ND 58401  
800-366-8331 • 701-252-2341  
ndfu.org

October 13, 2021

Mr. Al Anderson, Executive Director  
Clean Sustainable Energy Authority  
State Capitol 14th Floor  
600 East Boulevard Ave. Dept 405  
Bismarck ND 58505-0840

RE: Support of Midwest AgEnergy CSEA Grant Application for Completion of CO2 Underground Storage

Dear Mr. Anderson:

North Dakota Farmers Union (NDFU) represents more than 50,000 farm and ranch families and their energy and agriculture supply cooperatives. We are the largest general farm organization in the state.

This project is important to the long-term viability of Blue Flint Ethanol and the farming economy in North Dakota. We want to express our support for the grant that will allow Midwest AgEnergy Group to complete their project at the Blue Flint Ethanol facility to sequester CO2 into permanent underground storage.

Midwest AgEnergy Group has invested significant resources into feasibility studies, a stratigraphic test well and subsurface modeling to demonstrate this project will be successful in achieving safe, long-term underground storage of CO2. Their project is well developed and positioned to be at the forefront of demonstrating underground CO2 storage in central North Dakota. Midwest AgEnergy has a strong history of innovation and production of low carbon biofuels. Over the years we have observed their strong dedication to stewardship of our natural resources and community outreach efforts.

We support Midwest AgEnergy's Clean Sustainable Energy Authority grant application which will aid in completing and commissioning a Class VI storage well and associated capture, compression and dehydration equipment needed to complete the project. The success of this project will be incredibly valuable to the agricultural producers in North Dakota and provide proof of concept to advance future carbon storage efforts in our state across all energy sectors.

Developing long-term strategies to mitigate CO2 emissions, such as this project, is an integral part of our nation's energy and agriculture future. We encourage your support of this project and look forward to its completion.

Sincerely,

NORTH DAKOTA FARMERS UNION

A handwritten signature in black ink that reads "Mark Watne".

Mark Watne  
President



APPENDIX E  
EERC COMPANY INFO

## **EERC Background/Overview with Oil and Gas and CO<sub>2</sub> Storage Focus**

The Energy & Environmental Research Center (EERC) is a research, development, demonstration, and commercialization organization recognized as one of the world's leading developers of cleaner, more efficient energy and environmental technologies. The EERC has a proven track record working with industry to develop and deploy a wide range of innovative and synergistic technologies. Since the EERC became a part of the University of North Dakota (UND) in April 1983, it has established working relationships with over 1300 different entities, including federal and state agencies such as the U.S. Department of Energy (DOE), universities, energy exploration and production companies, research and development firms, engineering firms, and other organizations, representing 53 countries. The EERC employs over 200 people and is expanding its staff. This staff includes a diverse multidisciplinary team of engineers, geologists, and other scientists with extensive research and operational experience and cross-training. The EERC has expertise in data collection, management, and interpretation; petrophysical analysis; geostatistical analysis; geocellular modeling at field and regional scales; geologic characterization and reservoir evaluation; conducting predictive numerical injection and production simulations; performing fossil fuel and CO<sub>2</sub> storage resource assessments; and creating geographic information system (GIS) products.

The EERC has a specialized technical group focused on the implementation of new approaches to the exploration, development, and production of oil and gas resources and geologic CO<sub>2</sub> storage. Working closely with industry and government agencies, this group has developed tools and approaches specifically focused on resource assessment and optimization with a focus on commercial application of technology. Practicing under the long-standing EERC philosophy of collaboration with an interdisciplinary approach, the group's success is based on developing effective partnerships with energy and environmental industries and government agencies.

The EERC has a proven track record of conducting small- and large-scale projects that meet the needs of its clients. Projects can range in size and scope from singularly focused, fast-tracked projects for individual clients, to multiyear, multimillion-dollar programs with multiple stakeholders. Projects successfully conducted in the past include studies focused on the Powder River, Denver–Julesburg, Williston, and Alberta Basins. Extensive databases of petroleum-related characteristics for the basins have been created, including web-based decision support systems (DSSs) for CO<sub>2</sub> storage and enhanced oil recovery (EOR) opportunities and the unconventional Bakken resource play. These web-based systems use GIS, are based on existing geological and engineering data sets, and are tailored to aid in the identification and, ultimately, development of new oil and gas exploitation and CO<sub>2</sub> storage opportunities in the central interior of North America.



# Carbon Capture, Utilization, And Storage

## CCUS Research, Development, and Deployment

The Energy & Environmental Research Center (EERC) is working with key stakeholders to develop CO<sub>2</sub> mitigation solutions. Carbon capture, utilization, and storage (CCUS) can provide a proven option for utilities and other industries seeking to combine greenhouse gas (GHG) mitigation with operations, creating market advantages and opportunities for the use or sale of captured CO<sub>2</sub>.

At the EERC, we conduct applied research for all stages of CO<sub>2</sub> capture and geologic storage projects, from technology demonstrations and regional assessments to detailed site appraisals in support of CCUS deployment. We successfully design and deploy CCUS technologies, including projects at the industrial scale, forming effective partnerships with industry.

Our expertise and extensive experience encompass associated storage incidental to enhanced oil recovery (EOR) operations and dedicated storage in deep saline formations. Capabilities also extend to potential storage in unconventional oil and gas reservoirs and other subsurface scenarios, such as deep unminable coal seams.

### Carbon Capture

We have the equipment and expertise to evaluate and develop CO<sub>2</sub> capture systems. Several of our highly adaptable pilot-scale systems can produce combustion flue gas and gasification syngas from virtually any fuel (all coal ranks, liquids, and gases) for testing of postcombustion and precombustion CO<sub>2</sub> capture and separation technologies.

Capture and separation have been successfully demonstrated at Minnkota Power Cooperative's Milton R. Young Station near Center, North Dakota, as part of Project Tundra. The project has received additional federal and state funding and is moving ahead to a front-end engineering and design (FEED) study.

### Carbon Utilization

We conduct multidisciplinary research to demonstrate the potential for CO<sub>2</sub>-based EOR and associated storage in the unconventional tight Bakken petroleum system, which has the potential to produce over 600 billion barrels of oil. We developed an innovative method to determine the ability of CO<sub>2</sub> to permeate the Bakken's tight formation and mobilize oil, yielding new insight into the chemical and physical mechanisms of CO<sub>2</sub> storage and EOR in these types of formations.

North Dakota CarbonSAFE research has proven the feasibility of CO<sub>2</sub> use for EOR in both conventional and unconventional oil fields. The EERC has shared involvement in other states' CarbonSAFE studies as well, yielding positive results in multiple types of geologic formations.

### Carbon Storage

We have investigated CO<sub>2</sub> geologic storage at all levels, from regional assessments to detailed site appraisals, in support of CCUS deployment. Our expertise encompasses CO<sub>2</sub> storage incidental to EOR operations and dedicated storage of CO<sub>2</sub> in deep saline formations.

The Red Trail Energy Carbon Capture and Storage Project is assessing the ability to inject captured CO<sub>2</sub> from its ethanol plant into two potential sandstone layers for permanent storage.



## Services and Solutions

- Pilot-scale testing and evaluation of capture technology:
  - System is portable and can be installed on-site.
- Long-term demonstration of solvent performance and impurities management.
- Modeling and assessment of integration approaches.
- Techno-economic evaluations of capture technologies.
- Technical support for large-scale capture demonstration.
- Proven adaptive management approach for deployment of storage, both in deep saline formations and associated with EOR.
- Expertise to develop cost-effective technical programs:
  - Site characterization including field and laboratory testing and evaluation of geologic, geophysical, geomechanical and petrophysical data.
- Design and implementation of site-specific, cost-effective MVA (monitoring, verification, and accounting) plans to ensure that business case and regulatory requirements of a CO<sub>2</sub> storage project are met.
- Development of new cost-effective geophysical monitoring technologies.
- Reservoir and process chemistry modeling and simulation.
- Risk assessment and risk management.
- Implementation of field services: vendor identification and selection, project planning, data acquisition and support, and fully integrated interpretation of data and results.
- Life cycle analysis of CCUS projects, including CO<sub>2</sub> EOR.

## PCOR Partnership Initiative

The PCOR Partnership Initiative addresses regional capture, transport, use, and storage challenges facing commercial CCUS deployment by focusing on:

- Strengthening the technical foundation for geologic CO<sub>2</sub> storage and enhanced oil recovery.
- Advancing capture technology.
- Improving application of monitoring technologies.
- Promoting integration between capture, transportation, use, and storage industries.
- Facilitating regulatory frameworks.
- Providing scientific support to policy makers.

The U.S. Department of Energy (DOE) National Energy Technology Laboratory (NETL) through its Regional Carbon Sequestration Partnerships Initiative, the North Dakota Industrial Commission (NDIC), and partner organizations are fostering the deployment of CCUS in the PCOR region. The EERC leads the PCOR Partnership Initiative, with support from the University of Wyoming and the University of Alaska at Fairbanks.



## Project Tundra

Our extensive work in carbon dioxide capture enables CCUS projects to move forward by determining the best capture technology options and system configurations for an existing lignite-fired system. Our research in carbon capture, utilization, and storage informed Minnkota Power Cooperative's Project Tundra, which will assess the final barriers relating to efficiency and economics for implementation of postcombustion capture on the existing fleet of power systems. Project Tundra is led by Minnkota Power and supported by partnerships between the EERC, BNI Energy, the North Dakota Industrial Commission, DOE, and Burns & McDonnell.



## BEST

The North Dakota Brine Extraction and Storage Test (BEST) project is developing active reservoir management (ARM) techniques that have potential to improve the performance of geologic CO<sub>2</sub> storage. ARM uses the extraction of native brine from the same formation where CO<sub>2</sub> is being stored to manage reservoir pressure to improve injection and minimize a CCS project's risk and operating profile. Modeling suggests that ARM can theoretically reduce the size of the permitted area, the area of review, and the postinjection monitoring period for CCS projects by more than 90%. The ARM being conducted by the EERC through the BEST project is the first at-scale field pilot designed to validate ARM performance. The results will be valuable for determining the expected techno-economic performance of ARM for a range of potential implementation scenarios that could benefit CCS projects.

Treatment and handling of high-TDS (total dissolved solids) waters associated with energy production are challenging and not readily or economically accomplished using conventional water treatment techniques. Geologic injection is often required to effectively manage fluids associated with electrical power generation, oil and gas production, and active reservoir management for geologic CO<sub>2</sub> storage. As part of a public-private collaboration, the EERC constructed a facility in western North Dakota to pilot-test high-TDS water treatment

technologies. These technologies can produce alternate sources of water for industrial or domestic use, produce salable products, and meaningfully reduce brine disposal volumes. The pilot testing conducted through the BEST project provides critical understanding of technology performance under field operating conditions.

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## North Dakota CarbonSAFE, CarbonSAFE-WY, Midcontinent

The North Dakota Integrated Carbon Capture and Storage Feasibility Study—North Dakota CarbonSAFE for short—is assessing the feasibility of commercial-scale geologic storage of carbon dioxide to manage CO<sub>2</sub> emissions captured from coal-based energy facilities. The project is part of an ongoing effort to ensure clean, affordable energy and the wise use of North Dakota's resources. The North Dakota project is one of 16 projects funded under DOE's CarbonSAFE initiative. DOE's CarbonSAFE initiative supports projects that address key research in the path toward the deployment of CCUS technologies, including the development of safe, commercial-scale geologic storage sites for CO<sub>2</sub>.



## Red Trail Energy CCS

Red Trail Energy (RTE), which owns an ethanol plant near Richardton, North Dakota, and the EERC began investigating CCUS to reduce the carbon dioxide emissions associated with ethanol production. Reducing emissions at an ethanol facility makes the produced fuel more valuable to states that have low-carbon fuel programs. It could also qualify the facilities for federal tax credits for capturing and storing CO<sub>2</sub> in deep geologic formations. In partnership with NDIC through the North Dakota Renewable Energy Program, and with DOE, research has been ongoing since 2016. Preliminary technical and economic feasibility of CCUS technology with ethanol production has been successfully demonstrated for the RTE site in previous phases. Current activities are focused on finalizing geologic characterization, developing a North Dakota CO<sub>2</sub> Storage Facility Permit application, and continuing community public outreach.



## Bell Creek and Cedar Creek Anticline Projects

With the support of Denbury Resources Inc. (Denbury), the EERC successfully completed the integrated technical assessment of 5 million tons of associated storage at Denbury's Bell Creek Field as part of the PCOR Partnership Initiative. This collaboration has facilitated the ongoing field assessment of several innovative technologies through the PCOR Partnership Initiative and multiple separately funded projects. Denbury continues to support the PCOR Partnership Initiative in the advancement of EOR technology to foster CCUS deployment.

Denbury is implementing a commercial project that injects approximately 1 million tons (0.9 million tonnes) of CO<sub>2</sub> per year into its Bell Creek oil field to rejuvenate oil production and permanently store anthropogenic CO<sub>2</sub> deep underground. The EERC is adding value to Denbury's project through additional characterization, monitoring, and modeling. This collaborative effort will result in a new standard for safe and practical long-term geologic storage of anthropogenic CO<sub>2</sub>.



## Pre-FEED at Coal Creek Station

A preliminary FEED study is being conducted for full-scale carbon capture at the Coal Creek Station located 50 miles north of Bismarck, North Dakota. The EERC is leading the pre-FEED, utilizing our experience in carbon capture, and providing critical information from our portable pilot-scale carbon capture system. The EERC is being supported by NDIC and partnerships between Great River Energy, the Electric Power Research Institute, and Mitsubishi Heavy Industries.



## PCO<sub>2</sub>C

Since 2008, the EERC has worked with DOE and 30 private sector partners under the Partnership for CO<sub>2</sub> Capture (PCO<sub>2</sub>C). The program began to develop, evaluate, and reduce the energy requirements and associated costs of promising carbon capture technologies. PCO<sub>2</sub>C continues to advance technologies along the development pathway in preparation for scale-up and deployment. The EERC has designed and fabricated world-class systems to test postcombustion and precombustion capture technologies on its existing solid fuel combustion and gasification test facilities.

For More Information, Contact:

**Energy & Environmental Research Center**

University of North Dakota  
15 North 23rd Street, Stop 9018  
Grand Forks, ND 58202-9018

(701) 777-5000

[www.undeerc.org](http://www.undeerc.org)

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Critical Challenges **Practical Solutions**

## APPENDIX F

### CARBON AMERICA COMPANY INFO

A large version of the Carbon America logo, centered on a solid blue rectangular background. The text "Carbon America" is in a bold, black, sans-serif font, with the "o" in "Carbon" being white and highlighted by a blue circle.

# Carbon America Business Overview

## Who We Are

- Carbon America was created to transform the carbon capture and sequestration (CCS) industry by lowering costs and rapidly increasing deployment.
- Our mission is to capture and sequester as much carbon dioxide as possible, as quickly as possible.
- To achieve this, we have built a team combining world class engineers, subsurface experts, project developers, and financiers into a vertically integrated CCS company.
- Carbon America has several mid-development projects underway, with anticipated first commercial operations in late 2023. In addition, we are actively pursuing 10+ projects in various stages of development.
- Carbon America was formed in January 2020 as a spin-off from its parent company which was established in 2010 to develop and commercialize technologies with transformative potential for the global climate.
- Carbon America's investors are institutions, private foundations, ultra high-net-worth family offices and individuals with climate change mitigation objectives.

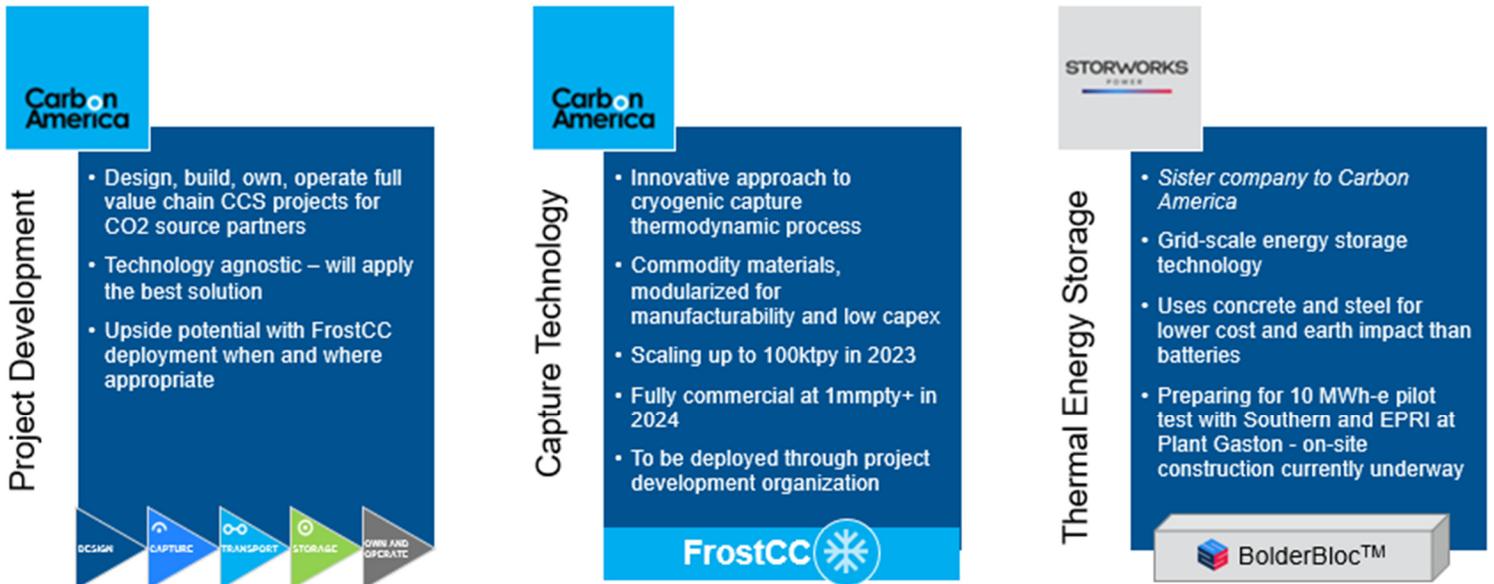
## What We Do

- At Carbon America, we are passionate about creating profitable, near-term business solutions to the CO<sub>2</sub> challenge. Our world-class team has proven engineering, design, and project delivery experience, as well as deep experience in project development and tax equity project financing. We are positioned to start fast and profitable, grow rapidly, and reduce costs to expand markets.
- Our experience integrating deep technical analysis with low-cost fabrication approaches allows us to choose the best technology for the job, marrying the speed of execution and lower cost, ultimately providing out-sized returns.
- This makes us a dependable, efficient, and responsive partner for capture, transportation and sequestration of CO<sub>2</sub>. We are a one-stop shop for CO<sub>2</sub> solutions.
- We are committed to finding solutions in a manner that creates value for all stakeholders involved – CO<sub>2</sub> emitters, storage facilities and EOR operators, investors, regulators, and society.
- Carbon America actively engages in promoting practical and reliable commercial and regulatory frameworks for CCS through a strong presence at various federal, state, and coalition levels.

## Technology Offerings

In addition to technology-agnostic CCS project development, Carbon America is developing two technologies which, when commercially available, can be integrated into brownfield or greenfield projects to further reduce carbon intensities, optimize operations, and improve economics.

- Carbon Capture Technology:** The FrostCC capture technology stands to dramatically reduce the capital cost associated with low-purity carbon capture systems appropriate for coal, natural gas, cement, steel, SMR and other combustion sources, requiring minimal site host integration and resulting in benign atmospheric effluents.
- Energy Storage Technology:** Our sister company, from which Carbon America spun off, is developing extremely low-cost, non-battery technology for grid-scale bulk energy storage. By engaging with Carbon America in CCS project development, you will also have early access to experts to discuss the applicability of these technologies to new or existing projects or assets.





## Carbon America Project Expertise

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Project Development and Execution
Tax Equity Structuring and Origination
Regulatory Engagement and Class VI Well Approval
CARB Project Certification
45Q Tax Credit Provisions
Pore Space Acquisition
Project Financing
Synergy and Upside Development and Execution
Capture Construction
Pipeline ROW and Construction
Sequestration Site Construction
Project Operations (capture, pipeline, injection)
Project Closure
Project Post Closure Activity and Liability, 100 Years

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## Business Model - CCS Value Streams

- A core offering of Carbon America is to ensure the project qualifies for any potential value stream. These value streams ensure an economically viable project and can be shared commensurate with investments and ownership of short- and long-term risks.
- 45Q: Tax credit that provides \$50/metric tonne for storage (\$35 for EOR). Credit goes first to the owner of the “capture equipment” to support a return for an investable project.
- Low Carbon Fuel Standard programs (when applicable): Where a fuel goes to a market with applicable programs, the reduction in carbon intensity created by CCS can often be qualified to generate credits.
- Other value streams may be applicable including voluntary credits, federal programs, state/province or local incentives, and synergistic application of renewable energy or other carbon intensity reducing practices.

## Business Model - Project Participation Options

- **Carbon America scope:** Carbon America offers to develop and operate the entire CCS value chain including capture/compression equipment, transportation if needed, carbon injection and storage facility, and all monitoring and reporting components from the time of first applications/permits through final project shutdown, which may be decades after stopping injection.
- **General project structure:** Carbon America anticipates establishing at least one Special Purpose Entity (SPE) to own and operate components of the project. In most situations, distinct SPEs will be established to create clear separation of risks and liabilities (e.g., investors in the capture facility are protected from sequestration liabilities).
  - “CaptureCo” will own and operate at least the CO<sub>2</sub> capture equipment. This SPE will be organized and managed as a tax equity partnership to enable receipt of 45Q tax credits. This SPE will have two distinct classes of investors or partners: “Sponsor Equity” or Class B, who provides development capital and owns the SPE, and “Tax Equity” or Class A who receives the 45Q credits in exchange for investments in the project.
  - “SequesterCo” will own and operate at least the sequestration site.
  - CO<sub>2</sub> transportation infrastructure such as pipelines may be owned by a separate “TransportCo” or assigned to CaptureCo or SequesterCo.
- **Structure execution:** Carbon America’s team will leverage its extensive experience in executing tax equity deals to facilitate project development. This internal capability can potentially save projects several million dollars in third party financial advisor fees.

## Why Choose Us

Working with Carbon America creates speed, efficiency, and alignment of interests enabled by:

- **Expertise across the value chain.** Carbon America has assembled a highly coordinated team of world-class experts in all aspects of CCS including capture processes; geology, geoscience, and reservoir engineering; project development and management; commercial, finance, and tax equity structuring; regulatory and advocacy engagement; and acquisition of necessary land and pore space rights for CO<sub>2</sub> storage. At advanced project stages, Carbon America engages and provides oversight to the leading engineering, procurement, and construction (EPC) companies for execution.
- **Strong, respected presence in CCS industry.** Carbon America and its team are widely respected and trusted in a variety of technical and non-technical networks including federal (DOE and EPA) and state agencies, academic groups, tax equity financiers, and advocacy coalitions. Our team has chosen to focus on developing expertise and relationships rather than marketing.
- **Capital funding.** Putting in our own capital reduces the need for capital outlay by host companies.

- **Risk management and heavy lifting.** By investing our own capital and managing as much of the project scope as possible, Carbon America can bring to bear extensive project and financing experience to understand, assess, and manage financial and timing risks across the CCS value chain, which present a particular challenge for this nascent market.
- **Alignment and transparency.** Because Carbon America's intent is to invest in, own, and operate CCS at your facility, we will have shared project goals and objectives. This alignment, embodied in transparency and shared decision making, ensures efficiency, speed to execution, and maximizes likelihood of project success for the near- and long-term.
- **Upside and synergy development.** With significant breadth and depth in commercial development, Carbon America can bring to bear creative strategies to improve economics and further reduce carbon footprints. This may include our proprietary capture technology and thermal energy storage systems in development.
- **Flexible structures.** Thanks to the agility of a small, CCS-dedicated company and the variety of resources at our disposal, project and commercial structures can be tailored to the goals and preferences of our partners.

## Selected Current and Previous CCS Project Development Experience

The table below provides a high-level overview of selected projects progressed by Carbon America.

Project	Descriptor	Status
<b>Ethanol A</b>	Two ethanol plants, shared EOR / depleted oil field sink. 325,000 tonnes CO <sub>2</sub> per year. Trucking transportation.	Technical work on analysis/characterization of sink, actively engaged with state and California regulators. Letters of Intent in place with subsurface and ethanol plant owners, RFP for capture systems ready for issue, finalizing definitive agreements with ethanol plants.
<b>Ethanol B</b>	Two ethanol plants, 60 miles separation, 350,000 tonnes CO <sub>2</sub> per year, one or two Class VI sequester facilities. Pipeline and possible trucking transportation	LOI's in place with ethanol plants. Purchasing existing 3D seismic for target reservoir with adequate capacity for both plants. Exploring second site options to enable 1-into-1 source/sink for both plants. Contemplation of drilling test well at site with existing seismic ~6 months. Contemplation of shooting seismic at second site TBD ~ 9 months.
<b>Ethanol C</b>	Two ethanol plants, 120 miles separation, 390,000 tonnes CO <sub>2</sub> per year, nominally 2 plants into 1 Class VI sink immediately next to one plant, pipeline or trucking transport	Seismic shot and test well drilled and completed next to one plant under Class VI rules. Seismic planned for second plant ~6 months to explore immediate geology. Carbon America in final negotiation to take over project going forward
<b>Ethanol D</b>	Single ethanol plant, targeted reservoir with existing 3D seismic ~20 miles away, pipeline	Pre-LOI discussions with plant owner, agreed commercial terms well established. Anticipating finalized LOI and seismic purchase ~2 months.
<b>Cement A – FrostCC</b>	3 US cement plant under common ownership, 1,000,000 tonnes CO <sub>2</sub> per year each, options for EOR via existing 3rd party pipelines or new Class VI sequester. Pipeline transportation	Discussing options for siting a Carbon America FrostCC pilot at one plant. Cement company very early stages of exploring decarbonization



<p><b>Ethanol – FrostCC</b></p>	<p>Possibility of leveraging CCS projects already developed for pure-stream fermenter emissions. Can add FrostCC capture to combustion (boiler) emissions, leverage existing CCS infrastructure</p>	<p>Small scale (75,000+ tonnes CO<sub>2</sub> per year) boiler emissions appropriate for piloting FrostCC scale-up systems. Can be economic without satisfying 45Q threshold requirements</p>
<p><b>Steel A – FrostCC</b></p>	<p>Foreign multinational steel company with US presence, exploring decarbonization starting with US plants. Likely Class VI. May not be economic without additional emissions from other proximate industrial sources</p>	<p>Preparing to execute a screening study for US locations, anticipatory of proceeding to eventual project.</p>
<p><b>Steel B – FrostCC</b></p>	<p>U.S. based steel company with US presence, exploring decarbonization. Likely Class VI.</p>	<p>Evaluated applicability and cost of FrostCC to emissions streams; tracking development for future deployment.</p>
<p><b>FrostCC – DOE grant application</b></p>	<p>Carbon America teamed with Electric Power Research Institute and East Coast utility to apply for DOE grant funds to implement pilot-scale FrostCC at a very large gas fired steam boiler as proof of concept.</p>	<p>Notice of awards expected October, 2021</p>

## Overview of Key Personnel

### Company Leadership

- **CEO, CTO, Co-Founder: Scott Frazier** has twenty years of experience in top management and leadership for design, engineering, and manufacturing teams for \$100M+ large rocket engineering programs for NASA and commercial rocket launch programs. Scott holds a Bachelor of Science in Aeronautical Engineering from the University of Illinois. He also has a Master of Science in Aero/Astro Engineering from Rensselaer Polytechnic Institute.
- **CFO, Co-Founder: Brent Lewis** has more than twenty years of senior and C-suite level experience in banking and finance within the renewables, natural resources, and utility industries. He has closed transactions with an aggregate value in excess of \$15 billion. Brent has deep experience in all aspects of energy and infrastructure finance including carbon capture and utilization and tax equity. Brent has a Bachelor of Arts in Economics from Western University and a Masters of Business Administration from the Kellogg School of Management.
- **Co-Founder, Director: Alex Lau** is one of the leading clean tech super angel investors in the Pacific Northwest. He has 25 years of technical management and consulting responsibilities with multiple IT and clean technology companies. Alex holds a Bachelors in Cognitive Science from Dartmouth College.
- **Director: John Rockwell** is a Founder and Managing Director of Element Partners, an \$800 million venture capital and private equity firm focused on clean tech investments. Prior to Element, John was a Partner at Advent International. Built and led 4 companies, all of which were successful exits for their investors. He has 25 years of experience managing, developing, and investing in companies commercializing products in numerous clean tech markets.
- **General Counsel: Jeff Becker** has 19 years of project development, finance and transactional experience in the energy industry. He was the Counsel to senior leadership developing utility-scale renewable energy generation projects, storage applications, conventional resource production, CO2 EOR and midstream transportation. Jeff has extensive experience drafting and negotiating EPC and BOT energy infrastructure construction agreements, tax equity project finance and M&A in the energy industry totaling over \$5 billion. Degree(s): JD, Tulane Law School / MSPH (Environmental Management), Tulane School of Public Health & Tropical Medicine / BA (International Relations), Brown University.

### **Business Development, Project Development, Engineering**

- **EVP Commercial Development: Kevin Pykkonen** has held VP Level roles in Finance, Marketing and Engineering for Fortune 500 and startup companies. He has been co-founder of telecom and energy startups and authored multiple US and international patents. Kevin has 35 years' engineering and management experience in energy technology industries. Kevin has a Bachelor of Science in Aero and Astro Engineering from MIT and an MBA (Finance) from The Wharton School of Business.
- **Senior Director, Policy and Business Development: Ashleigh Ross** has 18 years of dedication to CCS across a broad range including strategy, technology, policy, economics, commercial and project development, and deep subsurface expertise. In a previous role, she was responsible for development of BP's CCUS strategy and portfolio, particularly in the Western Hemisphere. She also served as CCS expert and reservoir engineer at ConocoPhillips. Ashleigh has a Bachelor of Science in Chemical Engineering from Oklahoma State University. She also has a Master of Science in Chemical Engineering and a Master of Science in Technology and Policy from MIT, where her work was on techno-economic-based deployment strategies for CCS. Additionally, Ashleigh holds a Master of Philosophy in Environmental Policy from the University of Cambridge.
- **Program Manager: Angela Gallimore** was awarded the Commander's Award for Civilian Service by the Department of the Army. She has 10+ years of experience in the management of complex integration programs focusing across the full spectrum of project lifecycle. She performed as the program manager for Navy and Pentagon projects upgrading chemical, biological and radiological defense (CBRD) systems. Angela has a Bachelor of Science in Mechanical Engineering from the University of South Carolina and is Project Management Professional Certified.
- **Finance Director: Paul Sabbagh** has 8 years of experience in the power and renewables space with significant experience in corporate and project finance, having closed over \$500M+ in tax equity financings for Leeward Renewable Energy, LLC. He previously responsible for all development and M&A financing. Paul has a Bachelor of Business Administration in Finance/Mechanical Engineering from University of Texas at Austin.
- **Chief Engineer: Miles Abarr's** background is techno-economic modeling and optimization of clean energy systems, dynamic model development of thermo-fluid systems and components, experimental design and validation, and development of new clean energy technologies. Miles has invented several utility-scale energy storage and carbon capture system and subsystem concepts. At Carbon America, he leads the R&D effort to develop new carbon capture technologies. Miles has a Bachelor of Science in Aerospace Engineering from the University of California, San Diego. He also as a Master of Science and PhD in Mechanical Engineering from the University of Colorado, Boulder.

## Subsurface Team

- **VP Subsurface: Mark Linroth** has over 30 years' experience in the field managing complex CO<sub>2</sub> floods as well as surface and subsurface activities. Mark began his career in the Permian Basin, then worked on reservoir development and secondary recovery project plans for several international oil companies, including Sonatrach and Pemex. He was most recently principal engineer at Kinder-Morgan. Mark has a BSc in Petroleum Engineering from the Colorado School of Mines.
- **VP Special Projects: Mike Matson** has 10 years oil & gas research, engineering, and operations with Oxy and Kinder Morgan. He has experience with reservoir surveillance and development of water and CO<sub>2</sub> floods, drilling operations in Permian Basin and Colorado CO<sub>2</sub> fields. Mike has been lead engineer on >\$50M of projects and managed kerogen/bitumen research lab with Exxon. Mike is also an Author of Inorganic Chemistry for Dummies. Mike has a Bachelor of Science in Chemistry from the US Naval Academy. He also holds a Master of Science and PhD in Chemistry from Rice University.
- **Chief Geologist: David Scull** is a subsurface geologist with 30+ years of experience working exploration and development projects in the USA, Tunisia, Malaysia, England, China, Argentina and Colombia. He previously held senior technical and project management roles in successful large independent oil companies including BHP, Triton Energy and Hunt Oil. David has a Bachelor of Arts in Geology from Occidental College.
- **Senior Environmental Geologist: Jessica Gregg** has seventeen years of experience in the regulatory and environmental sectors, specializing in regulatory gap analysis and EHS program improvement in multiple industries. She has vast legislative experience in the Western United States and is adept at working with industry special interest groups, consultants, state regulators, and local governments. More recently, she has become an expert on EPA Class II oil and gas related injection well permitting and induced seismicity regulations. Jessica has a B.S. in Geological Sciences from San Diego State University.
- **Senior Geologist: Karen Lechtenberg** is a subsurface geologist specializing in sedimentology and sequence stratigraphy. Her experience is in North American basins including Piceance, DJ Basin, Permian, Eagleford, and San Juan Basins. Her previous roles included development, operations, reservoir characterization, and exploration geologist at Encana. Karen has a Bachelor of Science in Geology with a minor in Astrobiology from the University of Kansas. She also has a Master of Science in Geology in Carbonate Sequence Stratigraphy from the University of Kansas.
- **Land Manager: Steve Hawthorne** has had project management roles in energy exploration, development, operations and asset retirement. He has done contract design and management of due diligence, acquisition and divestiture covering >\$1B in assets and thousands of oil and gas wells in Kansas, Nebraska, Illinois, Indiana, New

Mexico, Oklahoma, Texas and Colorado. He has 25+ years of experience in natural resource property rights and contracts. Steve has a Bachelor of Art in History from Cornell University and a JD from Tulane University School of Law.

APPENDIX G  
FAGEN COMPANY INFO

Fagen Inc., is an employee-owned full service industrial contractor located in Granite Falls, MN. Fagen typically performs in the role of an EPC contractor in industrial process and power generation projects. A substantial portion of the Fagen's 30+ year history has been in the renewable fuels industry. Fagen has constructed close to 100 ethanol and biofuels projects as an EPC and maintains the internal resources to continue to support those industries as they move forward into technologies and side stream processes to further their business success. Fagen Inc is #173 in the Engineering News Record list of top 400 contractors and #16 in power contractors on the 2021 list. Fagen Inc., routinely executes projects from \$5 to \$450 million and has an annual revenue of approximately \$581M in 2020. Fagen also maintains one of the largest heavy crane and mobile construction equipment fleets in the upper Midwest. Fagen has a bonding capacity of \$1.5B and has no corporate debt. Fagen typically maintains a work force of about 1200-1500 employees and has had in the past, an operational peak manpower of about 3500. Fagen self-performs about 90% of project construction activities depending on the project scope.

Fagen also maintains in-house engineering resources to support their construction activities and has numerous relationships with both process design and detail design engineering firms to deliver turn key projects. To facilitate the complex nature of these projects Fagen partners with process system manufactures and engineering firms that provide strong process technical and engineering support to ensure the technology being deployed is designed to support the project requirements. These relationships are critical to the success of a project. Fagen has a long track record of delivering complex projects on time and on budget meeting performance criteria set for the project.

The Fagen Inc., team provides a unique set of expertise and experience to this challenge. Fagen Inc., and its internal engineering resource, Fagen Engineering, have the construction and BOP engineering experience from constructing over 90 fuel ethanol projects. This experience has provided Fagen with a historic database of the site layout, topographic, utility infrastructure and geotechnical information for these plants.

Part of the Fagen team for Blue Flint Ethanol is Salof LTD. Salof has installed over 40, CO2 processing systems on operating fuel ethanol plants. They have a unique understanding of CO2 processing along with gas compression, dehydration and refrigeration. This expertise has been deployed to process CO2 from ethanol operations into industrial gases and now is being deployed to facilitate the processing of CO2 for sequestration. This technical expertise is very valuable in understanding the true characteristics of CO2 from ethanol fermentation.

In addition, our more recent project experience around incorporating combined heat power projects into existing ethanol plants has enabled Fagen to develop a relationship with IC Thomasson as a utility design engineer. IC Thomasson's team brings with it the expertise on not only thermal energy integration, but also well aligned to the challenges of the Blue Flint project, the understanding of electrical utility infrastructure serving these plants. The high electrical loads associated with CO2 processing will be a challenge to accommodate in the existing electrical utility infrastructure. IC Thomasson has the expertise to support this effort. They also provide the mechanical engineering resources to do the plant CO2 and water interconnect design.

Our team is unique in that it not only has the real-world experience in ethanol plant design and construction to make your project successful, but also offers access to engineering information that will be beneficial to help make early-stage activities more effect.

A successful project is the result of a team approach based on achieving shared goals. Special emphasis must be placed on the following major goals to ensure a successful project:

### **SAFETY**

Safety must be continually and diligently monitored and enforced during all construction activities on the project. The Fagen Inc., Health & Safety Procedures Manual is the guiding program for our employees, subcontractors and visitors to follow to ensure safe practices. Site- Specific Safety plans and training provide additional guidance. Preplanning activities and adherence to our safety program is critical to ensuring day-to-day safety. Our safety goal is to execute and attain an accident/injury free project.

### **QUALITY**

Quality standards for the project are detailed in the Fagen Inc., Quality Control Procedures Manual. This manual outlines all aspects of construction pertaining to quality fabrication and installation, through Project Substantial Completion. Our quality goal is to construct a project that demonstrates reliability, operability and maintainability for our client.

### **SCHEDULE**

A detailed project schedule will be created around the contract milestones to ensure project success. Ongoing monitoring and evaluation of the schedule, along with analysis of the critical path, may provide the opportunity to mechanically complete the project early and allow the Client to start production. Our goal is to be on or ahead of schedule dates.

### **RISK ASSESSMENT & MANAGEMENT**

As this project progresses, the Fagen Inc. Project Manager, Safety Director and supporting Field Management Staff will create and coordinate risk assessment analyses and reports. Critical path activities and equipment will be identified and discussed with all Field Management Staff and necessary client contacts. The Project Manager will notify the client of any issues and will also address how Fagen Inc., will mitigate and/or handle the issue safely and correctly. Fagen Inc., and the client must work together to identify, plan and address all issues in a timely manner so as not to affect construction performance, goals or schedule.

**CORPORATE CONTACTS:**

<b>Name</b>	<b>Responsibility</b>	<b>Email</b>
Chris Howard	Chief Operating Officer	<a href="mailto:choward@fageninc.com">choward@fageninc.com</a>
Mark Neu	Corporate Safety Director	<a href="mailto:mneu@fageninc.com">mneu@fageninc.com</a>
Heath Wells	Corporate QA/QC Manager	<a href="mailto:hwells@fageninc.com">hwells@fageninc.com</a>
Amy Johnson	Corporate Procurement Manager	<a href="mailto:ajohnson@fageninc.com">ajohnson@fageninc.com</a>
Jeremy Corner	Corporate Warranty Manager	<a href="mailto:jcorner@fageninc.com">jcorner@fageninc.com</a>

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## CURRENT PROJECTS

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### Boise Cascade Paper

CLIENT . . . . Boise Cascade  
LOCATION . . . . International Falls, MN  
SCOPE . . . . . Maintenance for a paper mill.

### Blackjack Creek Wind

CLIENT . . . . RWE  
LOCATION . . . . Woodsboro, TX  
SCOPE . . . . . BOP installation of 240 MW, (50) Nordex N155 4.8 MW wind turbine generators, all 108 meter hub heights. This includes turbine erection, turbine foundations, access roads, laydown yard, crane pads, drainage, down tower wiring & met tower installation.

### Conestoga Energy

CLIENT . . . . . Arkalon Ethanol  
LOCATION . . . . Liberal, KS  
SCOPE . . . . . Full EPC Grain Neutral Spirits Hydrous Alcohol Facility. (25 MMGPY System)



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## CURRENT PROJECTS

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### Conestoga Energy

CLIENT . . . . . Bonanza BioEnergy  
LOCATION . . . . . Garden City, KS  
SCOPE . . . . . Full EPC Grain Neutral Spirits Hydrous Alcohol Facility. (25 MMGPY System)

### Independence Wind Energy

CLIENT . . . . . Independence Wind Energy, LLC  
LOCATION . . . . . Ryan, IA  
SCOPE . . . . . Fagen, Inc. is the bop installation of 53.58 MW, (19) GE 2.82 -127 wind turbine generators, all 89 meter hub heights. This includes laydown yard, access roads, turbine foundations, drainage, crane pads, turbine erection & down tower wiring.

### MSC Protein Production

CLIENT . . . . . Green Plains, Inc.  
LOCATION . . . . . Central City, NE  
SCOPE . . . . . General contractor to construct and install Fluid Quip Technologies' MSC™ system for its biorefining platform



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## CURRENT PROJECTS

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### Northwestern Energy Huron Generating Station

CLIENT . . . . . Northwestern Energy  
LOCATION . . . . . Huron, SD  
SCOPE . . . . . Full EPC Nominal 57 MW power plant addition (6 x Caterpillar G20CM34 60 Hz, Natural Gas)

### Renewable Diesel Refinery

CLIENT . . . . . Seaboard Energy  
LOCATION . . . . . Hugoton, KS  
SCOPE . . . . . Fagen, Inc. is the EPC contractor for a 6,500 barrel-per- day Renewable Diesel Refinery.

### Shell Rock Soybean Processing Facility

CLIENT . . . . . Shell Rock Soy Processing, LLC  
LOCATION . . . . . Shell Rock, IA  
SCOPE . . . . . Full EPC Wrap 3,300 tons per day Soybean Processing Facility.





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## PAST EXPERIENCE

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Fagen, Inc., as an EPC contractor, has served over 139 clients.

- Ethanol projects range from 40 MGY – 120 MGY plants, expansions, and shut downs.
- Total ethanol capacity built is over 6 billion gallons of ethanol a year.
- Power projects range from 500 kw solar to 425MW clean coal power projects.
- Total power capacity exceeds 6 gigawatts.



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## ETHANOL EXPERIENCE

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### Cellulosic Ethanol

#### DuPont Nevada Cellulosic Ethanol Facility

Location. . . Nevada, IA  
Size. . . . . 30 MGY  
Scope. . . . Procurement and construction  
for a cellulosic ethanol bio-refinery.

### Ethanol

#### Aberdeen Energy, LLC

Location. . . Mina, SD  
Size. . . . . 100 MGY  
Scope. . . . Full EPC Wrap

#### Abengoa Bioenergy Corporation

Location. . . York, NE  
Size. . . . . 50 MGY  
Scope. . . . General Contractor

#### Abengoa Bioenergy Corporation

Location. . . Colwich, KS  
Size. . . . . 20 MGY  
Scope. . . . General Contractor

#### Absolute Energy, LLC

Location. . . St. Ansgar, IA  
Size. . . . . 100 MGY  
Scope. . . . Full EPC Wrap

#### ADM (Archer Daniels Midland)

Location. . . Clinton, IA  
Scope. . . . Structural & Electrical



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## ETHANOL EXPERIENCE

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### **ADM (Archer Daniels Midland)**

Location. . . Columbus, NE  
Size. . . . . 100 MGY  
Scope. . . . General Contractor

### **ADM (Archer Daniels Midland)**

Location. . . Marshall, MN  
Size. . . . . 40 MGY  
Scope. . . . General Contractor

### **Advanced BioEnergy**

Location. . . Fairmont, NE  
Size. . . . . 100 MGY  
Scope. . . . Full EPC Wrap

### **Ag Processing, Inc.**

Location. . . Hasting, NE  
Size. . . . . 52 MGY  
Scope. . . . Dismantle and Re-Install  
Equipment from Jasper, TN

### **Ag Star Financial Services ACA**

Location. . . Hankinson, ND  
Size. . . . . 100 MGY  
Scope. . . . Full EPC Wrap

### **Agri-Energy, LLC**

Location. . . Luverne, MN  
Size. . . . . 21 MGY  
Scope. . . . General Contractor



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## ETHANOL EXPERIENCE

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### **Amazing Energy**

Location. . . Denison, IA  
Size. . . . . 40 MGY  
Scope. . . . Full EPC Wrap

### **Aventine Renewable Energy**

Location. . . Mt. Vernon, IL  
Size. . . . . 108 MGY  
Scope. . . . Completion of an abandoned plant.

### **Aventine Renewable Energy**

Location. . . Aurora, NE  
Size. . . . . 108 MGY  
Scope. . . . Completion of an abandoned plant.

### **Aventine Renewable Energy**

Location. . . Canton, IL  
Size. . . . . 37 MGY  
Scope. . . . Completion of an abandoned plant

### **Aventine Renewable Energy**

Location. . . Pekin, IL  
Size. . . . . 100 MGY  
Scope. . . . General Contractor

### **Badger State Ethanol, LLC**

Location. . . Monroe, WI  
Size. . . . . 40 MGY  
Scope. . . . Full EPC Wrap



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## ETHANOL EXPERIENCE

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### **Badger State Ethanol, LLC**

Location. . . Monroe, WI  
Scope. . . . Full EPC wrap for a dual  
fermenter addition.

### **Big River Galva, LLC**

Location. . . Galva, IL  
Size. . . . . 100 MGY  
Scope. . . . Full EPC Wrap

### **Big River Resources, LLC**

Location. . . West Burlington, IA  
Size. . . . . 52 MGY  
Scope. . . . Full EPC Wrap

### **Bionol Clearfield, LLC**

Location. . . Clearfield, PA  
Size. . . . . 100 MGY  
Scope. . . . Full EPC Wrap

### **Blue Flint Ethanol**

Location. . . Underwood, ND  
Size. . . . . 50 MGY  
Scope. . . . Full EPC Wrap

### **Bushmills Ethanol**

Location. . . Atwater, MN  
Size. . . . . 40 MGY  
Scope. . . . Full EPC Wrap



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## ETHANOL EXPERIENCE

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### **Bushmills Ethanol**

Location. . . Atwater, MN  
Scope. . . . Civil and concrete package for  
a fermentation cooling tower  
and energy center.

### **Carbon Green LLC**

Location. . . Lake Odessa, MI  
Size. . . . . 40 MGY  
Scope. . . . Full EPC Wrap

### **Cardinal Ethanol, LLC**

Location. . . Union City, IN  
Size. . . . . 100 MGY  
Scope. . . . Full EPC Wrap

### **Cargill, Inc.**

Location. . . Blair, NE  
Size. . . . . 85 MGY  
Scope. . . . Civil & Electrical

### **Cargill, Inc.**

Location. . . Eddyville, IA  
Size. . . . . 35 MGY  
Scope. . . . Civil & Electrical

### **Castle Rock Renewable Fuels, LLC**

Location. . . Necedah, WI  
Size. . . . . 50 MGY  
Scope. . . . Full EPC Wrap



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## ETHANOL EXPERIENCE

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### Central Farmers Cooperative/FREMAR, LLC

Location. . . Marion, SD  
Size. . . . . 100 MGY  
Scope. . . . Full EPC Wrap

### Central Indiana Ethanol, LLC

Location. . . Marion, IN  
Size. . . . . 40 MGY  
Scope. . . . Full EPC Wrap

### Central MN Ethanol Cooperative

Location. . . Little Falls, MN  
Size. . . . . 15 MGY  
Scope. . . . Complete an Abandoned Plant

### Chief Ethanol Fuels

Location. . . Hastings, NE  
Size. . . . . 52 MGY  
Scope. . . . Civil, Electrical, Structural, & Millwright

### Commonwealth Agri-Energy, LLC

Location. . . Hopkinsville, KY  
Size. . . . . 20 MGY  
Scope. . . . Full EPC Wrap

### Corn, LP

Location. . . Goldfield, IA  
Size. . . . . 50 MGY  
Scope. . . . Full EPC Wrap



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## ETHANOL EXPERIENCE

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### DENCO

Location. . . Morris, MN  
Size. . . . . 15 MGY  
Scope. . . . General Contractor

### E Energy Adams, LLC

Location. . . Adams, NE  
Size. . . . . 50 MGY  
Scope. . . . Full EPC Wrap

### East Kansas Agri Energy

Location. . . Garnett, KS  
Size. . . . . 35 MGY  
Scope. . . . Civil, Structural, Siding, Millwright,  
Pipe & I/E

### Elkhorn Valley Ethanol, LLC

Location. . . Norfolk, NE  
Size. . . . . 40 MGY  
Scope. . . . Full EPC Wrap

### Ethanol 2000

Location. . . Bingham Lake, MN  
Size. . . . . 28 MGY  
Scope. . . . Mechanical

### Ethanol Grain Processors, LLC

Location. . . Rives, TN  
Size. . . . . 100 MGY  
Scope. . . . Full EPC Wrap

### Elite Octane Ethanol

Location. . . Atlantic, IA  
Size. . . . . 120 MGY  
Scope. . . . Full EPC Wrap



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## ETHANOL EXPERIENCE

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### Exol Corporation

Location. . . Albert Lea, MN  
Size. . . . . 30 MGY  
Scope. . . . Full EPC Wrap

### First United Ethanol

Location. . . Camilla, GA  
Size. . . . . 100 MGY  
Scope. . . . Full EPC Wrap

### Glacial Lakes Energy, LLC

Location. . . Watertown, SD  
Size. . . . . 40 MGY  
Scope. . . . Full EPC Wrap

### Flint Hill Renewables

Location. . . Camilla, GA  
Scope. . . . EPC wrap for a double fermenter expansion.

### Flint Hill Renewables

Location. . . Fairbank, IA  
Scope. . . . EPC wrap for a double fermenter expansion.

### Flint Hill Renewables

Location. . . Shellrock, IA  
Scope. . . . EPC wrap for a double fermenter expansion.

### Flint Hill Renewables

Location. . . Menlo, IA  
Scope. . . . EPC wrap for a double fermenter expansion.



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## ETHANOL EXPERIENCE

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### **Green Plains Renewable Energy, Inc.**

Location. . . Shenandoah, IA  
Size. . . . . 50 MGY  
Scope. . . . Full EPC Wrap

### **Green Plains Renewable Energy, Inc.**

Location. . . Shenandoah, IA  
Scope. . . . Full EPC single fermenter addition  
with building extension

### **Green Plains Renewable Energy, Inc.**

Location. . . Ord, NE  
Size. . . . . 40 MGY  
Scope. . . . Full EPC Wrap

### **Green Plains Renewable Energy, Inc.**

Location. . . Central City, NE  
Size. . . . . 80 MGY  
Scope. . . . Full EPC Wrap

### **Green Plains Renewable Energy, Inc.**

Location. . . Central City, NE  
Scope. . . . Full EPC wrap for a fermenter  
expansion at an existing ethanol  
facility.

### **Green Plains Renewable Energy, Inc.**

Location. . . Ord, NE  
Scope. . . . Civil, mechanical and electrical for a  
fermenter expansion.



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## ETHANOL EXPERIENCE

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### Golden Grain Energy, LLC

Location. . . Mason City, IA  
Size. . . . . 80 MGY  
Scope. . . . Full EPC Wrap

### Golden Triangle Energy, LLC

Location. . . Craig, MO  
Size. . . . . 20 MGY  
Scope. . . . General Contractor

### Granite Falls Energy

Location. . . Granite Falls, MN  
Size. . . . . 40 MGY  
Scope. . . . Full EPC Wrap

### Granite Falls Energy

Location. . . Granite Falls, MN  
Scope. . . . Full EPC wrap for a cooling tower expansion.

### Guardian Energy LLC

Location. . . Janesville, MN  
Size. . . . . 100 MGY  
Scope. . . . Full EPC Wrap

### Green Plains Renewable Energy, Inc.

Location. . . Shenandoah, IA  
Size. . . . . 50 MGY  
Scope. . . . Full EPC Wrap

### Hawkeye Renewables

Location. . . Fairbank, IA  
Size. . . . . 100 MGY  
Scope. . . . Full EPC Wrap



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## ETHANOL EXPERIENCE

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### Hawkeye Menlo, LLC

Location. . . Menlo, IA  
Size. . . . . 100 MGY  
Scope. . . . Full EPC Wrap

### Hawkeye Renewables

Location. . . Iowa Falls, IA  
Size. . . . . 80 MGY  
Scope. . . . Full EPC Wrap

### Hawkeye Shell Rock, LLC

Location. . . Shell Rock, IA  
Size. . . . . 100 MGY  
Scope. . . . Full EPC Wrap

### Heartland Corn Products

Location. . . Winthrop, MN  
Size. . . . . 35 MGY  
Scope. . . . General Contractor

### Heartland Grain Fuels

Location. . . Aberdeen, SD  
Size. . . . . 8 MGY  
Scope. . . . Millwright

### Heron Lake Bioenergy

Location. . . Heron Lake, MN  
Size. . . . . 50 MGY  
Scope. . . . Full EPC Wrap

### Highwater Ethanol, LLC

Location. . . Lamberton, MN  
Size. . . . . 50 MGY  
Scope. . . . Full EPC Wrap



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## ETHANOL EXPERIENCE

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### Homeland Energy Solutions, LLC

Location. . . Lawler, IA  
Size. . . . . 100 MGY  
Scope. . . . Full EPC Wrap

### Husker Ag, LLC

Location. . . Plainview, NE  
Size. . . . . 20 MGY  
Scope. . . . Full EPC Wrap

### Illinois River Energy

Location. . . Rochelle, IL  
Size. . . . . 100 MGY  
Scope. . . . Full EPC Wrap

### Indiana Bio-Energy

Location. . . Bluffton, IN  
Size. . . . . 100 MGY  
Scope. . . . Full EPC Wrap

### Iroquois Bioenergy Company

Location. . . Rensselaer, IN  
Size. . . . . 40 MGY  
Scope. . . . Full EPC Wrap

### KAAPA Ethanol, LLC

Location. . . Minden, NE  
Size. . . . . 40 MGY  
Scope. . . . Full EPC Wrap



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## ETHANOL EXPERIENCE

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### **Lincolnland Agri-Energy, LLC**

Location. . . Palestine, IL  
Scope. . . . Full EPC Wrap for a single  
fermenter addition.

### **Lincolnland Agri-Energy, LLC**

Location. . . Palestine, IL  
Size. . . . . 40 MGY  
Scope. . . . Full EPC Wrap

### **Lincolnway Energy Co-op**

Location. . . Nevada, IA  
Size. . . . . 50 MGY  
Scope. . . . Full EPC Wrap

### **Little Sioux Corn Processors, LLC**

Location. . . Marcus, IA  
Size. . . . . 80 MGY  
Scope. . . . Full EPC Wrap

### **Little Sioux Corn Processors, LLC**

Location. . . Marcus, IA  
Scope. . . . Structural engineering and GC scope  
for the installation of a double  
fermenter expansion and chiller

### **LDC Grand Junction, LLC**

Location. . . Grand Junction, IA  
Size. . . . . 100 MGY  
Scope. . . . Full EPC Wrap

### **Marquis Energy, LLC**

Location. . . Hennepin, IL  
Size. . . . . 100 MGY  
Scope. . . . Full EPC Wrap



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## ETHANOL EXPERIENCE

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### **Marquis Energy, LLC**

Location. . . Hennepin, IL  
Size. . . . . 120 MGY  
Scope. . . Full EPC Wrap

### **Marysville Ethanol, LLC**

Location. . . Marysville, MI  
Size. . . . . 50 MGY  
Scope. . . Full EPC Wrap

### **Mid-Missouri Energy, Inc.**

Location. . . Malta Bend, MO  
Size. . . . . 40 MGY  
Scope. . . Full EPC Wrap

### **Midwest Grain Processors Cooperative**

Location. . . Lakota, IA  
Size. . . . . 45 MGY  
Scope. . . Full EPC Wrap

### **Nebraska Energy LLC**

Location. . . Aurora, NE  
Size. . . . . 35 MGY  
Scope. . . Civil & Dismantle Equipment from  
Jennings, LA

### **One Earth Energy**

Location. . . Gibson City, IL  
Size. . . . . 100 MGY  
Scope. . . Full EPC Wrap

### **Pannonia Ethanol**

Location. . . Dunafoldvar, Hungary  
Size. . . . . 50 MGY  
Scope. . . Full EPC Wrap



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## ETHANOL EXPERIENCE

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### **Patriot Renewable Fuels, LLC**

Location. . . Mineral, IL  
Size. . . . . 100 MGY  
Scope. . . . Full EPC Wrap

### **Platinum Ethanol, LLC**

Location. . . Arthur, IA  
Size. . . . . 110 MGY  
Scope. . . . Full EPC Wrap

### **Pro-Corn LLC**

Location. . . Preston, MN  
Size. . . . . 18 MGY  
Scope. . . . General Contractor

### **Ring Neck Energy**

Location. . . Onida, SD  
Size. . . . . 120 MGY  
Scope. . . . Full EPC Wrap

### **Red Trail Energy**

Location. . . Richardton, ND  
Size. . . . . 50 MGY  
Scope. . . . Full EPC Wrap

### **Redfield Energy, LLC**

Location. . . Redfield, SD  
Size. . . . . 40 MGY  
Scope. . . . Full EPC Wrap

### **River Valley Energy Services Ltd.**

Location. . . Dyersville, IA  
Size. . . . . 100 MGY  
Scope. . . . Full EPC Wrap

### **Siouxland Ethanol, LLC**

Location. . . Jackson, NE  
Size. . . . . 50 MGY  
Scope. . . . Full EPC Wrap



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## ETHANOL EXPERIENCE

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### Trenton Agri-Products

Location. . . Trenton, NE  
Size. . . . . 30 MGY  
Scope. . . . . General Contractor

### United WI Grain Producers, LLC

Location. . . Friesland, WI  
Size. . . . . 40 MGY  
Scope. . . . . Full EPC Wrap

### US Energy Partners, LLC

Location. . . Russell, KS  
Size. . . . . 25 MGY  
Scope. . . . . Civil, Structural, & Millwright

### Valero Energy Corporation

Location. . . Albert City, IA  
Size. . . . . 100 MGY  
Scope. . . . . Full EPC Wrap

### Valero Energy Corporation Location. . .

Albion, NE  
Size. . . . . 100 MGY  
Scope. . . . . Full EPC Wrap

### Valero Energy Corporation Location. . .

Charles City, IA  
Size. . . . . 100 MGY  
Scope. . . . . Full EPC Wrap

### Valero Energy Corporation Location. . .

Aurora, SD  
Size. . . . . 100 MGY  
Scope. . . . . Full EPC Wrap



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---

## ETHANOL EXPERIENCE

---

### Valero Energy Corporation

Location. . . Fort Dodge, IA  
Size. . . . . 100 MGY  
Scope. . . . Full EPC Wrap

### Valero Energy Corporation

Location. . . Hartley, IA  
Size. . . . . 110 MGY  
Scope. . . . Full EPC Wrap

### Valero Energy Corporation

Location. . . Welcome, MN  
Size. . . . . 110 MGY  
Scope. . . . Full EPC Wrap

### West LB Ag

Location. . . Bloomingburg, OH  
Size. . . . . 100 MGY  
Scope. . . . Full EPC Wrap

### West LB Ag

Location. . . Linden, IN  
Size. . . . . 100 MGY  
Scope. . . . Full EPC Wrap

### Western New York Energy, LLC

Location. . . Medina, NY  
Size. . . . . 50 MGY  
Scope. . . . Full EPC Wrap



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---

## ETHANOL EXPERIENCE

---

### **Western Plains Energy, LLC**

Location. . . Oakley, KS  
Size. . . . . 30 MGY  
Scope. . . . General Contractor

### **Western WI Renewable Energy**

Location. . . Boyceville, WI  
Size. . . . . 40 MGY  
Scope. . . . Full EPC Wrap

### **White Energy Hereford, Ltd.**

Location. . Hereford, TX  
Size. . . . . 100 MGY  
Scope. . . . Full EPC Wrap

### **White Energy Plainview**

Location. . Plainview, TX  
Size. . . . . 100 MGY  
Scope. . . . Full EPC Wrap



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**Fagen, Inc. had 48 ethanol plants under construction simultaneously in 2007.**





---

## SEABOARD ENERGY

---

### Seaboard Energy

Hugoton, KS

#### SCOPE

Fagen, Inc. is the EPC contractor for a 6,500 barrel-per-day Renewable Diesel Refinery.





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## RING NECK ENERGY

---

### Ring Neck Energy

Onida, SD

#### SCOPE

Fagen, Inc. was the EPC contractor for a 80 MGY ethanol facility.





---

# ELITE OCTANE

---

## Elite Octane

Atlantic, IA

### SCOPE

Fagen, Inc. was the EPC contractor for a 120 MMGY dry grind ethanol production facility.

### AWARDS

ABC Excellence In Construction Awards  
2016 Mega – Projects Honorable Mention





---

## MARQUIS ENERGY, LLC

---

### Marquis Energy, LLC

Hennepin, IL

#### SCOPE

Fagen, Inc. was the EPC contractor for a 120 MMGY dry grind ethanol production facility.

#### AWARDS

ABC Excellence In Construction Awards  
2016 Mega – Projects Honorable Mention





---

## PANONIA ETHANOL, ZRT

---

### **Panonia Ethanol, ZRT** Dunafoldvar, Hungary

#### **SCOPE**

Fagen, Inc. was the EPC contractor for a 50 MMGY dry grind ethanol production facility.

#### **AWARDS**

ENR Power / Industrial  
Award of Merit





---

## PLATINUM ETHANOL, LLC

---

### Platinum Ethanol, LLC

Arthur, IA

#### SCOPE

Fagen, Inc. was the EPC contractor for a 110 MMGY dry grind ethanol production facility.





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# BADGER STATE ETHANOL

---

## Badger State Ethanol

Monroe, WI

### SCOPE

Fagen, Inc. was the EPC contractor for a dual fermenter expansion and a tank farm expansion.





---

## FLINT HILLS RENEWABLES

---

### Flint Hills Renewables

Multiple Locations

#### SCOPE

Fagen, Inc. was the EPC contractor multiple upgrades, expansions and shut down work. Projects included corn oil extraction, grain bins, cellunator expansions and routine maintenance.





---

## CORN, LP

---

**Corn, LP**  
Goldfield, IA

**SCOPE**

Fagen, Inc. was the EPC for a fermenter addition.



---

# LINCOLNLAND AGRI-ENERGY

---



## Lincolmland Agri-Energy

Palestine, IL

### SCOPE

Fagen, Inc. was the EPC contractor for a fermenter expansion.





---

# GREEN PLAINS INC

---

## Green Plains Inc

Multiple Locations

### SCOPE

Fagen, Inc. was the EPC contractor for a several fermenter expansions.





---

## DUPONT CELLULOSIC ETHANOL

---

### DuPont Cellulosic Ethanol

Nevada, IA

#### SCOPE

Fagen, Inc. built the world's largest commercial cellulosic bio-refinery. This is a 30 MGY refinery utilizing baled corn stover as a feed stock.





---

## D3MAX / ACE ETHANOL

---

### D3max / Ace Ethanol

Stanley, WI

#### SCOPE

Fagen, Inc. was the EPC converting corn fiber and residual starch in distillers grains to cellulosic ethanol .





---

# SIouxLAND ETHANOL, LLC

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## Siouxland Ethanol, LLC

Jackson, NE

### SCOPE

Fagen, Inc. is the EPC contractor for a combined heat and power facility which will include a combustion turbine and HRSG based system capable of producing a nominal 7.5 megawatts (MW) of power.





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# EAST KANSAS AGRI-ENERGY

---

## East Kansas Agri-energy

Garnett, KS

### SCOPE

Fagen, Inc. was the general contractor for the completion of a renewable diesel production facility.





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# BIOFUELS COMPANY OF AMERICA

---

## Biofuels Company of America

Danville, IL

### SCOPE

Fagen, Inc. provided a 40 million GPY biodiesel facility. This project was performed on a turnkey EPCM basis, with DeSmet Ballestra providing the process technology and process equipment



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APPENDIX H  
SALOF LTD COMPANY INFO



Salof LTD., Inc.  
5141 IH 35 South  
New Braunfels, TX 78132  
Ph: 830-225-1744

## **SALOF LTD., INC.**

CAPABILITIES / EXPERIENCE / METHODOLOGY

**Revision: 3**

**October 27, 2021**



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## 1 Summary

This document has been prepared in response to the request from Blue Flint, Inc., to detail Salof LTD., Inc.'s Capabilities / Experience Methodology in the area of CO<sub>2</sub> Processing and to detail typical package details.

The Salof LTD., Inc. Authorized Company Respondent will be:

Robert G. Luhrs  
President

Mailing Address:  
Salof LTD., Inc.  
5141 IH 35 South  
New Braunfels TX 78132

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Office Phone: 830-225-1744  
Mobile Phone: 830-708-0765



## 2 Health Safety and Environment

Health, Safety, and Environmental Management is of the utmost priority at Salof. Salof Limited's goals and beliefs are that all **injuries, occupational illnesses, and environmental incidents are preventable.**

Salof Limited's philosophy is that in the performance of our services and production of our products, the health and safety of all people involved, the protection of assets and the protection of the environment are of primary concern. There is no job or task so important that we cannot take the time to do it safely.

Salof Limited is dedicated to continuous improvement of its HSE processes while providing the highest quality service available to our customers. To meet this responsibility Salof Limited will manage our services and production of our products according to the following HSE principles:

- Management is directly responsible for preventing injuries, illnesses and incidents and requires the personal commitment of each employee.
- HSE performance is a condition of employment for every employee.
- Training is an essential element for a safe, healthy and environmentally sound workplace.
- HSE audits must be conducted to monitor the success of the HSE Management System.
- All deficiencies must be corrected immediately.
- It is essential to investigate all unsafe practices and near misses with potential for injury, illness and environmental incidents.
- Policies and procedures designed to reduce incidents must be periodically reviewed and evaluated for effectiveness.
- It is good business to prevent injuries, illnesses, and environmental incidents.
- People are the most critical element in the success of a Health, Safety and Environmental Management Program. Employees must take an active role to ensure a strong safety culture.

Salof Limited considers safety a primary focus in our plant designs as well as the construction of our plants. Starting from initial design concepts through to detailed plans, engineering incorporates safety features and considerations to ensure the plant operates safely for our clients.

Our Company's health and safety, injury management, and alcohol and drug policies provide all operations with a clear focus and direction.

## 3 Key Personnel

### 3.1 Organizational Chart

The original Salof Refrigeration CO., Inc. was formed in 1977 by George Salof. In 2013, GE Oil and Gas purchased the assets and one of the two facilities Salof used for manufacturing. In 2017, after observing that many of Salof Refrigeration CO.'s old customers were not being adequately served, the decision was made to restart the company as Salof LTD., Inc.

Salof LTD., Inc., (Salof) is a Sub S Corporation, incorporated in the state of Texas on March 13, 2017. When Salof LTD., began in 2017, the company had 4 core personnel. As of October 28, 2021, Salof



has 51 core personnel. The company takes a lean strategic approach to organizational structuring allowing for the core employees to work in multiple areas of the business allowing for employee growth and experience, while maintaining a lower overall head count. This approach has also helped the company maintain an extremely low turnover rate through employee job satisfaction and has allowed for extensive experience to remain within the company in multiple areas of the business. Salof also has multiple service agreements with engineering firms to allow for outsourcing of certain activities such as pipe and structural steel analysis. By outsourcing these activities Salof can focus on the engineering design and still maintain low overhead cost which is carried over to the customer by a decreased overall contract sales price.

Additionally, Salof has the ability to easily ramp up shop labor through agreements with local resourcing agencies, and through the reputation of the company as an excellent environment to work in and a company focused on the needs of the employee. The benefit of this alliance and reputation is it allows for operation cost to remain low and returns this value to the customer through cost savings in plant fabrication.

Our philosophy is to be on the leading edge of technology with regards to our plant design, manufacturing, and management techniques.

- Our designs start using the industry standard AspenTech Hysys® modeling. Our process design team will run multiple iterations to ensure our design will meet the project requirements under differing scenarios, including off-design cases and turn down scenarios.
- “Smart P&ID’s” are our standard, taking conventional P&ID’s a step further by integrating all tagged items into a project database. Autodesk AutoCAD PLANT 3D 2021 allows this attribute data to be passed on to the client after the project is completed for process safety and asset management systems.
- 3D modeling allows pre-manufacturing walk through and allows maintenance and safety design considerations to be integrated into the design. Our designers model all components of the plant to provide our clients with a comprehensive pre-manufactured view of their plant.
- Customized PLC/OI and DCS solutions are tailored to clients’ needs with our in-house team. FREE technical support via remote internet connection with customized security protocol as client required is standard.
- Commissioning, start up, and operator training using our in-house personnel. Customized documentation integrating current client systems and operating procedures is also available.
- Warranty, parts, and onsite technical service is provided by our Parts and Service Department.

Salof has the expertise and experience, combined with capability and capacity to undertake and deliver this project successfully.



The Salof team has a vast range of experience in design, manufacturing, installation, commissioning, operation, and parts supply for:

- 121 - CO2 Liquefaction Plants,
- 71 - Acid Recovery Plants,
- 14 - LNG Liquefaction Plants
- 8 - LPG Plants,
- 50+ - Ammonia Refrigeration Systems

Salof's top management personnel, consisting of 5 individuals, having a combined experience of over 160 years in gas liquefaction applications. The company runs at a fast pace with a lean team and is able to complete large projects through extensive experience and the ability to bring in personnel through the company reputation and local resourcing agencies.

<b>Team Role</b>	<b>Name</b>	<b>Years' Experience</b>
CEO	George Salof	50 Years
President	Bob Luhrs	40 Years
Vice President of Operations	Randy Elson	43 Years
Operations Manager	Craig Preiss	25 Years
Business Development	Brian Kuyper	25 Years
Process and Design Engineering Manager	Valerie Castillo	15 Years
Electrical, Controls, Instrumentation Manager	Sriram Ramanathan	15 Years
Project Manager	James Chestnut	7 Years
Project Engineer	Chris Bruer	8 Years
Project Controls	Deanna Hamm	13 Years
Shop Manager	Justin Schievelbein	25 Years
Procurement Manager	Brian Woody	27 Years

### **3.2 Typical Project Organizational Chart**

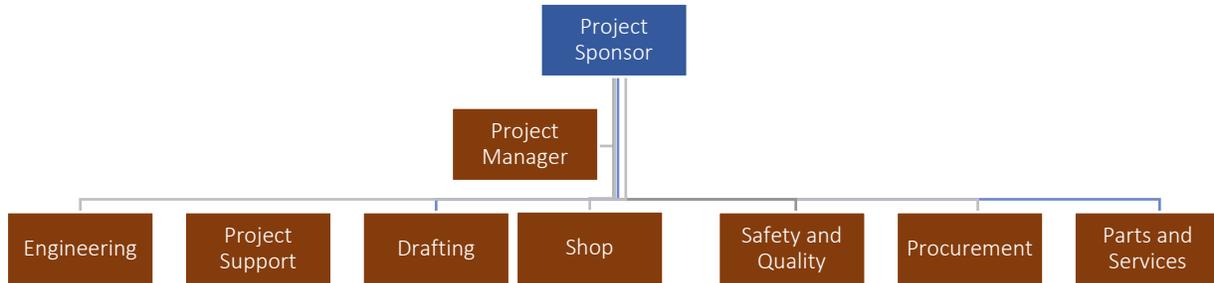
The Project Team staff comprises:

- Salof project professionals;
- Salof technical personnel acting in an advisory role to the project;



- Independent contractors hired directly by Salof; and
- Second and Third Level team members from other Salof departments.

The Project Team is intended to expand and contract as necessary to meet Salof’s needs for project management and technical services. Project teams are selected by Salof management during the project planning phase and will remain a part of the project until the project has been executed in its contractual entirety.



The Project Team is intended to function as an integrated cross-functional team based in the Salof offices in order that personnel may be readily dispatched as required. Personnel assignments will vary in duration depending on specific project requirements. The Project Team will complete and submit all deliverables as defined under the Contract for the Project. Salof has the below resources anticipated to support this project, based on project timing and Salof work scope these employees may be adjusted or their work scope modified for the project.

Project Role	Salof Employee
Contractor’s Authorized Representative	TBD
Project Manager	TBD
Project Engineer	TBD
Lead Process and Mechanical Engineer	TBD
Lead Controls, Instrumentation, Electrical Engineer	TBD

## 4 Previous Project Experience

### 4.1 Project List

Salof has the ability to work on engineering and manufacturing projects, as well as assist existing facilities with upgrades, maintenance, and turnaround operations. Below are just a few customers Salof



LTD., Inc. have helped in various capacities. A complete list of Salof Refrigeration / Salof LTD. built CO<sub>2</sub> Liquefaction Systems where fermentation is the source is attached to the end of this document.

**Service Customers List**

- Continental Carbonic
- Air Products
- Linde
- Polar Ice
- Mustang Gas Products LLC.
- Praxair

**Project Customers List**

Year	Location	Customer	Description	Size
2017	Woodward, OK	Linde North America Inc.	CATOX System	150 tons/day
2017	Martinez, CA	Continental Carbonic Products, Inc. (CCPI)	Compressor and Motor Skid Design and Fabrication	
2017	Brandon, MS	Linde North America Inc.	Engineering Feed Study	
2018	Denison, IA	Continental Carbonic Products, Inc. (CCPI)	Design, Manufacturer, Commissioning, and Startup of a Carbon Dioxide Compression and Condensing System	350 TPD Raw / 300 TPD Dry Ice Vapor Recovery System
2018	Brookhaven, MS	Continental Carbonic Products, Inc. (CCPI)	Design, Manufacture, Commission, Startup Evaporation Replacement Module	
2018	Yazoo City, MS	Airgas an Air Liquide Company	Design, Procure, Manufacture Gas Chiller System	2,000 lbs./hr.
2018	Tooele, UT	Airgas an Air Liquide Company	Feasibility Study for LN2O Production Plant	1,750 lbs./hr.
2018	Richmond, CA	Linde North America Inc.	Design, Procure, Manufacture CO2 Re-Condenser System	4,604 lbs./hr.
2018	San Antonio, Tx	Mission Controls	Manufacturing of MCC House and HMI Panel	
2018	Hennessey, OK	Specialist Mechanical Engineers	Design, Manufacturer, Commissioning, and Startup of a pump skid with sub cooler	
2018	Hennessey, OK	Specialist Mechanical Engineers	Automation upgrade for an existing gas plant	
2018	San Antonio, Tx	Mission Controls	Manufacturing of MCC House and HMI Panel	120,000 gal/day



2018	Chattanooga, TN	Southern Gas Company	Feasibility Study for LNG Pre-treatment System	7,000 MSCF/Day
2018	Yazoo City, MS	Airgas an Air Liquide Company	N2O Purification System – Reboiler / Stripper w/ Went Condenser	2,000 lbs./hr.
2019	Tooele, UT	Airgas an Air Liquide Company	Design, Manufacturer, Install, Commissioning, and Startup of a LN2O Production Plant	1,750 lbs./day
2019	Brandon, MS	Linde North America Inc.	Engineering, Fabrication, Installation, and Commissioning of a load out pump skid	
2019	Yazoo City, MS	Airgas an Air Liquide Company	2 - Non-Condensable Gas Purge Systems	240 lb./hr. Each
2019	Amistad, NM; Cheyenne, WY; Cortez, CO; Torrance, CA	Airgas an Air Liquide Company	Engineering and Drafting update and incorporation of client P&ID's for (4) facilities	N/A
2019	Greenville, OH; Louden, TN	Continental Carbonic Products, Inc. (CCPI)	Controls System Upgrade	N/A
2019	Toledo, OH	Midrex Technologies	Manufacturing of a seal gas refrigerant dryer system	15,000 NM <sup>3</sup> /HR
2019	San Antonio, TX	Bio Energy (Austin) EDL	Feasibility Study to purify of Landfill gas for delivery to pipeline	6,000 SCFM
2019	Elba Island, GA	Kinder Morgan	On Site Startup Support for a multi-train skid mounted SCMR LNG facility (.25MPTA 10 trains)	485,000 GPD
2019	Jacksonville, FL	Jax LNG	Engineering design, Procurement, Fabrication, Site Preparation, Installation, Commissioning, Startup of a SCMR LNG facility	240,000 GPD
2019	Philippines	CRYOSYS	Design and Manufacturing of an AG&P BOG LNG Re-liquefier Control System and panel	250 Kg/hr.
2020	Madison	Matheson Tri Gas	Design, Manufacturer, Commissioning, and Startup of a CO2 Gas Chiller Package	500 TPD
2020	Malta Bend, MO	Archview Carbonic, LLC	Plant relocation from Sauget, IL to Malta Bend, MO	



2020	Martinez, CA	Continental Carbonic Products, Inc. (CCPI)	Replacing the existing Evaporative Condenser and remote sump	250 GPM
2020	El Dorado, AR	Continental Carbonic Products, Inc. (CPPI)	Design, Manufacturer, Commissioning, and Startup of a Carbon Dioxide Compression and Condensing System	368 TPD Raw / 350 TPD Dry Ice Vapor Recovery System
2020	Richardson, ND	Red Trail Energy	Design, Manufacturer, Commissioning, and Startup of a Carbon Dioxide Compression and Condensing System	648 TPD CO2 Capture / Sequestration System
2020	Martinez, CA	Continental Carbonic Products, Inc. (CPPI)	Complete System Overhaul / Commissioning of a previous system built in 2000 for relocation in Martinez. CA	4,000 lbs./hr.
2020	Clearfield, PA	Pennsylvania Grain Processing	CO2 Plant Expansion Blower Skid	400 TPD
2020	Clearfield, PA	Continental Carbonic Products, Inc. (CCPI)	Design, Manufacturer, Commissioning, and Startup of a Carbon Dioxide Compression and Condensing System	400 TPD Raw Gas Expansion & 300 TPD Dry Ice Vapor Recovery System
2020	Pixley, CA	Air Liquide USA	Design, Manufacturer and provide Commissioning Support for COS Hydrolysis Bed	500 TPD
2021	Wilmington, CA	Airgas	NH3 Compressor Package Rebuild, Startup Support	160 TPD
2021	Portland, IN	Poet Ethanol Products	Design, Manufacturer, Commissioning, and Startup of a Carbon Dioxide Compression and Condensing System	200 TPD
2021	Phoenix, AZ	Air Liquide USA	Design, Manufacturer, Commissioning, and Startup of two (2) Hi Purity Carbon Dioxide Compression and Condensing System	10 TPD Ea.



## 4.2 Reference List

### **Mark Brewer**

Engineering Manager

Continental Carbonic Products, Inc.

3985 East Harrison Ave.

Decatur, IL 62526

865-368-1889 | mbrewer@matheson.com

### **Relationship**

Mark has provided Salof with multiple CPPI / Matheson projects including new greenfield sites and modifications to existing facilities.

### **Roger Weber**

Vice President, Operations

Nitrous Oxide Corporation / Airgas an Air Liquide Company

2531 Sever Road, Suite 300

Lawrenceville, GA 30043

804-721-4094 | roger.weber@airgas.com

### **Relationship**

Roger has provided Salof with multiple Airgas projects including modifications to existing Airgas facilities as well as a new build facility.

### **Jason Dickfos**

Head of Growth - Technical

EDL Energy

Waterfront Place, Level 6, 1 Eagle Street

Brisbane Queensland 4000 Australia

PO Box 2768, Queen St. Mall, QLD 4000

+61 7 3275 5647 | Jason.dickfos@edlenergy.com

### **Relationship**

Jason was the project manager at the Maitland LNG facility during construction and commissioning when Salof Refrigeration was on site installing and commissioning the facility.



## 5 Engineering and Technology

The following technical sections are presented to describe the process and process equipment on which Salof's CO<sub>2</sub> Capture / Liquefaction Project are based.

Each system is custom designed based on the project's gas composition, process conditions, flows and finished product quality requirements. In general, each system consists of compression, purification, dehydration, liquefaction and the necessary refrigeration components to accomplish the desired outcome.

### 5.1 Design and Engineering Procedures

Salof's engineering is comprised of a team of chemical, mechanical, electrical, industrial engineers. Projects begin with a project kick off meeting to assign project personnel areas of responsibility and ensure a common basis of design and scope is identified. Proposal and contractual information are reviewed at this point. The process engineering team then further develops and confirms a plant specific process to meet client specifications, while balancing efficient plant design versus project cost. Our process design team will run and confirm the plant design using multiple iterations of AspenTech Hysys<sup>®</sup> software to ensure our design will meet the project requirements under all required scenarios.

The major equipment is then sent to suppliers for design verification and the process is revised as required based on actual equipment designs and efficiencies. Again, multiple iterations are run to ensure plant specifications are met under all given input scenarios. As per our quality standard, the process design is reviewed and approved by the appropriate project management team members.

The next step in the process is to develop piping and instrumentation drawings (P&ID's). Salof's standard is to use Autocad which allows the creation of "smart" P&ID's. Smart P&ID's take conventional P&ID's a step farther by integrating all tagged items into a project database. This database allows for "linked" design information documents, equipment datasheets, drawings, operation manuals, and additional documentation to be more easily provided, as required per contract. This database can be further incorporated into client process safety and asset management systems. The Autocad system also allows coordination with the procurement department and is utilized to create valve lists, line lists, and instrumentation lists.

A hazardous operation study (HAZOP) and hazard Identification (HAZID) will follow. Additional requirements derived during these studies would then be incorporated into the P&ID's before an issued for construction (IFC) set is completed.

Our procedures break down procurement into the following categories: major equipment, control and relief valves, instrumentation, miscellaneous valves, and electrical equipment. A datasheet is created for each tagged item and is then checked and approved before issuing to our procurement team. This information is all tied to the P&ID database for smooth and accurate transition to our plant design team.



Our design team next develops 3 dimensional (3D) models of the major equipment using Autocad's AutoPLANT Modeler. A skidded plant layout depicting the complete proposed facility is developed with these models and is submitted for client layout approval. After the layout has passed constructability and other applicable reviews, the plant and piping are fully 3D modeled. As we build our own equipment modules, we can control all aspects of the layout. Where vendor packages are required Salof works with the vendor to ensure the same procedures are followed and equipment is specified to be consistent with the balance of plant equipment. When applicable, our design team can import multiple file types, from the vendor, into the 3D model to ensure the accurate size of equipment and nozzle locations per the vendor design.

After the plant design has been approved and issued for construction to our shop, engineering stays involved checking the construction throughout the entire build process. Again, all construction follows our quality manual for quality manufacturing assurance. Our design team can share data driven models securely to our clients for multidisciplinary view of their projects.

Our clients are always welcomed to be involved in any phase of our engineering process. We welcome feedback and appreciate customer visits during the construction phase to make sure the customer is satisfied with the end product.

## **5.2 Software and Information Technology**

Salof prides itself with being on the cutting edge of Engineering, Design, and Information Technology software. We maintain current releases of all software that are used in our daily processes.

Microsoft Software:

- Microsoft Office 2021
- Microsoft SharePoint

Planning Software:

- Microsoft Project
- Primavera P6

Engineering Software:

- Aspen ONE Hysys – Process Simulation
- Aspen HTFS – Heat Exchanger Sizing
- ChemCAD – Process Simulation
- Staad Pro – Structural Steel analyses
- Various Control Valve Sizing programs based on project specifications
- Various Pressure Safety Valve Sizing programs base on project specifications

Design Software:

- Autodesk: AutoCAD 2021 - Plant Layout/Process Flow Diagrams / P&ID's
- Autodesk: AutoCAD Electrical 2021 – Control Panel Schematics/One-Line Diagrams



Document Control Software:

- Smartsheet
- Autodesk Vault

### **5.3 Project Document Management**

Salof will employ its' standard Electronic Document Management System (EDMS).

## **6 Fabrication**

Salof LTD., Inc. personnel have been engaged in design, engineering, manufacturing, installation and commissioning of refrigeration and the cryogenic industry for many years. Salof is located in New Braunfels, Texas which is just a few minutes outside of San Antonio and 190 miles from the port of Houston. The manufacturing campus is situated on a 9-acre plot that is owned by Salof. The campus contains offices, 40,000 FT<sup>2</sup> of enclosed manufacturing space under crane and additional space for outdoor construction and full plant assembly as required.

### **6.1 Manufacturing Process**

Steel bases, or modules, are designed in the drafting department. Size and strength of modules are determined by the equipment to be set on the module. These designs are reviewed by engineering, drafting, and manufacturing. The drawings are printed, controlled through the ISO program, and issued to the mechanical department. Steel is purchased using a bill of material. Steel is delivered and construction begins. Steel is cut by oxy-acetylene torch or mechanical band saw. The welding process used is GMAW (gas metal arc welding) or FCAW (flux core arc welding). It is imperative that the steel structure is dimensionally correct for proper placement of equipment so modules are checked for quality and accuracy. The structure is then sent to be sandblasted and painted.

#### **6.1.1 Piping Installation – B31.3 / B31.5**

Modules are set and positioned in the manner that they will be in the field, or by the best possible use of space in the shop. A sight level is used to ensure grade is level for all skids. Equipment is then set and piping begins. Pipe racks are set up and interconnecting piping connecting the modules is installed. If a module cannot be set up in the shop due to height or room constraints, a dummy rack will be made which mimics the actual placement of flanges to a common reference point. Pipe will be run to the rack. The rack will be moved to the connecting module and piping resumed. Spool pieces will be stamped to insure proper installation during field assembly.

All welding on pressure piping is performed by qualified welders who are required to pass a stringent 6G welding test outlined by ASME which establishes rules of safety governing the design, fabrication, and inspection of vessels and pressure piping. Piping is welded by many methods, the most common being SMAW (shielded metal arc welding) and GTAW (gas tungsten arc welding). All welds are visually inspected and a minimum of 5% X-ray, governed by ASME standards. A weld map is made to



record welds which include location, welder's identification stamp, and X-ray results. The majority of piping is rolled out on the shop floor. These steps greatly increase production and weld quality and minimizes position welds. This also increases safety.

Proper bolts and gaskets are installed per specification. Pressure testing is then performed per Salof pressure testing procedure. Safety precautions are taken during testing per our safety policy. Test pressures are recorded in the pressure testing log and signed. Only calibrated gauges shall be used.

When pressure testing is complete, insulation begins. Type and thickness of insulation are determined by engineering. Professional insulation contractors are brought in to install insulation and protective jacketing. Skids are cleaned and final painting is applied.

Electrical, instrumentation, pumps, and motors are installed starting at 40% of piping complete. After painting, IO checks and FAT tests are completed. Walk downs will begin and final items on the quality checklist are completed and signed. The shipment release form is the last document filled out to release the project for shipment.

#### **6.1.2 Controls Panel(s) – UL-508**

When panel drawings are issued to the shop manager, the shop manager then assigns the work to the panel workers in the panel shop. Each panel has a set of drawings supplied. The drawings include the panel layout with dimensions, device label, and location. The enclosure back panel is laid out using a square and dimensions on the drawing. The panel is drilled and threads tapped for mounting the devices. Wire duct is installed to accommodate the wiring and make a tidy panel when finished. Grounding terminals and lugs are installed as shown on the drawing. The panel is then wired as shown on the diagrams. Each control wire is labeled on each end with a self-laminating label or a heat shrink label per the customer's requirements. The enclosure is then drilled for the pilot devices and/or controllers. The door devices are carefully wired and neatly laced on the door and protective spiral wrap is put around the harness leaving the door. The back panel is then placed in the enclosure and secured. A grounding wire is connected from the hinged door to the back panel for safety. The door wiring is then landed on the back-panel devices they are designated for. The panel worker then checks all the terminations for loose connections, makes sure the components are labeled as shown, and installs fuses and covers on the devices. The panel is then cleaned of debris and sent to the testing area.

After the assembly work is done, the panel then proceeds to the quality control and testing department. The panels are checked for errors, built to UL specifications, and, if possible, powered and tested for proper operation. The panel is checked for loose and mis-wired connections. All connections are then torqued to specifications. If the quality control person finds a discrepancy, they notify the project manager. The project manager then decides on the course of action to correct the discrepancy. After quality verification is completed, a set of "as-built" drawings are generated. At this time the panel is assigned a UL label. The quality control person generates a report that describes the items checked and gives a copy to the project manager.

When the module assembly is ready for the installation of the controls, the panels are moved to the fabrication shop and mounted. Placement on the module is shown on the layout drawings. Most panels



have floor mount legs, and these are welded both to the module frame and to the enclosure. An additional brace is usually fabricated that helps in shipping to secure the top of the enclosure and prevent stresses from transporting to break the panel loose from its mounting.

### **6.1.3 Wiring on Module**

At this point, the electrical conduit crew starts running the connecting conduit or cable tray. Coordination with devices being already mounted on the skid is key to the progress of the installation. The conduit is one of the last items installed on the skid. The job of selecting the wire for the skid is done from the electrical drawings and specs. The conduit is sized by the number of conductors in the pipe by using the NEC codes. Placement is decided using general arrangement drawings, the P&ID drawings and Navisworks software and is carefully chosen to keep the conduit from interfering with pipe insulation, service, and equipment placement. Voltage types such as low voltage DC (such as 24 volts DC) and analog signals and control voltage such as AC (120-volt AC is typical) are segregated to prevent cross talk and interference. Shielded cables carry some of the signals and are chosen to meet customer requirements and code requirements. Each multi-conductor cable has a sleeve label on it with the cable designation or IO number, and can have device and signal carried information if required.

Each device is labeled with a permanent device tag that matches the P&ID and electrical drawings. All conduits are secured to the skid with brackets and clamps for that type and size. Conduit hubs, pull fittings, and junctions and heavy duty and gasketed as used were required.

Some “runs” start with many conductors and they split off to devices along the way. Three and four-way fittings are used to distribute the wiring to the skid in a neat order. All devices require a “flex” for connection to accommodate both servicing and vibration on the skid. These flex for conduits generally is liquid tight and have a spiral inner core with a copper conductor for good grounding between conduit and device, and to protect the wiring. In addition to this, grounding connectors are used that have provision for an external supplementary ground to assure proper grounding in Class 1 Division II areas.

### **6.1.4 Cable Tray**

Cable tray and cable tray wiring is mounted on the individual modules during “in shop” assembly. Care is taken to use adequate bracing to make this sturdy. The trays are configured much the same as the conduits, with attention to serviceability of the wiring and devices on the module. After in-house assembly is finished, the modules can be aligned to allow for field run wiring to be installed between the devices and terminate all devices. If the job requires a motor control center, or operations building, that also can be wired and energized to test it to the extent possible.

### **6.1.5 Instrumentation and Instrument Air**

When the vessels are set and piping is complete it is time to mount instruments. Instruments are pressure transmitters, temperature transmitters, level indicators, flow meters, etc. All instruments are mounted where they are easy to see and easy to service. The piping and instrument diagram (P&ID) indicate the location of instruments. Instruments are direct mounted or on mounting brackets. Direct mount means on the valve. If the valves are too high or not easily accessible, they must be remote



mounted. When remote mounted, stainless steel tubing is used to connect the instrument to the correct valve. The pressure ratings and temperature ranges are predetermined by our engineers.

The instrument air header is made with one-inch threaded galvanized pipe and fittings. It is mounted to the module base using "right angle" clamps. The header runs throughout the module to each control valve. A one-inch threaded tee is installed as close as possible to the control valve. In the tee is a ½" threaded bushing and a ½" brass ball valve for isolation. Installed in the brass ball valve is a tube fitting. A tube fitting is a fitting with male pipe threads at one end and a nut and ferrule at the other end. Stainless steel tubing is run from ½" brass ball valve to the control valve. The tubing is bent using tubing benders to fit from ball valve to control valve. The tubing shall be plumb, level, and square with the module base. When the air header and tubing is complete it is pressure tested and repaired if necessary. When testing is complete, a quality check list is performed by a supervisor. The supervisor makes sure the tubing is to the correct instrument and correct port. He then checks accessibility to all instruments, if the tubing is installed to specification, and that all instruments and tubing are secure for shipping.

#### **6.1.6 Manufacturing Completion**

Salof will carry out activities to achieve a status of Manufacturing Completion, meaning all functional systems have reached a stage of pre-defined completeness and the systems are tight, clean, and its functional integrity are suitable to demonstrate on-site integrity, loop, and configuration testing. Each module reported as Manufacturing Completion.

#### **6.1.7 Testing at Salof Facility**

Salof perform final verification activities at its facility in New Braunfels, Texas. Each module will be tested to demonstrate module alignment, integrity, configuration, loop, and functionality testing in order to minimize field commissioning activities. Per schedule adjustments will be made to account for onsite installation timeframes as well as shop constraints.

#### **6.1.8 Preservation, Packaging, and Storage**

Salof will inspect each module and provide preservation to modules that require it. Salof will follow the Companies best practice procedures. Once Salof manufacturing final inspection and preservation is complete, Salof will prepare the module for shipment. Based on contractual requirements this could include shrink wrap or netting.

## **7 Quality Management and Quality Assurance**

Salof LTD., Inc, is an ISO 9001:2015 compliant (QMS) Quality Management System.



Salof's executive management provides evidence of its commitment to the development and implementation of the QMS and continually improving its effectiveness by establishing the quality policy, ensuring that quality objectives are established, conducting management reviews, and ensuring the availability of resources.

The QMS Procedures detail the purpose, scope, responsibilities, instructions/procedure, and controls applicable to each function. The procedures take into consideration the requirements of national and international standards and regulations, including those related to quality assurance programs such as ISO 9001.

The quality assurance organization consists of ISO process management teams who ensure that quality objectives, including those needed to meet requirements for project, are established at relevant functions and levels within the organization. The quality objectives are measurable and consistent with the quality policy.

➤ **Design and Development**

In planning of the project, the project manager will determine the quality objectives and requirements for the product, the need to establish processes, documents, and provide resources specific to the plant, required verification, validation, monitoring, inspection and test activities, specific to the plant and the criteria for plant acceptance, and the records needed to provide evidence that the realization processes and plant meet requirements.

Where plant design or manufacturing requirements are changed, the Project Manager ensures that relevant changes are approved within the project team and customer and the appropriate documents are amended.

The Project Manager is responsible for managing the interfaces between different groups involved in design and development to ensure effective communication and clear assignment of responsibility.

➤ **Document Control**

Project Documents are controlled to ensure that relevant versions are available at points of use, to remove obsolete documents, and to control external documents. Documents are reviewed and approved, including re-approval as required, by the project.

A documented procedure has been established to define the controls needed to approve documents as required for adequacy prior to issue, to ensure that changes and the current revision status of documents are identified, and to ensure that documents of external origin are identified, and their distribution controlled.

Records are established and maintained to provide evidence of conformity to requirements and of the effective operation of the quality management system. Records are legible, readily identifiable and retrievable. A documented procedure has been established to define the controls needed for the identification, storage, protection, retrieval, retention time and disposition of records.



➤ **Procurement**

The procurement process team ensures that any purchased product conforms to specified requirements. The type and extent of control applied to the supplier and the purchased product is dependent upon the effect of the purchased product on subsequent product realization or the final product.

The team evaluates and selects suppliers based on their ability to supply product in accordance with the organization's specifications and/or requirements. A criterion for selection, evaluation and re-evaluation is established. Records of the results of evaluations and any necessary actions arising from the evaluation are maintained.

The team ensures the adequacy of specified purchase requirements prior to communication to the supplier and establishes and implements the inspection or other activities necessary for ensuring that purchased product meets specified purchase requirements.

➤ **Manufacturing and Service**

The manufacturing department plans and carries out Production and Service Provision under controlled conditions. Controlled conditions include, as applicable:

- the availability of information that describes the characteristics of the product
- the availability of work instructions, as necessary
- the use of suitable equipment
- the availability and use of monitoring and measuring devices
- the implementation of monitoring and measurement and
- the implementation of release, delivery and post-delivery activities

The manufacturing department is responsible for controlling all phases of Product and Service Provision and for maintaining appropriate records. The department follows the guidelines provided in the Quality Control Manual for the Shop Fabrication of Systems in accordance with project specifications.

The manufacturing department establishes arrangements for the validation of the defined criteria for review and approval of the processes, approval of equipment and qualification of personnel, use of specific methods and procedures, requirements for records, and revalidation.

The manufacturing department is responsible for preserving the conformity of skids during internal processing and delivery to the intended destination. This preservation includes identification, handling, packaging, storage and protection. Preservation also applies to the constituent parts of a plant.

### **7.1 Codes and Standards**

The plant will be designed, but not be limited to the following list of codes and shall abide by all governing U.S. codes and standards.



- NFPA 59A – 2019 ed. (Standard for the production, Storage and Handling of Liquefied Natural Gas). Additional references from NFPA 59A include but are not limited to:
- NFPA 72 – 1999 ed. National Fire Alarm Code
- NFPA 70 – 1999 ed. National Electrical Code
- NFPA 25 – 1998 ed. Standard for the inspection, Testing and Maintenance of Water-Based Fire Protection Systems
- NFPA 20 – 1999 ed. Standard for Stationary Pumps for Fire protection
- CSA Z276-18 Standards for Liquefied Natural Gas (LNG) – Production, Storage, and Handling
- Shell and Tube Heat Exchangers TEMA class “B”
- National Electric Code
- Underwriters Laboratories
- Vacuum Jacketed Piping – 2016 ed.
- Piping Code B31.3 B31.5 and others as applicable
- Local Canadian Codes – Applicable local codes
- Teflon barriers will be used to eliminate metal on metal contact.
- Codes and standards will be clearly identified in documentation to allow for easy reference and review.
- All flow meters will include temperature, pressure, and flow composition.
- Filters or/and screens will be provided for equipment.
- All bare carbon steel components will be coated with a marine grade paint or galvanized.
- PSV systems will be certified.
- ANSI/IIAR 2-2021 – Standard for Design of Safe Closed Circuit Ammonia Refrigeration Systems

## 7.2 Preliminary Equipment List

The below list is a typical equipment list for a capturing CO2 from an ethanol source.

Tag No.	Description
D-0	Inlet CO2 Gas Condensate Separator
B-1	Centrifugal Booster Blower
E-1	Hi Temperature Gas Desuperheater
E-2	+50°F Gas Chiller
D-2	Condensate Separator
C-1	CO2 Gas Compound Compressor
E-4	Hi Temperature Gas Desuperheater
T-1	Hi Pressure Water Wash Column (For Food or Beverage Grade LCO2 applications)
E-5	+50°F Gas Chiller
D-5	Condensate Separator
PH-5	Gas Superheater
D-6 A&B	Dehydration Beds
H-6	Regeneration Gas Heater
D-4 A&B	Carbon Beds (For Food or Beverage Grade LCO2)



H-4	Regeneration Gas Heater
E-6	Reboiler
E-6A	Aux Reboiler
E-6B	Aux Reboiler
E-7	Primary CO2 Condenser
E-8	CO2 Vent Condenser
E-9	LCO2 Subcooler
P-12	CO2 High Pressure Surface Pump(s) – Sequestration or Pipeline Projects
C-2	Ammonia Refrigeration Compound Compressor
E-11	Evaporative or Air Cooled Refrigerant Condenser
D-11	High Pressure Receiver
PU-1	Non Condensable Gas Purger
-	MCC System (includes PDC w/ LVMCC, UPS, CPs, etc.)
-	MCC System (includes PDC w/ MVSWGR, VFD, MVMCC etc.)

## 8 CO<sub>2</sub> Liquefaction Plant Description

The following technical sections are presented to describe the process and process equipment on which for a typical CO<sub>2</sub> plant. The plant will be furnished complete, using a skid/modular type approach.

Equipment, pipes, valves, electrical and instrument components, etc. will be prefabricated, mounted to skids/modules, insulated, painted and tested in our shop to reduce the site installation work, ensure quality, and shorten the project on line delivery cycle. Modularization of the plant streamlines the fabrication and construction of the traditional job site work to allow for the quality and logistic controlled production of labor-intensive portions of work in a controlled environment. This allows skilled labor to work in a centralized location with greater total efficiency resulting in a lower cost project with higher quality and on time manufacturing.

### 8.1 CO<sub>2</sub> Gas Liquefaction Process

The CO<sub>2</sub> Liquefaction Plant is designed to capture CO<sub>2</sub> vapor which is discharged during the production of ethanol. The CO<sub>2</sub> Liquefaction Plant will compress, dehydrate and liquefy the CO<sub>2</sub> before again compressing to a super-critical state and superheating the CO<sub>2</sub> to meet pipeline specs. The plant is design to meet these design conditions under worst case design supply temperature and pressure conditions. In addition, the plant is normally able to operate at a 50% turndown ratio.

A process flow diagram is included to graphically illustrate the following process description. The raw CO<sub>2</sub> is captured from the Ethanol Plant’s final water scrubber and then passes through a water knock out vessel (D-0) and into the inlet Blower(s) B-1 and initially compressed to a sufficient pressure to ensure that the most efficient main gas compressor can be utilized. The gas is then de-superheated in an air cooled desuperheater E-1 before being routed to the main liquefaction / compression process building through a pipeline. Upon entering the main process building, the CO<sub>2</sub> is further cooled to +50°F with +40°F ammonia in E-3. The CO<sub>2</sub> vapor then passes through a



water knockout vessel (D-3) before being compressed to 325 PSIA with a compound rotary screw compressor(s) (C-1). After passing through a high efficiency external oil coalescer(s), the CO<sub>2</sub> gas stream passes through a high temperature gas de-superheater (E-4) where the gas is cooled to +110°F with +100°F PG and further cooled in a refrigerated aftercooler (E-5) to +50°F with +40°F ammonia. The additional water condensed out of the gas stream in E-5 is removed in D-5. To prevent the possibility of corrosion, the gas is superheated (PH-5) to 60°F before the final purification and liquefaction steps are performed.

The CO<sub>2</sub> passes through the online drier bed (D-6A or B), where the CO<sub>2</sub> is dried to a minimum dew-point of -70°F. While one dryer bed is online and the other bed is offline where it is regenerated after being online for 12 hours. Process Gas is used for regeneration gas can be before being returned to the system for reprocessing.

Should the system be used to produce beverage grade LCO<sub>2</sub>, a high pressure water wash T-1 is installed between E-4 and E-5 and a set of Carbon Beds (D-4 A&B) which operate similar to the Drier Beds will be provided to remove Sulfur and any remaining VOC's not removed in the high pressure water wash column.

As the gas exits the on line drier, it passes through the Filter F-6 and through the reboiler (E-6A) and is condensed in the CO<sub>2</sub> condenser (E-7). The liquid CO<sub>2</sub> flows (by pressure) to the stripper column (T-14) for further purification. The vapor off of the top of the column is routed through the Vent Condenser (E-8) to maximize the recovery of CO<sub>2</sub> from the non-condensable gas stream. The CO<sub>2</sub> condensed in E-8 is pumped back to the column. The non-condensable vapor off of E-8 is vented to atmosphere. The liquid CO<sub>2</sub> that flows over the internal weir in the reboiler E-6 is flows through the subcooler E-9. Exiting the Sub-Cooler, the LCO<sub>2</sub> is ether sent to bulk storage tanks or compressed to the necessary pressure for pipeline or ground injection (1600 to 2200 PSIG) and superheated to a minimum of 40°F before being discharged.

The CO<sub>2</sub> compressor(s) are equipped with a high efficiency oil coalescer to reduce lubricant carryover to less than 1 PPMW.

## **8.2 NH<sub>3</sub> REFRIGERATION SYSTEM**

A closed loop NH<sub>3</sub> refrigeration system is provided for required high temperature, intermediate temperate and low temperature duties required to process the raw CO<sub>2</sub> gas stream to the required outlet purity requirements. An Air Cooled or Evaporative Condenser sized for the total load will be provided to condense the NH<sub>3</sub> vapor discharged from the compressors during operation. Condensed NH<sub>3</sub> supplied from the high-pressure receiver (D-11) will be used for the intermediate and low temperature heat exchangers. Ether thermosyphon or pumped NH<sub>3</sub> ammonia is used for the hi-temperature desuperheating duties.

The NH<sub>3</sub> relief valves will be connected to a common manifold. Once installed, the Buyer will install additional headers to rout outside the process building in the event of a NH<sub>3</sub> release.

The NH<sub>3</sub> compressors are equipped with a high efficiency oil coalescer to reduce lubricant carryover to less than 1 PPMW.



### 8.3 Additional Equipment and Services included

- a) First Fills of Lubricants, Carbons & Desiccants
- b) MCC / MCC Building
- c) Arch Flash Study

### 8.4 Civil and Construction

Further details on civil and construction will be provided at a later date and will be based on site conditions.

### 8.5 Startup, Commissioning, Training

Startup, commissioning, and training will be provided by Salof.

## 9 Electrical Control System and DCS

### 9.1 Electrical Design

The facility will use the following power distribution design:

Motors above 250 HP	4.16 kV, 3-phase, 60 Hz
Motors from ½ HP to 250 HP	480 V, 3-phase, 60 Hz
Utility Power	208/120vac, 3-Phase, 60 Hz
Controls, UPS and Utility Power	120VAC, 1 Phase, 60 Hz

### 9.2 MCC Equipment

MCC equipment necessary for operation of the plant is included. A standalone building for MCC equipment will be included.

### 9.3 Control System

All instrumentation and controls will be integrated into an Allen-Bradley PLC and a Wonderware HMI system. The control system will be designed to provide automatic operation to the fullest extent possible with minimal intervention. Safety critical control loops will be identified during detailed design.

### 9.4 Skid I/O

All electrical and instrumentation on the Salof manufactured skids is typically wired to on-skid remote I/O cabinets where feasible for quick and easy field installation. The cable tray/conduit system is designed and installed on all skids and interconnecting skid pipe-racks enabling for all skids to be physically connected at Salof and fully wired and tested prior to shipment.



### **9.5 UPS / Power Redundancy - Optional**

The MCC room is equipped with an Uninterruptable Power Supply (UPS) to supply conditioned and backup control power to all critical process control equipment.

### **9.6 Fire & Gas Detection System**

The Fire & Gas detection system (FGS) will be used to monitor the facility area utilizing IR flame detectors and combustible gas detectors. The FGS system will be connected to the safety PLC system for taking intended actions on the plant and alarms back to the Control System where status can be monitored on the HMI.

### **9.7 Analytical Equipment**

A dewpoint analyzer is included for confirm proper Dryer Operation. Based on customer's needs, additional analyzers may be added to the system.

### **9.8 Technical Documentation**

Salof's control system comes fully documented; which will consist of, but not limited to, the following documents:

- Process control and safety protection to be included in overall system operation manual.
- Controls manual with relevant narratives, control and alarm/trip setpoints, DCS IO lists, etc.
- Cause & Effect Diagram
- Instrumentation data sheets and list(s)
- Electrical and Control system schematics

### **9.9 Training**

Salof control system training will be conducted by our skilled engineering team knowledgeable in all aspects of the process and control of plant. Standard training will be conducted both during pre/post commissioning, and for an additional cost, optional training is available at Salof office after the control system Factory Acceptance Test has been completed. Salof standard training material includes, but is not limited to, piping & Instrument drawings (P&ID), process flow diagrams, Cause & Effect diagram, relevant narratives and a plant operation manual.

A hand and hand training approach with additional classroom training time will be provided to the operators. By the commencement of startup, the operators will have a thorough understanding of how to monitor and effectively manage the plant production.

## **10 Performance and Plant Acceptance**

The following are typical plant performance criteria to be checked:

- ✓ CO<sub>2</sub> Throughput Capacity
- ✓ Power Consumption



✓ CO<sub>2</sub> Quality

The following protocols have been developed to confirm plant performance, reliability, and overall plant acceptance.

## 10.1 Testing Method

### 10.1.1 Design Case

The “design case” will be updated during detailed engineering and this mass balance will incorporate the dynamics of the equipment/plant operation. This case will be the basis for all testing.

### 10.1.2 Detailed Test Plans and Procedures

The Supplier shall produce detailed Test Plans and Procedures for all Tests listed above.

### 10.1.3 Measurement Accuracy

All measurements taken during the conduct of tests shall be made using plant instrumentation, which has accuracy commensurate with the expected pass criteria of the tests.

### 10.1.4 Test Witnessing and Issue of Test Certificates

The client shall have the right to witness all performance and function tests undertaken. In the event client waives the right to witness the test, the Supplier shall be required to issue a test certificate within two days of performing the test, or within two days of receiving the test results from third parties.

The Supplier shall record all test results obtained and shall provide Red Trail Energy with test certificates, for each and every test, verifying that all required tests have been carried out satisfactorily and showing the results obtained.

### 10.1.5 Data Recording

All relevant process data is to be continuously recorded on the Plant control and HMI system for twelve months. Data to be archived per client standards.

Additional samples required for independent verification will be handled by the client as required. Details of the sampling will be logged including the time, location and person doing the sampling. Samples should be dispatched for analysis within 24 hours of the time the sample was taken, whenever practical.

## 10.2 CO<sub>2</sub> Production Test Format

### 10.2.1 Stable Operation

The plant is to attain stable operation before the test commences. In the event the test is unable to be completed due to gas supply, power supply or factors outside the supplier’s control then the plant will be considered provisionally accepted. The supplier can leave site and testing will be rescheduled at a mutually agreeable time.

### 10.2.2 Inlet pressure

Inlet pressure to the CO<sub>2</sub> plant is to be regulated above the minimum design plant design pressure throughout the test. If the supply pressure drops below the minimum pressure the test is to be suspended and then recommenced when the pressure rises above the minimum required pressure and production has re-stabilized.



### **10.2.3 Full Capacity**

The capacity and product quality will be tested to ensure the plant meets full throughput design capabilities for a period of 168 hours.

### **10.3 Capacity Test**

The capacity of the plant will be as determined by the plant design case. In the event that gas supply issues limit the feed gas quantity the test will be completed with the maximum available gas.

### **10.4 Power Consumption**

The expected power consumption of the plant is calculated once the final equipment selections have been made. During the capacity tests the power consumption figures will be recorded and compared against design figures. Any discrepancies will be noted and reviewed for possible action.

### **10.5 Mass Balance Integrity Check**

Raw Gas and Finish LCO<sub>2</sub> samples will be taken during commissioning and submitted to a 3<sup>rd</sup> party testing facility if local analyzers indicate out of spec finished product.

### **10.6 Functional Test**

Functional tests shall be performed at the pre-commissioning stage to demonstrate correct operation of manual and automatic control functions and modes of operation, including:

- Auto Plant Startup
- Upon loss of power, controlled shutdown of the plant to a safe condition.
- Stable operation of the plant at specified minimum continuous production rate.

### **10.7 Certificate of Plant Completion**

When the CO<sub>2</sub> System has:

- a) Fully met and satisfied the acceptance testing in all regards; and
- b) Is otherwise materially complete,

Salof shall promptly issue a certificate of completion to the client for signing.

## **11 Warranty**

Salof typically provides a 12-month warranty, but this can be tailored to customer needs.



## **12 Project Schedule**

The estimated schedule timeframe is about 14 months from order to startup. This will be tailored further as the project scope becomes more detailed. This time excludes delays due to customer changes or supply chain disruptions.

The recommended software for this project is Primavera. A detailed project controls plan will be provided within 3 weeks of project kickoff to detail the project schedule features, assumptions, constraints, WBS structure, milestones, updating procedures, and forecasting. Along with the detailed information on the project schedule will be procedures detailing change management, project approval structure, costing, and project forecasting.

If the Customer would like to integrate the Salof schedule into a larger project schedule, adjustments can be made to the project setup or software changes can be made.

## **13 1<sup>st</sup> Year Spares**

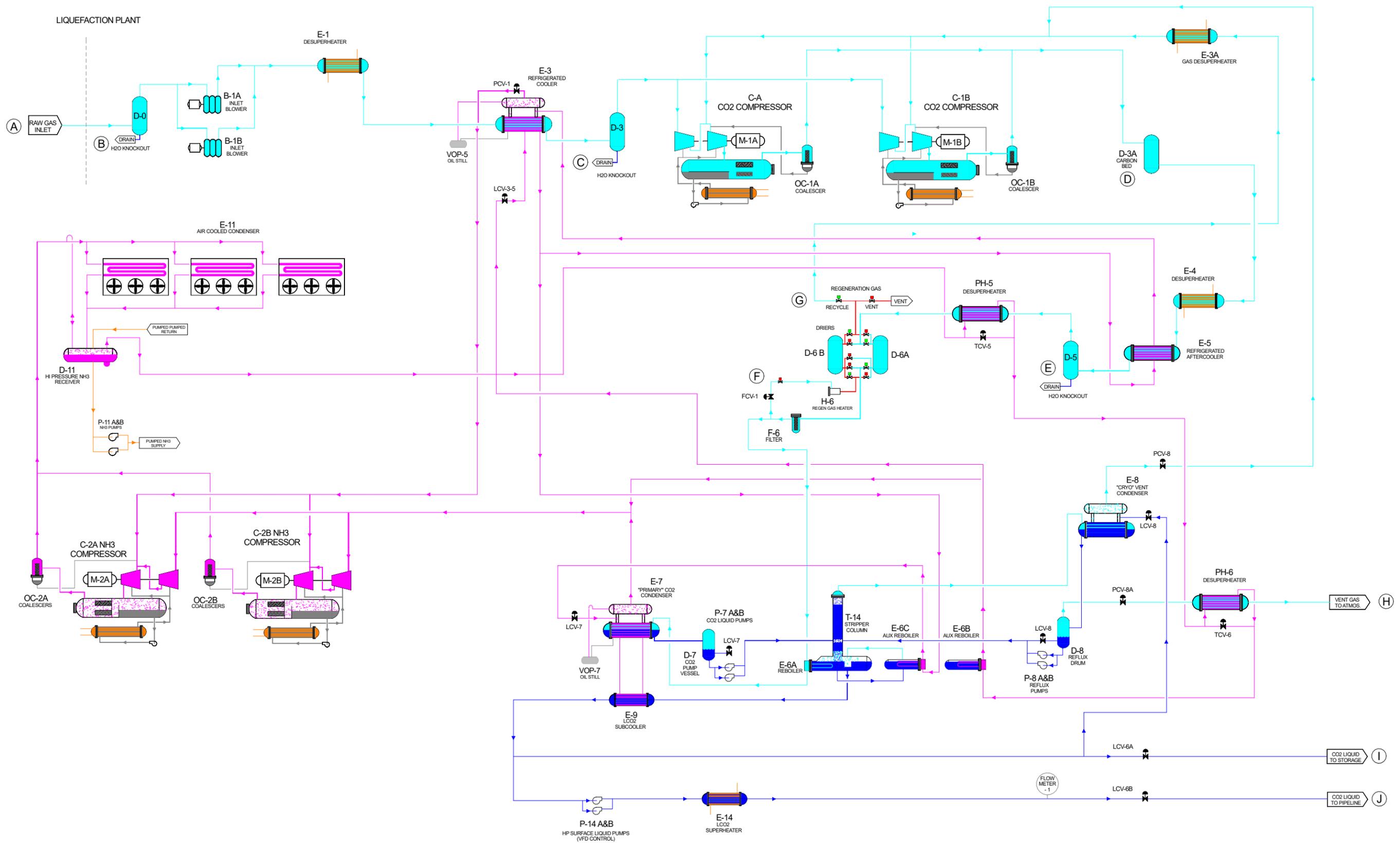
Salof can included a proposal for 1<sup>st</sup> year spares. Salof has a list of recommended items to be purchased, but will work with the Customer to determine the best items based on customer goals and objectives.



**SALOF LTD., INC.**  
 5141 IH 35 S, NEW BRAUNFELS, TX 78132  
 1-830-225-1744

**SALOF LTD., INC & SALOF REFRIGERATION CO., INC. - CO<sub>2</sub> LIQUEFACTION PLANTS - ETHANOL PLANTS IN YELLOW**

CUSTOMER	PLANT LOCATION	YEAR BUILT	CO <sub>2</sub> CAPACITY (TPD)	CUSTOMER	PLANT LOCATION	YEAR BUILT	CO <sub>2</sub> CAPACITY (TPD)
PCS Nitrogen	Geismer, LA	2011	1900	BOC Gases	Muscataine, IA	1995	200
Airgas	Star, MS	2006	820	Cryoinfra	Puebla, Mexico	2004	180
AC Industries	Augusta, GA	1996	810	Carbonyl Corporation	Decatur, AL	1997	175
Red Trail Energy	Richardson, ND	2020	647	Dixie Carbonic	Winnebago, MN	1998	175/100
Yara	ENGLAND	2008	650	Pain Enterprises	Hopkinsville, KY	2004	170/120
Green Carbon	Kuwait City, Kuwait	2011	600	Poet / Markwest	McAlester, OK	2014	160
Cargill, Inc.	Blair, NE	1995	600	Continental Carbonics	Greenville, OH	2011	155
OPD (Optimized Process Design)	Streetman, TX	2006	530	Pain Enterprises	Hopkinsville, KY	2006	150
BOC Gases	Brandon, MS	1995	500	MG Industries	St. Paul, MN	1999	150
Praxair	Hopewell, VA	2010	450	Pain Enterprises	Edgemoor, DE	1999	150
Airgas	Camilla, GA	2008	450	Raytheon (A.E.S.)	Cumberland, MD	1997	150
Airgas	Houston, TX	2007	450	Praxair	Augusta, GA	1984	150
Praxair	Sarnia, Ontario Canada	2005	425	Cryoinfra	Morelos, Mexico	2003	132
Continental Carbonics	Clearfield, PA	2020	400	Air Liquide	Campana, Argentina	2008	120
Airgas	Alvin, TX	2013	400	ZAK	POLAND	1996	120
Northeast Missouri Grain LLC	Macon, MO	2002	400	BOC Gases	Winthrop, MN	1994	120
Procorn LLC	Preston, MN	2002	400	Praxair	Decatur, AL	1987	120
EPCO	Beaumont, TX	1998	400	Continental Carbonics	Brookhaven, MS	2004	111
Continental Carbonics	El Dorado, AR	2020	368/350	Praxair	Iguatama, Brazil	2010	110
Continental Carbonics	Denison, IA	2010	350/300	Praxair	COLOMBIA	2006	110
Continental Carbonics	Greenville, OH	2010	350/300	Praxair	Beijing, CHINA	1997	110
Continental Carbonics	Albion, MI	2006	350/300	Louis Rich/Kraft Foods	Newberry, SC	1997	108
Continental Carbonics	Clearfield, PA	2020	350	Poet	Fostoria, OH	2012	100
Air Liquide	Prescott, Canada	2016	330	Poet	Ladonna, MO	2012	100
Air Liquide	Alymer, Canada	2016	330	Poet	Marion, OH	2011	100
Praxair	Varenne, Canada	2006	330	Achema	Lithuania	2006	100
Airgas	Star, MS	2002	330	Tri-State Carbonic LLC	Lawrenceburg, IN	2006	100
Praxair	Monterrey, Mexico	1999	330	Praxair	Decatur, AL	2003	100
Cargill, Inc.	Eddyville, IA	1994	330	Dixie Carbonic	Beatrice, NE	1996	100
Cryoinfra	Minatitlan, Mexico	2011	300	Praxair	Lawrence, KS	1984	100
EPCO	Shelby, NY	2008	300	Daelim / Saudi Kayan (2 Sys)	SAUDI ARABIA	2007	96 / 96
EPCO	Marion, IN	2006	300	Daelim / HPC	SOUTH KOREA	2007	89
Pure CO2	Price, Utah	2006	300	STROMBEEK	BRUSSELS, BELGIUM	2005	87
Pain Enterprises	Riga, MI	2005	300/240	Total Ice Systems	ENGLAND	1999	82
Praxair	Morelos, Mexico	2003	300	Air Liquide	CANADA	1997	82
Ace Ethanol	Stanley, WI	2002	300	Broin & Associates	Scotland, SD	1996	80
Continental Carbonics	Pekin, IL	1995	300	SCO <sub>2</sub>	SINGAPORE	1999	79
Linde	Beaumont, TX	1995	300	Industrial Gas Co.	TRINIDAD	2010	70
Praxair	Benicia, CA	1995	300	Poet	St. Joseph, MO	2010	70
BOC Gases	Muscataine, IA	1994	300	Praxair	Costa Rica	2014	55
Praxair	Ferndale, WA	1994	300	Praxair	Costa Rica	2003	55
Praxair	Tulsa, OK	1994	300	Jasons Dry Ice	St. Paul, MN	2000	50
Praxair	Pekin, IL	1993	300	Polar Ice	IRELAND	2003	40
Continental Carbonic	Loudon, TN	2001	275/140	CO <sub>2</sub> Air	Denver, CO	1997	36
Ethanol 2000	Bingham Lake, MN	2000	260	Holox, Inc.	Colfax, NC	1996	36
Exol	Albert Lea, MN	2000	260	Atlantic Dry Ice	Gainesville, GA	1995	36
Linde, LLC	Fort Worth, TX	2014	250	Air Liquide Corp.	Smithfield, VA	1989	36
Husky Energy	Calgary, CANADA	2009	250	Praxair	Tonawanda, NY	1997	35
United Ethanol	Milton, WI	2007	250	Praxair	COLOMBIA	1989	35
Renew Energy	Jefferson, WI	2006	250	Hydro-Chem	TAIWAN	1999	30
Dufour Petroleum	New Orleans, LA	2002	250	Air Liquide	ARGENTINA	1997	28 & 30
Heller Carbonic	Galva, IA	2002	250	Praxair	Boston, MA	1986	25
UTICA Energy	Algoma, WI	2002	250	Industrial Gas Co.	TRINIDAD	2006	24
EPCO	Beatrice, NE	1995	250	Talosto	RUSSIA	1998	24
EPCO	Monroe, LA	1994	250	Hoprich	Evansville, IN	1995	24
Praxair	Fort Dodge, IA	1993	250	Industrial Gas Co.	TRINIDAD	1998	20
EPCO	Boyceville, WI	2011	240	Goldkist	Carrolton, GA	1997	18



■ VAPOR CO2 ■ AMMONIA ■ LUBRICANT  
 ■ LIQUID CO2 ■ PUMPED NH3  
 (A) SEE SUMMARY MASS FLOW NOTE: PUMPED PUMPED LOOP NOT SHOWN



**BLUE FLINT ETHANOL**  
**626 TPD CO2 CONDENSING PLANT**  
 PROCESS FLOW DIAGRAM - "CRYO LOOP" - REV 3  
 AUGUST 5, 2021

APPENDIX I  
PROJECT SCHEDULE

