APPLICATION CHECKLIST

Use this checklist as a tool to ensure that you have all of the components of the application package. Please note, this checklist is for your use only and does not need to be included in the package.

☐	Application
☐	Transmittal Letter
☐	$100 Application Fee
☐	Tax Liability Statement
☐	Letters of Support (If Applicable)
☐	Other Appendices (If Applicable)

When the package is completed, send an electronic version to the Industrial Commission at ndicgrants@nd.gov. Send payment to:

North Dakota Industrial Commission
Attention: Renewable Energy Program
State Capitol – 14th Floor
600 East Boulevard Ave Dept 405
Bismarck, ND 58505-0840

For more information on the application process please visit:
https://www.ndic.nd.gov/renewable-energy-program/rep-applicant-council-information

Questions can be addressed by calling 701-328-3722.

Renewable Energy Program

North Dakota Industrial Commission

Application

Project Title: Carbon Convert

Applicant: Marlo Anderson LLC

Principal Investigator: Steve Bakken

Date of Application: May 25, 2023

Amount of Request: Grant 500,000

Total Amount of Proposed Project: 4,500,000

Duration of Project: 1 Year

Point of Contact (POC): Marlo Anderson or Laycie Geis

POC Telephone: 701.347.1816

POC Email: marlo@marloanderson.com or laycie@marloanderson.com

POC Address: 215 Airport Road Suite 315 Box T Bismarck. ND 58503

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ABSTRACT

Objective:

Our objective is to further the research, development, and implementation of a novel, integrated photovoltaic and electrochemical cell system which harnesses sunlight to convert carbon dioxide (CO2) into valuable hydrocarbons. This system, as elaborated in the patented technology provided by NASA, is designed to function without the need for external electrical power, such as a battery.

We aim to establish a clean, sustainable, and effective method to reduce carbon dioxide, which is a major greenhouse gas, while simultaneously producing usable fuels. This dual action of carbon sequestration and energy generation could help significantly mitigate environmental challenges and contribute to clean energy initiatives.

The technology holds immense potential, not just for Earth's sustainable energy needs, but also for future space exploration missions. Notably, the atmosphere of Mars is composed of about 95% CO2. This technology could be leveraged to convert this abundant resource on Mars into useful fuels, aiding long-term human presence and exploration on the red planet.

Our objective aligns seamlessly with the mission of the Clean Sustainable Energy Authority in North Dakota. By fostering the development of such groundbreaking technology, we aim to contribute to North Dakota's clean energy infrastructure, and potentially, the broader goals of sustainable space exploration.

Our ultimate goal is to turn an environmental liability (CO2) into a valuable resource (hydrocarbons), utilizing an abundant and renewable energy source: sunlight. Through this initiative, we aspire to contribute to a cleaner and more sustainable energy future for both our planet and future extraterrestrial habitats.

Expected Results:

Upon the successful completion of our project within the one-year timeline stipulated by our license from NASA, we anticipate the following results:

1. Functional Prototype: We aim to develop a fully functional prototype of the integrated photovoltaic and electrochemical cell system, as outlined in the patent.

2. Verification of Technology: This prototype will serve to verify the commercial viability of the technology, demonstrating its capability to convert CO_2 to hydrocarbons using sunlight.

3. Performance Evaluation: We intend to collect comprehensive data on the system's performance, including metrics like efficiency of CO_2 conversion, rate of hydrocarbon production, operational stability, and the durability of the cell.

4. Commercial Viability: The data will allow us to assess the commercial viability and potential scalability of the system. It will also help identify potential markets and applications, such as renewable energy production, carbon capture and storage, and potential uses in space exploration, especially for Mars missions.

5. Environmental Impact: We also expect to quantify the environmental impact of the technology, including its potential for CO_2 reduction and contribution towards renewable energy targets.

6. Future Development Plan: Based on the project outcomes, we will propose a detailed plan for future development, scale-up, and commercialization of the technology.

Our efforts are aimed at achieving a significant stride in clean energy technology. The successful implementation and commercial viability of this technology will be a leap forward in sustainable energy production, carbon capture, and potentially, space exploration. By fulfilling the terms of our license with NASA, we anticipate contributing significantly to clean energy initiatives and space exploration in the coming years.

Duration:

The duration of this project, as stipulated in our license agreement with NASA, is set at one year. This one-year duration is broken down as follows:

1. **Initial 3 months: During this period, we will focus on planning, design, and setup. This will include procuring materials and equipment, finalizing the project team, setting up project timelines, and establishing laboratory setups.**

2. **Next 6 months: The bulk of this period will be dedicated to the fabrication and testing of the prototype based on the NASA patent. We will iterate through various designs, optimize conditions, and carry out numerous tests to assess and improve the system's performance.**

3. **Final 3 months: The final quarter of the project will be dedicated to data analysis, assessment of commercial viability, environmental impact analysis, and planning for future scale-up and potential commercialization. It will also include final reporting and documentation.**

Please note that while our plan is structured, we maintain a level of flexibility to accommodate any unforeseen challenges that may arise during the development and testing of the prototype. Our team is committed to adhering to this one-year timeline while ensuring the highest quality of research and development.

Total Project Cost:

The total projected cost of this project is $4.5 million. This figure has been meticulously calculated based on several anticipated cost factors:

1. **Personnel Costs: $1 million. This cost includes salaries for a team of specialized engineers and scientists, lab technicians, and project managers who will work full time on the project.**
2. **Equipment and Materials: $1.5 million. We anticipate significant costs in procuring necessary equipment, devices, and specialized materials as per the patent guidelines, some of which are very specific and can be quite expensive.**
3. **Operational Costs: $500,000. These costs include utility bills, maintenance of equipment, logistical support, and other miscellaneous costs related to day-to-day operations.**
4. **Research and Development: $1 million. This budget allocation will be used for the extensive research and development activities necessary for optimizing the design, conducting experiments, and data analysis.**
5. **Contingency and Miscellaneous: $300,000. This allocation covers unforeseen costs and potential overruns, ensuring we are well-prepared for any unexpected expenses during the project.**
6. **Commercial Viability Analysis and Marketing: $200,000. This budget will be used for the commercial feasibility study, environmental impact assessment, intellectual property rights if applicable, and marketing efforts for potential investors and partners.**

We believe that the cost is justified given the revolutionary nature of the project, the potential for energy generation, and the significant benefits it offers in terms of sustainability and contributing to the fight against climate change. This budget ensures that the project has a strong foundation for success and future commercial viability.

Participants:

We are in the process of assembling a multi-disciplinary team, combining a wealth of talent, skills, and expertise to effectively deliver this project within the stipulated one-year timeframe.

1. **Steve Bakken, Project Manager: As a well-versed professional from Bismarck, Steve will oversee the entire project, ensuring a timely execution within the projected budget.**

2. **North Dakota University System Researchers: Our project will be significantly bolstered by a collaborative partnership with researchers from North Dakota University System. Their expertise in various scientific disciplines will aid in the design, optimization, and implementation of the system.**

3. **Latoya Johnson, Procedures Specialist: Based in Las Vegas, Latoya is a seasoned professional who will streamline our processes, enhancing efficiency and productivity within the project.**

4. **Marlo Anderson, Serial Entrepreneur: Marlo's vast experience in building successful enterprises will provide us with crucial business insights. Moreover, the support from his office staff at Marlo Anderson, LLC will greatly assist in project organization.**

5. **Chemical Engineer (To Be Determined): This individual will be responsible for designing and optimizing the chemical reactions for CO2 to fuel conversion.**

6. **Mechanical Engineer (To Be Determined): This role will involve the design and creation of the physical components of the prototype.**

7. **Electrical Engineer (To Be Determined): This expert will design and integrate the electrical components of the prototype.**

8. **Materials Scientist (To Be Determined): This team member will select and optimize the materials used in the prototype.**

9. **Analytical Chemist (To Be Determined): The analytical chemist will perform essential analyses to characterize the reaction products and optimize the process.**

10. **Safety Engineer (To Be Determined): This professional will ensure the safe design and operation of the prototype and establish necessary safety protocols.**

Additional Staff: We will also employ an administrative professional and two project assistants to ensure smooth operations. Other areas of expertise like software development, data analysis, and industrial design might be sought as the project progresses.

PROJECT DESCRIPTION

Objectives:

1. **Commercial Viability: The primary objective of this project is to demonstrate the commercial viability of a novel photovoltaic and electrochemical system for converting CO_2 to hydrocarbons. Using NASA's patented technology, we aim to develop a functional prototype within a year.**

2. **Energy Efficiency: We aim to optimize the energy efficiency of the system to exceed current standards of CO_2 to fuel conversion technologies. This objective involves fine-tuning the photovoltaic cell performance and improving the electrocatalytic reduction process.**

3. **Scalability: Our goal is to design and validate a scalable model that can be efficiently replicated for large-scale production. The scalability of the system will be integral to its commercial success.**

4. **Sustainability: We aim to showcase the system's potential in contributing to sustainable energy solutions, by transforming CO_2, a potent greenhouse gas, into valuable hydrocarbons. This objective aligns with the global goals of reducing carbon emissions and promoting green energy.**

5. **Potential Mars Applications: We aim to explore the potential of the system in converting Mars' CO_2-rich atmosphere into fuel. This exploration aligns with NASA's long-term objectives of human colonization of Mars and space exploration. The success of this project could have profound implications for future Mars missions.**

6. **Job Creation and Economic Impact: By establishing this project, we aim to create job opportunities and stimulate economic activity in North Dakota. The successful commercialization of this technology could position North Dakota as a leader in sustainable energy technology.**

Methodology:

Our methodology for this project will consist of several phases, each designed to facilitate efficient development and optimization of the CO_2 conversion system:

1. **Research and Design Phase**: In this phase, we will analyze NASA's patented technology in-depth to understand the underlying mechanisms and design requirements. With the aid of Computer-Aided Design (CAD) tools, we will design the physical components of the system.

2. **Prototype Development Phase**: Based on the design, our team of engineers and scientists will develop a working prototype of the system. This includes fabricating the photovoltaic and electrochemical cells, integrating them, and setting up the control systems.

3. **Testing and Optimization Phase**: We will conduct extensive testing on the prototype under various operational conditions. The electrocatalysts and reactor materials will be optimized for efficient CO_2 conversion. The electrical engineers will calibrate the control system and sensors for optimal performance.

4. **Data Analysis Phase**: Throughout the testing phase, we will collect performance data. Our team will analyze this data to evaluate the system's efficiency, durability, and scalability. This information will guide further iterations and improvements.

5. **Safety and Compliance Phase**: Throughout all stages, we will follow rigorous safety protocols. A safety engineer will oversee this aspect, ensuring the prototype is designed and operated safely.

6. **Scale-up Phase**: After optimizing the prototype, we will design a scalable model that can be replicated for large-scale production.

7. **Exploration of Mars Application**: We will conduct a feasibility study to explore the system's potential to convert Mars' CO_2-rich atmosphere into fuel.

Throughout this project, we will follow a lean management approach, ensuring resources are used efficiently and the project stays within the timeline and budget. Regular meetings will facilitate coordination among the team members and stakeholders. The project manager will oversee all phases, maintaining clear communication and managing the project's progression.

Anticipated Results:

Upon the successful completion of this project, we anticipate several impactful results that align with both the Clean Sustainable Energy Authority's objectives and broader societal needs.

1. **Proof of Concept: We expect to validate the NASA-licensed technology's commercial viability, establishing an effective system for converting CO2 into hydrocarbons using solar energy. This breakthrough will demonstrate a feasible solution for significant CO2 emission reduction and the generation of sustainable, renewable energy sources.**
2. **Mobile, Scalable Energy Production: By designing our system to fit within cargo containers, we introduce an element of unprecedented mobility to renewable energy production. These self-contained units can be easily transported and deployed to any location, providing clean energy wherever needed. Additionally, the units' modularity allows for scalable energy production; multiple units can be linked together to amplify output based on demand.**
3. **Local Economic Stimulus: Manufacturing these units within North Dakota will stimulate the local economy, creating jobs within the state and promoting local industries. Our operations will not only focus on production but will also include research and development roles, offering a diverse range of employment opportunities.**
4. **Contribution to Global Carbon Reduction Efforts: Successful implementation of this technology will help reduce global carbon emissions. By recycling CO2 into fuel, we directly tackle one of the most pressing environmental challenges of our era.**
5. **Long-term Sustainability and Energy Independence: Over time, this technology can help North Dakota and other regions around the world achieve energy independence and foster a sustainable future. The technology's compatibility with the Martian atmosphere also presents potential applications for future space missions, advancing humanity's ambitions in space exploration and colonization.**
6. **Educational Opportunities: The project will also serve as an exceptional learning platform for local universities and colleges, offering students the opportunity to engage in groundbreaking research and development.**

Ultimately, we foresee our project as a key driver in the transition towards a clean, sustainable energy future. The anticipated results extend beyond just technology development, promising significant socio-economic and environmental benefits.

Facilities:

Our facilities will be located in North Dakota, chosen for its robust support for clean energy projects and the presence of quality educational institutions for potential collaboration and skilled personnel sourcing.

1. **Manufacturing Facility: The core of our operation will be a manufacturing facility where we assemble our CO2-to-hydrocarbon conversion units. This facility will have ample space to house the manufacturing process and to store cargo containers. Equipped with the latest manufacturing tools and technologies, it will adhere to the highest safety and environmental standards.**

2. **Research & Development Laboratory: Our facilities will include a state-of-the-art R&D lab, equipped with advanced chemical and material analysis equipment for ongoing optimization and refinement of our technology. The lab will also facilitate rigorous testing of our units under varying conditions to ensure reliability and performance.**

3. **Office Space: Our facilities will include office spaces to accommodate the project management team, administrative staff, and other essential non-manufacturing roles. This area will be set up for effective communication and collaboration, with meeting rooms, dedicated workstations, and video conferencing capabilities.**

4. **Training Area: A dedicated space for training will be established to ensure that all personnel, especially those handling the manufacturing and operation of the units, are adequately prepared. Safety training, equipment operation, and emergency response will be covered in this area.**

5. **Outdoor Testing Site: Given that our units are designed for various environments, having an outdoor site for field testing is crucial. This will allow us to test the units under realistic conditions, especially in terms of exposure to sunlight and varying weather conditions.**

Each facility component will be designed with an eye towards growth and scalability, ensuring we can expand operations as the demand for our units grows. Safety, efficiency, and environmental sustainability will guide the planning and operation of all our facilities.

Resources:

To successfully bring our CO2-to-hydrocarbon conversion units to market, we will utilize a diverse array of resources:

1. **Human Capital: Our team includes industry professionals and subject matter experts in the fields of chemical engineering, mechanical engineering, electrical engineering, materials science, and analytical chemistry. We also have a dedicated project management team and support staff to ensure smooth operations.**
2. **Intellectual Property: We have a licensed patent from NASA which lays the groundwork for our technology. This gives us a unique advantage in the marketplace and provides a solid foundation for our product development.**
3. **Physical Resources: Our manufacturing and research facilities, equipped with cutting-edge technology and equipment, are major assets. The use of cargo containers for unit assembly enhances mobility, scalability, and adaptability of our solution.**
4. **Collaborations: We are in the process of developing collaborations with research institutions, such as North Dakota University System, which will provide us with access to additional resources and expertise.**
5. **Financial Resources: The funding sought through this grant, along with other sources of funding, will be critical for project development. These funds will go towards research and development, hiring and training personnel, purchasing equipment and materials, building and maintaining our facilities, and other operational expenses.**
6. **Community and Industry Support: North Dakota's support for clean energy and its commitment to environmental sustainability are important resources. The acceptance and encouragement from the community and industry will be crucial in our venture's success.**

Techniques to Be Used, Their Availability and Capability:

To achieve our objectives, we will use several established and innovative techniques:

1. **Photocatalysis and Electrochemistry**: At the heart of our technology is a unique combination of photocatalytic and electrochemical reactions that convert CO2 into hydrocarbon fuels. We will optimize the reaction conditions and parameters to improve the efficiency and selectivity of the process.

2. **Material Synthesis and Characterization**: We will synthesize nanostructured catalysts and other materials using techniques such as sol-gel, precipitation, and thermal decomposition. These materials will be characterized using methods like X-ray diffraction (XRD), scanning electron microscopy (SEM), and X-ray photoelectron spectroscopy (XPS) to understand their composition, structure, and properties.

3. **Device Fabrication**: We will use methods like spin coating, dip coating, and sputtering to fabricate the various components of our system. The device performance will be evaluated using electrochemical techniques like cyclic voltammetry (CV) and electrochemical impedance spectroscopy (EIS).

4. **Product Analysis**: The produced hydrocarbon fuels will be analyzed using gas chromatography-mass spectrometry (GC-MS) to verify their composition and purity.

5. **Computational Modeling and Simulation**: To optimize the design of our system and predict its performance, we will use computational modeling and simulation techniques. These include density functional theory (DFT) for materials modeling and computational fluid dynamics (CFD) for system design.

6. **Modular Construction**: The use of cargo containers for housing our system not only provides mobility but also allows for modular construction. This technique increases the speed of manufacturing and provides the ability to scale production as needed.

These techniques are available within our team's capabilities, and we have the resources, facilities, and expertise to use them effectively. Through our collaboration with research institutions, we will also have access to additional specialized equipment and expertise, further enhancing our capabilities.

Environmental and Economic Impacts while Project is Underway:

During the development and implementation of this project, we expect both environmental and economic impacts.

Environmental Impacts:

1. **Reduced Carbon Emissions**: Throughout the project, our aim is to demonstrate a viable method for recycling carbon dioxide, a potent greenhouse gas. By converting waste CO_2 into useful fuel, we are effectively reducing the net carbon emissions, which will have a positive environmental impact in the context of global warming and climate change.

2. **Environmentally Friendly Manufacturing Process**: We will adhere to environmentally conscious practices during the construction of our units. The modular design of the system using cargo containers minimizes waste and can incorporate recycled materials.

3. **Safe Handling of Materials**: All materials used in the project will be handled according to strict safety and environmental guidelines to prevent any possible harm to the environment.

Economic Impacts:

1. **Job Creation**: The project will create new jobs in North Dakota, boosting the local economy. This includes roles in research and development, engineering, manufacturing, administration, and support services.

2. **Stimulate Local Manufacturing Industry**: By setting up our manufacturing unit in North Dakota, we will be contributing to the local economy. Local suppliers and businesses will be involved, fostering a strong economic ecosystem.

3. **Potential for Future Economic Growth**: As this technology progresses towards commercialization, it will attract further investment, both local and international, bringing potential for substantial economic growth.

4. **Education and Skills Development**: The project will involve collaboration with local institutions, providing opportunities for skills development and knowledge transfer. This will lead to increased human capital in the region, an important asset for future economic growth.

In summary, while the project is underway, it will contribute positively to both environmental sustainability and economic growth in North Dakota.

Ultimate Technological and Economic Impacts:

Upon successful completion and deployment, this project has the potential to offer substantial technological and economic impacts:

Technological Impacts:

1. **Innovative Carbon Conversion Technology**: This project will advance a novel technology for converting carbon dioxide into useful fuels. This represents a significant step forward in the field of carbon capture, utilization, and storage (CCUS), a critical technology in mitigating climate change.

2. **Scalable and Modular Design**: The integration of the system into cargo containers creates a scalable and modular solution that can be deployed in a variety of locations and circumstances, further enhancing its technological impact.

3. **Enhanced Renewable Energy Storage**: The fuels produced can be used to store energy from renewable sources, which addresses one of the key challenges in the transition to a clean energy future: energy storage.

Economic Impacts:

1. **Job Creation and Economic Growth**: The commercial production of these units will create significant direct and indirect job opportunities, which will contribute to the economic growth of North Dakota and potentially nationwide. This includes roles in manufacturing, installation, operation, and maintenance of the units.

2. **New Market Opportunities**: The successful development of this technology could open up new markets for carbon capture and conversion technologies. This would stimulate further investment and innovation in the sector.

3. **Energy Cost Savings**: The produced fuels can be used locally, potentially reducing energy costs and increasing energy independence.

4. **Boost to the Local Manufacturing Industry**: As the manufacturing hub of this technology, North Dakota stands to benefit from the increased industrial activity, further stimulating local economy.

In the long term, this project can serve as a model for clean, sustainable energy solutions, putting North Dakota at the forefront of the global push for decarbonization, and driving economic growth through technological innovation.

Why the Project is Needed:

This project is profoundly needed due to a convergence of critical factors affecting our environment, economy, and energy sustainability:

1. **Climate Change Mitigation: One of the most pressing issues of our time is the excessive levels of carbon dioxide (CO_2) in our atmosphere contributing to global climate change. By converting CO_2 into useful hydrocarbons, this project provides a potent solution to mitigating these harmful effects, aligning with global sustainability goals.**

2. **Energy Transition and Security: As we shift away from fossil fuels towards more sustainable sources of energy, there is a growing need for innovative methods of renewable energy storage. The fuels produced from this project can play a pivotal role in addressing this challenge, enhancing energy security and independence.**

3. **Economic Development: North Dakota stands to greatly benefit from economic diversification into clean technology sectors. This project would bring new jobs, stimulate local industries, and potentially position the state as a leader in the emerging carbon capture, utilization, and storage (CCUS) market.**

4. **Scalable and Modular Energy Production: The utilization of cargo containers for housing the technology offers an unprecedented level of scalability and modularity. This innovation can revolutionize the way we approach energy production, allowing for deployment in diverse locations and circumstances.**

5. **Technological Advancement: There is a critical need to continue pushing the boundaries of clean technology. This project is at the cutting edge of research and innovation, representing a significant step forward in CO_2 conversion and renewable energy storage.**

6. **NASA's Future Mars Missions: Mars' atmosphere is 95% CO_2. This project's technology could be used to produce fuel for energy and propulsion on future Mars missions, thereby reducing the amount of fuel that needs to be transported from Earth. This could be a game-changer for space exploration.**

Overall, this project presents an essential solution to global environmental challenges while also driving local economic growth and contributing to the future of space exploration.

STANDARDS OF SUCCESS

Standards of Success should include: The measurable deliverables of the project that will determine whether it is a success; The value to North Dakota; An explanation of what parts of the public and private sector will likely make use of the project's results, and when and in what way; The potential that commercial use will be made of the project's results; How the project will enhance the education, research, development and marketing of North Dakota's renewable energy resources; How it will preserve existing jobs and create new ones; How it will otherwise satisfy the purposes established in the mission of the Program.

The standards by which the success of the project is to be measured. This may include:

- *Emissions reduction.*
- *Reduced environmental impacts.*
- *Increased energy sustainability.*
- *Value to North Dakota.*
- *Explanation of how the public and private sector will make use of the project's results, and when and in what way.*
- *The potential commercialization of the project's results.*
- *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.*
- *How it will preserve existing jobs and create new ones.*
- *How it will otherwise satisfy the purposes established in the mission of the Program.*

The success of our project can be measured against a range of standards that align with the goals of the Clean Sustainable Energy Authority and the broader objectives of environmental sustainability, economic growth, and energy security.

Emissions Reduction: We expect to measure success by the degree to which our technology can convert CO_2 into usable fuel, effectively reducing the carbon footprint of the energy sector. We will be able to quantify the amount of CO_2 reduction per unit of fuel produced and will aim to improve this efficiency continually.

Reduced Environmental Impacts: Another key measure of success will be a reduction in the reliance on non-renewable energy sources, which will inherently reduce the environmental impacts associated with extraction, refining, and use of such resources.

Increased Energy Sustainability: Our project's success will be determined by how significantly our technology contributes to energy sustainability. The capacity of our units to produce renewable, carbon-neutral fuels from CO_2 will serve as a benchmark for success.

Value to North Dakota: The development and implementation of this technology will bring substantial value to North Dakota, from job creation and economic stimulation to positioning the state as a leader in clean, renewable energy technology.

Public and Private Sector Utilization: The public sector could adopt this technology to reduce emissions and meet sustainability goals. The private sector, particularly industries with high CO_2 emissions, could use this technology to mitigate their environmental impact.

Commercialization Potential: The potential to commercialize the results of this project is high. Upon successful development and testing, we plan to manufacture and sell the technology on a larger scale, potentially to customers worldwide.

Enhancing Research, Development and Technologies: This project contributes significantly to the research and development of new technologies that reduce environmental impacts and increase energy sustainability in North Dakota, further strengthening the state's position in this field.

Job Preservation and Creation: This project will preserve existing jobs and create new ones, particularly in the fields of engineering, manufacturing, research, and development.

Fulfilling Program Mission: Our project aligns closely with the mission of the Clean Sustainable Energy Authority, as it seeks to reduce environmental impacts, increase energy sustainability, stimulate economic growth, and contribute to the research and development of clean energy technologies.

Ultimately, our project's success will be determined by our ability to achieve these key objectives and contribute positively to the state's environmental, economic, and energy goals.

BACKGROUND/QUALIFICIATIONS

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, principal investigator, and other participants in the project.***

The foundation of this project lies in the groundbreaking research conducted by NASA, who successfully developed and patented a novel photovoltaic and electrochemical cell that is capable of converting carbon dioxide into useful hydrocarbons. This technology, by virtue of harnessing renewable energy, tackles the dual objectives of mitigating climate change while also generating clean, renewable energy.

Marlo Anderson and his team at Marlo Anderson LLC have an established track record in innovative projects and entrepreneurial ventures. Most notably, the team has demonstrated its capability in liaising with national organizations such as NASA, and successfully secured an exclusive license for the technology that this project is based upon. This demonstrates a strong ability in negotiation, relationship-building, and navigating complex licensing arrangements, all of which will be invaluable for the success of this project.

Experience and Qualifications:

Marlo Anderson, a serial entrepreneur, brings a wealth of business and project management experience. His expertise lies in ideating, developing, and successfully executing business ventures. He provides a strategic vision for the project and ensures its alignment with broader market trends and demands.

Steve Bakken, the Project Manager, has proven experience in managing complex projects, bringing teams together, and ensuring that project deliverables are achieved on time and within budget. His expertise will be instrumental in overseeing the overall execution of the project.

Latoya Johnson, the Procedures Specialist, offers the necessary experience in standardizing processes and implementing systems to ensure that all project activities are conducted efficiently and effectively.

The team also includes professionals with expertise in a range of areas critical to the project, including chemical engineering, mechanical engineering, electrical engineering, material science, analytical chemistry, safety engineering, and others. This multidisciplinary team is equipped with the necessary skills to undertake the design, construction, testing, and optimization of the technology.

Overall, the combination of NASA's technological foundation, Marlo Anderson LLC's entrepreneurial acumen, and the collective expertise of the project team positions us in an ideal state to successfully undertake this project.

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.*

Project management and oversight are crucial components to ensure that the project is carried out according to schedule and meets its set objectives. To accomplish this, we have devised the following plan:

1. **Project Management:** Our Project Manager, Steve Bakken, will be responsible for overall project management. His role involves creating a detailed project plan, assigning roles and responsibilities, and establishing timelines. He will conduct regular team meetings to review progress, address issues, and make necessary adjustments.

2. **Use of Project Management Tools:** We will leverage modern project management tools and methodologies, which will provide a visual representation of tasks, timelines, and resources. This will ensure all team members have a clear understanding of their responsibilities and deadlines.

3. **Risk Management:** Proactively identifying potential risks and developing mitigation strategies will be a key aspect of our project management approach. We will perform regular risk assessments to identify any potential issues that could derail the project and devise appropriate strategies to address them.

4. **Regular Reviews:** We will conduct regular reviews at different stages of the project. These will involve assessments of project milestones, deliverables, budget, and timeline adherence.

5. **Stakeholder Communication:** Regular updates will be provided to all stakeholders, including the Clean Sustainable Energy Authority. These updates will outline progress, challenges encountered, solutions implemented, and any changes in the project plan or timeline.

Evaluation Points:

The project will be assessed at key milestones to determine if it's on track and to make necessary adjustments. These evaluation points will be set at:

1. **Design Phase Completion:** After finalizing the design of the prototype unit, we will assess whether it meets the technical requirements outlined in our objectives.

2. **Prototype Construction:** Once the initial prototype is built, it will be evaluated for operational efficiency and effectiveness in converting CO_2 to hydrocarbons.

3. **Testing Phase:** Post testing, we will assess the performance of the prototype under different conditions and refine it based on the results obtained.

4. **Production Scale-Up:** Following successful prototype testing, the project will move to scale up production. At this point, the focus will be on assessing the manufacturability of the units and their performance at a larger scale.

5. **Post Deployment:** After deployment, we will evaluate the real-world performance of the units and their impact on CO_2 reduction and energy production.

By following these management strategies and using the outlined evaluation points, we are confident in our ability to successfully carry out this project on schedule and in a manner that best ensures its objectives will be met

TIMETABLE

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

Creating a project timeline requires detailed knowledge about specific tasks, resource availability, and potential bottlenecks that are impossible to anticipate precisely without having more project-specific details. However, based on the typical timeline for a project of this scale, I can provide a rough estimate:

Starting Date: June 1, 2023

Task 1 - Project Kickoff and Preliminary Design Phase: June 1 - August 30, 2023

- Assemble team, establish design parameters, begin preliminary design.
- Interim Report #1: August 30, 2023

Task 2 - Detailed Design and Optimization: September 1 - November 30, 2023

- Finalize the detailed design of the prototype, including simulations and optimization studies.
- Interim Report #2: November 30, 2023

Task 3 - Prototype Construction: December 1, 2023 - February 28, 2024

- Construct the initial prototype in a controlled environment.
- Interim Report #3: February 28, 2024

Task 4 - Prototype Testing and Refinement: March 1 - June 30, 2024

- Test the prototype under different conditions, collect and analyze data, and refine the prototype based on the results.
- Interim Report #4: June 30, 2024

Task 5 - Production Scale-Up: July 1 - September 30, 2024

- Scale up production, perform quality control checks and necessary adjustments.
- Interim Report #5: September 30, 2024

Task 6 - Deployment and Real-World Testing: October 1 - December 31, 2024

- Deploy the units in real-world environments, monitor and evaluate their performance, and gather feedback for further improvement.
- Interim Report #6: December 31, 2024

Completion Date: December 31, 2024

Please note that this schedule is a rough estimate and could change depending on a number of factors. Adjustments would be communicated promptly to all relevant stakeholders. Also note that this schedule assumes that Phase One is successful and we start moving towards commercialization taking us through 2024.

BUDGET

*Please use the table below to provide an **itemized list** of the project's capital costs; direct operating costs, including salaries; and indirect costs; and an explanation of which of these costs will be supported by the grant and in what amount. The budget should identify all other committed and prospective funding sources and the amount of funding from each source. **Please feel free to add columns and rows as needed.** Higher priority will be given to those projects have matching private industry investment equal to at least 50% or more of total cost.*

Project Associated Expense	NDIC Grant	NDIC Loan	Applicant's Share (Cash)	Other Project Sponsor's Share	Total
Commercial Viability Analysis and Marketing				200,000	200,000
Personnel Costs	100,000			650,000	1,000,000
R&D	100,000			650,000	1,000,000
Equipment & Materials	200,000			1,000,000	1,500,000
Operational Costs	50,000		300,000	100,000	500,000
Contingency and Miscellaneous	50,000			100,000	300,000
Total	500,000		300,000	2,700,000	4,500,000

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

The total project cost estimate of $4.5 million takes into account a variety of expenses necessary to successfully develop, prototype, test, optimize, and commercialize the technology as described in the proposed work plan.

1. **Personnel costs:** Salaries and benefits for a team of 10 professionals who possess the unique and diverse skills required to execute this project. The team comprises a project manager, chemical engineer, mechanical engineer, electrical engineer, materials scientist, analytical chemist, safety engineer, software/data specialist, industrial designer, and administrative support.

2. **Materials and supplies:** Includes cost of all raw materials, catalysts, and other supplies necessary for prototyping and testing.

3. **Facility and equipment costs:** Expenses related to leasing and operating the manufacturing facility, as well as the procurement, maintenance, and upgrading of necessary machinery and equipment.

4. **Research and development:** Costs related to conducting tests, analyzing results, optimizing designs, and continually refining the technology based on the data collected.

5. **Administrative and overhead costs:** General operating costs such as rent, utilities, insurance, and other necessary expenses to support the project's operation.

6. **Commercialization and marketing:** Expenses related to market research, marketing, and promotion of the technology once it is ready for commercial use.

Impact of Reduced Funding:

If less funding than requested is provided, it may result in a delay in project completion, reduction in scope, or compromise in quality. The reduction in funding might necessitate cuts in key areas such as:

1. **Personnel:** Might lead to a smaller team which could delay the project timeline due to reduced manpower.

2. **Materials and supplies:** Reduction in budget may limit the availability of necessary materials and supplies, affecting the quality and efficiency of prototyping and testing.

3. **Facility and equipment:** With reduced funding, there may be limitations on the facility and equipment that can be procured, which may limit the project's capacity and efficiency.

4. **Research and development:** Limited funds might compromise the thoroughness of testing and analysis, affecting the optimization and refinement of the technology.

5. **Commercialization and marketing:** A cut in these areas could hinder our ability to effectively market and sell the finished product, impacting its ultimate success and profitability.

In conclusion, a reduction in funding could potentially impact the project timeline, the quality of work, and the ultimate success of the project. It is thus crucial to secure the requested amount to ensure the successful completion of the project.

CONFIDENTIAL INFORMATION

A person or entity may file a request with the Commission to have material(s) designated as confidential. By law, the request is confidential. The request for confidentiality should be strictly limited to information that meets the criteria to be identified as trade secrets or commercial, financial, or proprietary information. The Commission shall examine the request and determine whether the information meets the criteria.

Until such time as the Commission meets and reviews the request for confidentiality, the portions of the application for which confidentiality is being requested shall be held, on a provisional basis, as confidential.

If the confidentiality request is denied, the Commission shall notify the requester and the requester may ask for the return of the information and the request within 10 days of the notice. If no return is sought, the information and request are public record.

*Note: Information wished to be considered as confidential should be placed in separate appendices along with the confidentiality request. The appendices must be clearly labeled as confidential. If you plan to request confidentiality for **reports** if the proposal is successful, a request must still be provided.*

To request confidentiality, please use the template available at https://www.ndic.nd.gov/renewable-energy-program/rep-applicant-council-information.

If you are not requesting confidentiality, please note that below.

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.

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.

Industrial Commission

Tax Liability Statement

Applicant:
Marlo Anderson LLC

Application Title:
CarbonConvert

Program:

☐Lignite Research, Development and Marketing Program
☑Renewable Energy Program
☐Oil & Gas Research Program
☐Clean Sustainable Energy Authority

Certification:
I hereby certify that the applicant listed above does not have any outstanding tax liability owed to the State of North Dakota or any of its political subdivisions.

Marlo Anderson
____
Signature

CEO
____
Title

5/26/2023
____
Date

CarbonConvert Executive Summary

1. Executive Summary

CarbonConvert is an innovative clean technology company committed to addressing two pressing global issues - reducing CO_2 emissions and transitioning towards a sustainable energy future. Our mission is to commercialize a breakthrough technology, originally developed by NASA, that converts carbon dioxide into valuable hydrocarbons and oxygen. We foresee a vast market for our technology, spanning from fossil fuel plants to Mars missions, due to the universal need to manage CO_2 emissions and generate sustainable energy.

2. Company Description

CarbonConvert has licensed technology from NASA to convert carbon dioxide into useful hydrocarbons. This technology not only provides a solution to reduce greenhouse gases, but it also creates potential energy sources. Our core team is a dynamic blend of innovators, engineers, and business development professionals with a track record of successful projects and strong connections with national organizations like NASA.

3. Market Analysis

Our primary market comprises fossil fuel plants that generate large amounts of carbon dioxide as a byproduct of their operations. Additionally, there is a growing interest in our technology in the aerospace sector, particularly for Mars missions, considering the planet's atmosphere is comprised of 95% carbon dioxide. We anticipate the demand for our technology to grow in parallel with global initiatives to mitigate climate change and transition to renewable energy sources.

4. Organization and Management

Our team includes skilled professionals with experience in diverse fields. Marlo Anderson, a successful serial entrepreneur, provides strategic vision. Steve Bakken oversees project management, while Latoya Johnson specializes in procedures. Our team also includes experts in chemical, mechanical, and electrical engineering, material science, analytical chemistry, safety engineering, among others.

5. Service or Product Line

Our primary offering is a modular unit that can be deployed at any site with significant CO_2 emissions. These units, built within repurposed storage containers, not only reduce CO_2 emissions but also generate valuable hydrocarbons that can be used as a sustainable energy source.

6. Marketing and Sales Strategy

Our marketing strategy includes engaging with stakeholders from various sectors, demonstrating the value proposition of our technology, and showcasing its potential. We plan to leverage relationships with industry leaders and engage in targeted marketing efforts to reach potential customers. Our sales strategy will be built on providing tailored solutions to meet the unique needs of each client, with a commitment to ongoing service and support.

7. Funding Request

We are seeking $4.5 million in funding to support the development and commercialization of our technology. The funds will be allocated towards research & development, prototype creation, testing, project staffing, and initial marketing efforts.

8. Financial Projections

With the requested funding, we anticipate being able to commence full-scale production and generate revenue within two years. We expect the demand for our technology to grow consistently as industries and governments worldwide strive to achieve carbon neutrality. Detailed financial projections will be shared upon request.

9. Exit Strategy

While we are committed to the long-term growth of CarbonConvert, we understand investors may seek exit options. Potential exit strategies could include an acquisition by a larger company in the energy sector or an initial public offering (IPO) once the company achieves a certain valuation.

10. Appendix

Further documents, including the NASA patent, the licensing agreement, team biographies, and technical specifications of our technology, can be shared upon request.

Summary on Absence of Investment Letters

At the time of submitting this grant application, CarbonConvert does not have commitment letters from companies or individuals expressing interest in investing in our technology. This situation is not reflective of a lack of interest or potential in our technology but rather the recent finalization of our licensing agreement with NASA.

We believed it was crucial to respect the process and not prematurely engage potential investors before securing the rights to the NASA-developed technology. We have always operated with a sense of integrity and thoroughness, and we felt it was important to first solidify our foundation by acquiring the license from NASA.

This milestone has just been achieved, marking a significant step forward for our venture. Now that we have secured the license, we are ready to begin discussions with potential investors. In fact, we have already arranged several meetings with interested parties in the coming weeks.

We are confident that these discussions will lead to potential investments, partnerships, and collaborations that will support the development and commercialization of our technology. Thank you for understanding our position, and we look forward to updating you on our progress soon.