Renewable Energy Program

North Dakota Industrial Commission

Application

Project Title: Improving Renewable Energy Resources with Hydrogen Offtake

Applicant: BWR Innovations LLC

Principal Investigator: Joel Jorgenson, Ph.D., PE

Date of Application: March 28, 2025

Amount of Request: $500,000

Total Amount of Proposed Project: $1,120,232

Duration of Project: 24 months

Point of Contact (POC): Joel Jorgenson

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ABSTRACT

Objective:
North Dakota leads the nation with an "all of the above" approach to energy production, creating a robust ecosystem where traditional and renewable energy sources work together to maximize economic value. As the state capitalizes on its abundant wind and solar resources, the North Dakota Renewable Energy Program (REP) is uniquely positioned to leverage curtailed power —energy produced but not utilized due to transmission limitations— and abundant and locally available resources such as Ag commodities and byproducts to create new energy products that drive economic growth, resilience, and sustainability. BWR Innovations proposes to revolutionize this process by deploying a cutting-edge modular hydrogen production and dispensing system that transforms otherwise wasted renewable energy into high-value, compressed hydrogen. This clean hydrogen, essential for industrial use, fuel cell technology, and products like sustainable aviation fuel (SAF), represents a significant economic opportunity estimated to reach a $410 billion market by 2030. By capturing and converting excess renewable energy, North Dakota is not only enhancing profitability for its grid-level renewable energy operators but also pioneering a scalable, replicable model of energy independence and resilience that can be deployed nationwide.

Expected Results:
At the conclusion of the project, the installation will be able to improve in the efficiencies and cost effectiveness of installed renewable (solar and wind turbine) systems by providing an offtake for the energy that is produced that cannot be sold on existing electrical transmission lines. Using electricity produced by renewable energy sources that is otherwise curtailed or sold at a loss to electrical grids to power electrolyzers will effectively store renewable energy as compressed hydrogen. Hydrogen is then sold for a profit, making the installed renewable energy sources more profitable.

This system follows on funded research by the US Air Force Research Laboratory (AFRL) and the US Army Research Laboratory (ARL), BWR Innovations will install the first commercial hydrogen production facility in North Dakota. The commercial demand for hydrogen is growing to an estimated $410B market by 2030, and this project provides an end-to-end hydrogen production and retail sale infrastructure.

Success in this project will increase revenue for grid level renewable energy operators such as Minnkota Power and Otter Tail Power, will provide the first commercial hydrogen production off take for the state of North Dakota, and creates a source of hydrogen for microgrids that can be used to improve the electrical grid, creates a source of hydrogen for commercial vehicles using fuel cell technology for over-the-road trucking applications, and municipal, commercial, and residential installations for backup generators that provide uninterrupted power with no emissions or noise and with minimal maintenance.

Duration:
BWR Innovation proposes this project to be completed in twenty-four months.

Total Project Cost:
Our estimated cost for this project is estimated at $1,120,232. This will include an electrolyzer capable of producing high purity hydrogen for fuel cell module use and vehicle use, compression and hydrogen storage (stationary and portable), electrical switchgear to connect to the local grid, safety systems to meet the requirements of fire, electrical, and industrial gas standards, and patented artificial intelligence (AI) software to continuously monitor all electrical parameters and optimizes system performance for highest profitability.

Participants:
Participants for this project include (but are not limited to): BWR Innovations (Fargo, ND), Total Hydrogen Solutions (Katy, TX), Element One (Colorado Springs, CO), Steelhead Composites (Golden, CO), New Eagle (Ann Arbor, MI) Assembly Systems (West Fargo, ND), Newava (Watertown SD), and North Dakota State University (Fargo, ND).

BWR Innovations is the lead institution, leading the research and design efforts of the hydrogen production generation. Total Hydrogen Solutions assists with experienced industrial gas production and specialized components such as hydrogen dispensers for vehicle refueling. Element One produces industrial electrolyzers, and Steelhead Composites provides pressurized containers for hydrogen. New Eagle provides ruggedized electronics running edge-based AI software, and Newava produces electronic harnesses for production and test access. North Dakota State University's College of Engineering and Architecture are technical partners, providing technical review and access to skilled workforce for future growth. Finally, Assembly Systems provides larger-scale manufacturing as the hydrogen production system is positioned for larger-scale commercial production, sales, and global support.

PROJECT DESCRIPTION

Objectives:
This project has the following objectives:

- On-site hydrogen production through the capture of renewable energy,
- On-site energy storage.
- Minimal operating cost,
- Zero carbon emissions,
- Minimal noise,
- Minimal footprint,
- A scalable design that will help put North Dakota as the lead in the nation's energy production.

Methodology:
BWR Innovations will use proven project management and technical development processes used successfully for previous and current projects. Successful projects that are relevant to this proposal are installations for Southern California Gas, sales for the Army Corps of Engineers, and ongoing projects for AFRL and ARL.

BWR Innovations is a partner in the Southern California Gas Home Hydrogen demonstration, a novel approach for creating and storing renewable energy in hydrogen tanks. This Home Hydrogen demonstration uses solar panels only (no wind energy) as its renewable energy source, with the stored hydrogen feeding fuel cell systems provided by BWR Innovations to provide electricity during evening and nighttime hours. Fast Company magazine has recognized the Home Hydrogen demonstration as a "World-Changing Idea".

BWR Innovations has been funded by ARFL to expand this approach from residential to grid level. In February 2024, BWR Innovations received a $5.5M subcontract to provide grid connection, electrolysis, compression, storage, and electrical production using fuel cell modules for a microgrid. This project builds on the patented and proven design from the Southern California Gas project, and demonstrates the scalability, modularity, and AI design developed by BWR Innovations.

This project builds on the design of the "World-Changing Idea", by addressing the unique aspects of renewable resources in North Dakota, specifically solar energy and wind energy. The efficiencies of renewable energy components have increased dramatically over the years, and this project increases the effectiveness of renewable energy systems by providing a means to "bottle sunshine" or "bottle the wind."

Energy storage for grid level systems has been proposed but not yet solved. Batteries are often proposed, but using batteries for electrical storage is not practical, due to the cost, size requirements, and availability of the number of batteries needed for large scale energy storage.

BWR Innovations proposes a unique energy storage methodology, using compressed hydrogen as a means to efficiently and cost-effectively store energy. The compressed hydrogen is created by an electrolyzer, which is powered by the excess electricity from the renewable energy sources. The electrolyzer takes inlet potable water, and splits the hydrogen-oxygen mixture into hydrogen gas and oxygen. The hydrogen is then compressed and stored, in tanks similar to propane tanks found throughout North Dakota.

Compressed hydrogen has a large and expanding market. An application that BWR Innovations has been developing at large scale is the use of hydrogen for electrical production. When the sun stops shining and the wind stops blowing, the compressed hydrogen is used to create electricity through the use of fuel cells. The fuel cells create electricity from compressed hydrogen, and the electricity produced can power the installation. Excess energy from the fuel cells can be sold back to utility companies on demand, as a form of distributed electrical generation to supply electricity to the grid in times of excess demand.

As part of the AFRL project, BWR Innovations is installing a 1MW electrolyzer, compressor, and storage system, creating approximately 450 kg of hydrogen in 24 hours. Once commissioned in Q2 2025, this demonstration system will be among the top five green hydrogen production facilities in the United States. The produced hydrogen is intended to be consumed by electrical generators with fuel cell modules, but the system can also be integrated with dispensers and refueling systems that provide direct point-of-sale of hydrogen to consumer, commercial, or industrial applications.

Figure 1 shows the components of the AFRL project developed by BWR Innovations, and the same components that are proposed in this demonstration project to bring vetted technology and designs to North Dakota. The proven designs paid with AFRL funding can be used in North Dakota to improve the efficiencies of our renewable resources and and foster the creation of a new market of wholesale and retail point-of-use hydrogen for the growing demand.

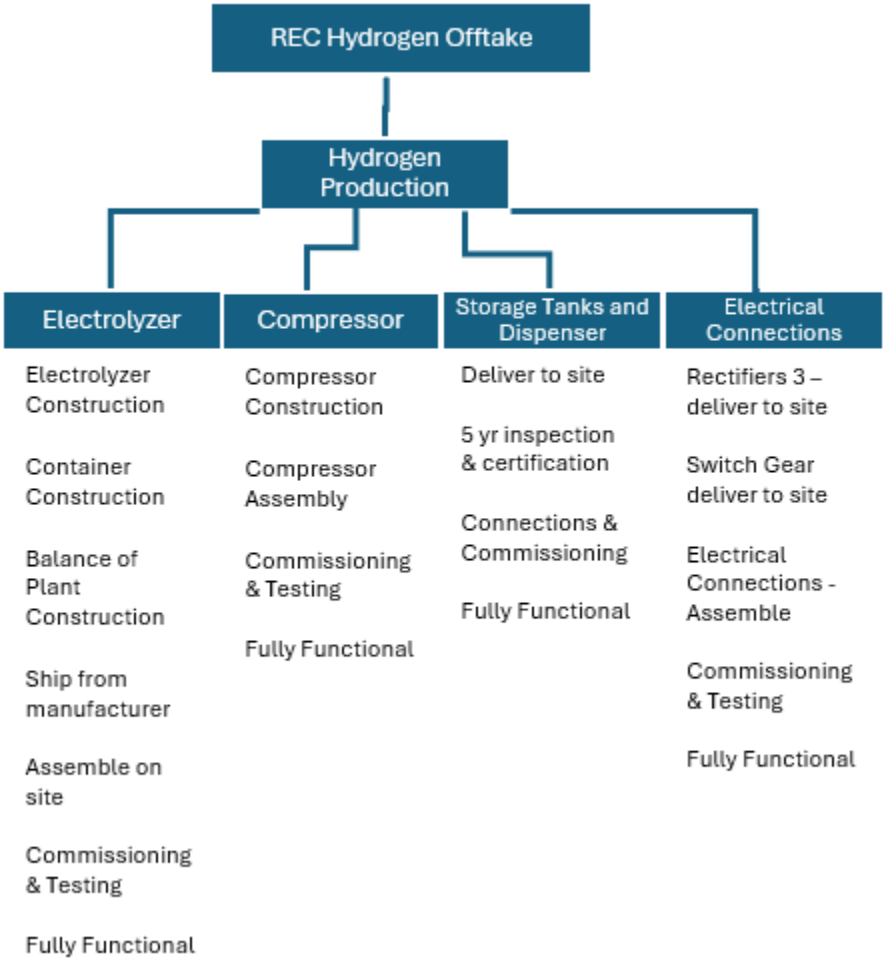


Figure 1. Functional Diagram of the Onsite Hydrogen Production for POS markets.

BWR Innovations uses design methodologies similar to those created for mission-critical electronics, specifically DO-254 design methods. The first major subtask is Requirements Capture, where the requirements, design environment, test plan, and preliminary vendor list are documented. These documents are critical, to accurately capture all of the performance, size, weight, cost, and environmental constraints of the microgrid design. Once all of the documents are complete, a review for all stakeholders occurs where the requirements are refined and ultimately approved. The approved requirements serve as a template for the conceptual and physical design reviews that will follow.

After the requirements are documented, the conceptual design tasks follow. These tasks are using computer aided design to create computer-based models to implement the microgrid requirements. For electrical engineers, the conceptual design tasks are harness designs and printed circuit board designs. Software engineers will create software code, and mechanical engineers will make layouts of chassis, enclosures, and fasteners. At the completion of the conceptual design, a complete set of drawings are available for review. The review verifies that the concept drawings will meet the requirements from the Design Capture phase, but also that the concept drawings have considerations for manufacturing, test, field support, procurement, and marketing.

The third stage is the physical design. The items from the conceptual design are prototyped and combined with procured items for the first integrated working model of the system. With all the pieces assembled and integrated, the working prototype is debugged, tuned, and performance tested against the Design Requirements from the first stage. The physical design may also then be stress tested, to verify reliability and stability, as well as to create procedures for installation, field use, troubleshooting, and customer service support.

The last stage is the design assurance. During this stage, the field-tested design is operated for extended durations to fully understand the issues that would be seen by end customers. Does the microgrid have long startup times, and does the startup time vary from winter to summer? Does humidity affect the energy capture of renewables? Is the pressure level of hydrogen affected by temperature? This stage uses the comprehensive telemetry expertise of BWR Innovations to accumulate the data available from the microgrid system, analyze for changes over time, and then start predictive analysis to be able to treat changes in performance or reliability before the system performance degrades or failures occur. A natural outcome of the design assurance stage is cost modeling and analysis. The cost analysis, combined with the performance data, sets the stage for future recommendations and proposed installations. This stage is data and computation extensive, and BWR Innovations is uniquely poised for a successful design assurance completion.

Anticipated Results:

BWR expects to demonstrate a modular, scalable hydrogen production system capable of producing and dispensing hydrogen using renewable energy. This point-of-sale system will demonstrate the conceptual, technical, and economic viability of converting solar and wind energy to hydrogen for economic and energy value.

The demonstration of the renewable energy storage system will provide energy independence and resiliency. If the hydrogen is used for electrical production, this project ensures electricity to the site independent of rolling blackouts or weather-related electrical power interruptions. Hydrogen production at a small, modular scale creates a new capability for our markets, our consumers, and our electrical grid.

Facilities:

BWR Innovations has design, fabrication, assembly, and test capabilities in our West Fargo location. We have demonstration systems for smaller scale hydrogen production, using a modular design to showcase

the production of hydrogen from water. We have demonstrations for electrical production from hydrogen, showing the integration of our electrical production and the electrical grid (either front-of-meter or behind-the-meter) at the building or transmission level. Finally, we have demonstration systems of our AI systems, to showcase remote autonomous monitoring of hydrogen or electrical production, including (but not limited to) identifying any system or sub-system that is faltering in its operation. In that event, our AI software isolates the faulty component, dispatches technicians if needed, and increases the production of other components to provide a constant source of hydrogen and/or electricity for end customers.

Resources:
No unique or rare resources will be needed for this project.

Techniques to Be Used, Their Availability and Capability:
While the science behind renewable energy and electrolysis has been known for decades, the innovation behind hydrogen components has rapidly accelerated. Public sector and private sector investments over the past few years have accelerated rapidly, with individual components for specific functions.

BWR Innovations is a proven integration partner for multiple worldwide component producers from around the world. Our patented hardware and software designs are recognized by fuel module suppliers such as Intelligent Energy, inverter suppliers such as Sol-Ark, electrolyzer partners such as Enapter, and storage system suppliers such as Steelhead Composites. Our designs are scalable and modular, creating site-specific solutions that can effectively and cost effectively create and store hydrogen with the potential to grow as markets and renewable energy sources grow.

The design proposed for this project is proven with AFRL funding. Our design techniques and methodologies are proven, our components and sub-assemblies are certified for high-reliability applications, and our AI software continually monitors performance and operation to ensure uptime and revenue.

Environmental and Economic Impacts while Project is Underway:
Since this project builds upon the successes of BWR Innovations' projects for Department of Defense applications, this project may use start with the existing (albeit smaller scale) components installed at BWR Innovations. The installed (small scale) electrolyzers, compressors, and telemetry can be connected to larger scale storage systems and dispensers.

To produce a kg of hydrogen with electricity, approximately 50kWh of electricity is needed. This electricity could be from renewable energy (solar and wind), which has negligible operating costs. If grid power is used, electicity may be purchased at peak or off-peak rates for 8 cents to 14 cents per kWh.

At the upper limit of 14 cents per kWh, the cost of production is approximately $7/kg of hydrogen. By comparison, industrial gas prices for hydrogen are approximately $16/kg, and consumer pricing in California (where nearly all of the vehicle hydrogen fueling systems are installed) is $35 to $47/kg. BWR Innovations is developing a power purchase agreement for our green hydrogen produced with our AFRL

system for $10/kg to $12/kg. It is likely that the costs of the produced hydrogen can be driven lower faster than market economics will drive down purchase prices.

Ultimate Technological and Economic Impacts:
BWR Innovations is proposing an installation that is scalable, modular, and reconfigurable in using renewable electricity and storing energy with zero carbon footprint. The system has telemetry monitoring that allows anywhere, anytime, any platform access of authorized users, and has the ability for utility company control. The ultimate goal of the system is to replicate to any site that desires to produce hydrogen as a revenue stream for their wholesale and/or retail markets.

Having the controls available at the utility level produces a robust distribution network. As the future moves towards microgrids and distributed generation of energy, BWR Innovations' concept is a solid basis that can be replicated anywhere in North Dakota, the United States, or in the world.

Hydrogen production is currently concentrated at oil and gas facilities, converting natural gas and hydrocarbons to compressed hydrogen. Industrial hydrogen purchased in North Dakota is produced in Kentucky or other distant states, whereas this project will demonstrate the ability to produce hydrogen at any site with available renewable energy or sufficient space to install renewable energy systems.

Why the Project is Needed:
This project is critically needed to demonstrate the capability of energy storage via compressed hydrogen, to demonstrate the green energy approach of using renewable energy to produce compressed hydrogen, and to demonstrate a standalone microgrid capable of meeting its own energy demand and providing the excess energy as a revenue stream. North Dakota has immense potential with wind and solar energy, but finding the most economical method of selling this energy is not a clear path. The storage of energy via compressed hydrogen and then the sale of this compressed hydrogen into the rapidly growing market for hydrogen could be significant for existing and new wind/solar production capacity. This capability will produce a whole new market for North Dakota farmers with the sale of energy through hydrogen.

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 of success are straightforward, based on the objectives proposed by BWR Innovations:

- The demonstration of a site producing sufficient hydrogen via renewable available for resale to consumer, commercial, or industrial partners,

- A robust, reliable hydrogen production system that is demonstrated to operate year-round, being impervious to temperature and wind conditions of the North Dakota weather,
- The capability to use renewable energy in a more profitable fashion,
- The demonstration of a reasonable return on investment, where future installations can expect to generate revenue and create cost savings to offset any investments for their hydrogen production system.

If these standards are satisfied, North Dakota would see a new era of energy, energy production, and the sales of systems that would make North Dakota the world's leader in energy systems:

- Hydrogen production systems, in partnership with Total Hydrogen Systems, Element One, and Steelhead Composites,
- Telemetry systems, designed by BWR Innovations, assembled at Assembly Systems, with components from Newava and New Eagle,
- Cloud based monitoring, developed by BWR Innovations,
- Further research, design, teaching, and extension services through North Dakota State University,
- A new market for hydrogen, which North Dakota can utilize in state or to sell/distribute to customers throughout North America.

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 a summary of the experience and qualifications pertinent to the project of the applicant, principal investigator, and other participants in the project.***

BWR Innovations is uniquely capable for this project due to our products, partnerships, and intellectual property. Our module fuel cell system, scalable from 4kW to multiple megawatt, is unique in the fuel cell marketplace. Currently, most fuel cells are either targeting mobility and material handling (greater than 50kW) or drones (less than 1200 Watts.) The collaborative partnership between BWR Innovations and Intelligent Energy (see attached letter of support) outlines BWR's role as Intelligent Energy integration partner for turnkey fuel cell systems in the United States. Finally, our issued patents in distributed electrical generation, distributed hydrogen generation, and utility level control of fuel cell systems are barriers to entry to any other entity considering this space.

The technical components of this project are led by Dr. Joel Jorgenson, CEO and President of BWR Innovations. Dr. Jorgenson has earned electrical engineering degrees from North Dakota State University (BSEE, 1987), the University of Iowa (MSEE, 1993), and Iowa State University (Ph.D., 1998), and is currently completing his Masters of Business Administration degree at the University of Illinois. Dr. Jorgenson holds patents in fuel cell systems, power management, and telemetry, and is an adjunct professor at North Dakota State University's Electrical and Computer Engineering Department. Dr. Jorgenson has been awarded Entrepreneur of the Year by the Fargo-Moorhead Chamber of Commerce,

the Architect of Defense by the Minnesota Defense Alliance, and has numerous accolades, publications, and positions.

The program management components of this project are led by Erik Lind, Fuel Cell Systems Program Manager of BWR Innovations. Mr. Lind leads BWR projects for the Air Force, Army, and other agencies, with special focus on hydrogen production and offtake. Administration from the Carlson School of Business at the University of Minnesota.

BWR Innovations was founded in 2018 by Dr. Jorgenson as a *Blue-Water* innovator for telemetry and fuel cell systems. The concept of the Blue Water innovation is based on the business concept by Mauborgne and Kim (*Blue Ocean Strategy, https://www.blueoceanstrategy.com/what-is-blue-ocean-strategy/)*where companies produce novel, unique value-added designs that are not commodity and are not directly available from competition. BWR Innovations was founded on this premise, and has been developing unique designs in fuel cell systems and telemetry that meet an unmet need and are creating new markets. The acronym *BWR* stands for Blue Water Resolute, which means that as we are creating new markets in Blue Oceans, the problems we are tackling are challenging and require resolute focus.

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.*

Projects managed at BWR Innovations use a combination of time-tested project management tools coupled with new technology for a distributed workforce. The online capability of the project management tools allows all users (and project stakeholders) to access project information, view status and progress, and to provide feedback and input.

The overall methodology of the program management is based on DO-254, a set of standards developed for the design of systems used in airborne systems. The Federal Aviation Administration has mandated the adoption of design assurances to be used in the design of electronics and mechanical systems that are integrated into aircraft systems, to assure that structured design methods are created, followed, and documented.

The first step of the project is the Design Capture phase, where each critical part of the design is documented and the interfaces between all parts are defined. For example, in this phase, the complete characteristics of the major components are defined, such as the solar cells, the wind turbine, the electrolyzer and compressor, the hydrogen storage tanks, the fuel cell modules, the inverters, and the telemetry system. Each system will have its performance characteristics established, and a defined means to test, troubleshoot, and repair each component.

The second step of the project is the Conceptual Design phase. During this phase, the architectures of the software, electronics, and mechanical components are defined. Software will be developed using Python, C, and Javascript; Electronic components will be designed using schematic capture, wire harness design, and printed circuit board design software; and mechanical design will use

Solidworks for design and manufacturing. At the end of this phase, the projected performance of each component will be compared against the requirements of the first phase.

The third step of the project is the Physical Design, where components are purchased, assembled, integrated, and tested. At the completion of this stage, the hydrogen microgrid system will be operational, and the performance metrics will be compared against the predicted performance of the Conceptual Design.

The final step of the project is the Design Assurance stage, where components are analyzed for performance within the design limits and for any potential failure points. The stage also allows for Lessons Learned to be documented, to allow for future improvements within this project and for future similar projects.

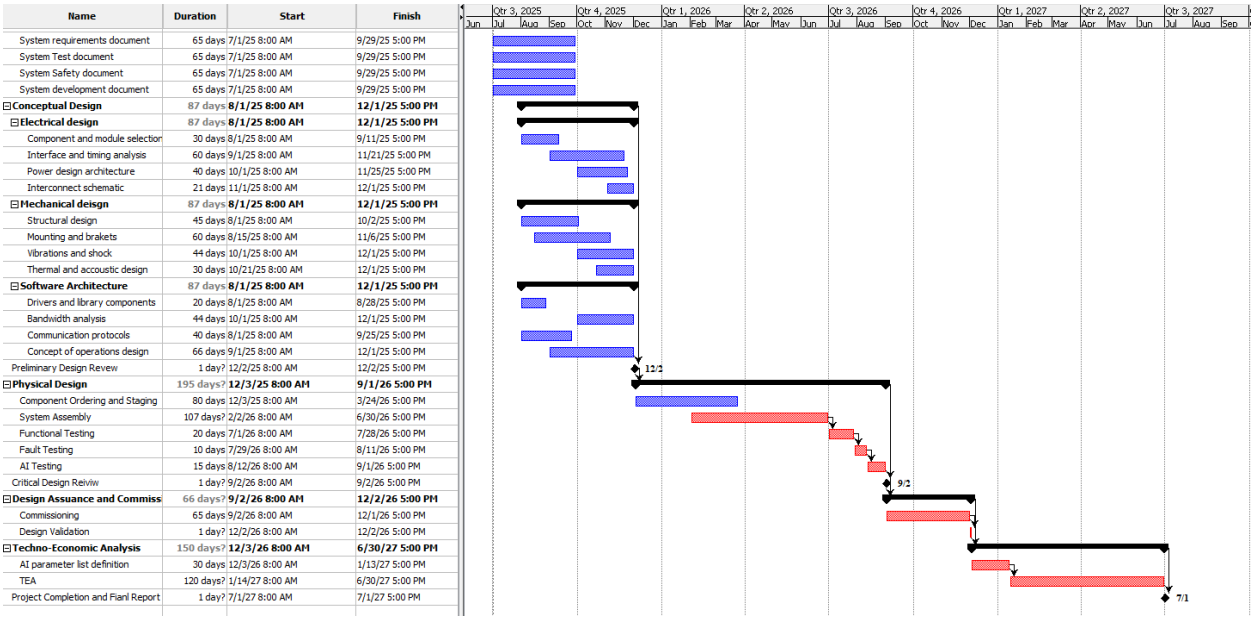
Dr. Jorgenson has used methods of DO-254 for decades. He was first introduced to this methodology while employed at Rockwell Collins (Cedar Rapids, IA) as a design engineer, and taught methods from DO-254 to engineering students at North Dakota State University. This methodology is robust and easy to learn and understand. To track progress, Gantt charts and Trello software are available to all team members and stakeholders.

BWR Innovations is also partnering with North Dakota State University. The specific point of contact at NDSU is Dr. Ben Braaten, Department Chair of Electrical and Computer Engineering. Dr. Braaten is instrumental in identifying faculty wishing to collaborate on research and publication of new discoveries in engineering, agricultural extension, and agricultural financial modeling.

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.

BWR has developed a preliminary Gantt chart based on a twenty-four-month schedule. Figure 2 shows the Gantt chart, with each of the four steps of the project management, and critical milestones at the end of each stage.



Name	Duration	Start	Finish
System requirements document	65 days	7/1/25 8:00 AM	9/29/25 5:00 PM
System Test document	65 days	7/1/25 8:00 AM	9/29/25 5:00 PM
System Safety document	65 days	7/1/25 8:00 AM	9/29/25 5:00 PM
System development document	65 days	7/1/25 8:00 AM	9/29/25 5:00 PM
Conceptual Design	**87 days**	**8/1/25 8:00 AM**	**12/1/25 5:00 PM**
Electrical design	**87 days**	**8/1/25 8:00 AM**	**12/1/25 5:00 PM**
Component and module selection	30 days	8/1/25 8:00 AM	9/11/25 5:00 PM
Interface and timing analysis	60 days	9/1/25 8:00 AM	11/21/25 5:00 PM
Power design architecture	40 days	10/1/25 8:00 AM	11/25/25 5:00 PM
Interconnect schematic	21 days	11/1/25 8:00 AM	12/1/25 5:00 PM
Mechanical deisgn	**87 days**	**8/1/25 8:00 AM**	**12/1/25 5:00 PM**
Structural design	45 days	8/1/25 8:00 AM	10/2/25 5:00 PM
Mounting and brakets	60 days	8/15/25 8:00 AM	11/6/25 5:00 PM
Vibrations and shock	44 days	10/1/25 8:00 AM	12/1/25 5:00 PM
Thermal and accoustic design	30 days	10/21/25 8:00 AM	12/1/25 5:00 PM
Software Architecture	**87 days**	**8/1/25 8:00 AM**	**12/1/25 5:00 PM**
Drivers and library components	20 days	8/1/25 8:00 AM	8/28/25 5:00 PM
Bandwidth analysis	44 days	10/1/25 8:00 AM	12/1/25 5:00 PM
Communication protocols	40 days	8/1/25 8:00 AM	9/25/25 5:00 PM
Concept of operations design	66 days	9/1/25 8:00 AM	12/1/25 5:00 PM
Preliminary Design Revew	1 day?	12/2/25 8:00 AM	12/2/25 5:00 PM
Physical Design	**195 days?**	**12/3/25 8:00 AM**	**9/1/26 5:00 PM**
Component Ordering and Staging	80 days	12/3/25 8:00 AM	3/24/26 5:00 PM
System Assembly	107 days?	2/2/26 8:00 AM	6/30/26 5:00 PM
Functional Testing	20 days	7/1/26 8:00 AM	7/28/26 5:00 PM
Fault Testing	10 days	7/29/26 8:00 AM	8/11/26 5:00 PM
AI Testing	15 days	8/12/26 8:00 AM	9/1/26 5:00 PM
Critical Design Reiviw	1 day?	9/2/26 8:00 AM	9/2/26 5:00 PM
Design Assuance and Commiss	**66 days?**	**9/2/26 8:00 AM**	**12/2/26 5:00 PM**
Commissioning	65 days	9/2/26 8:00 AM	12/1/26 5:00 PM
Design Validation	1 day?	12/2/26 8:00 AM	12/2/26 5:00 PM
Techno-Economic Analysis	**150 days?**	**12/3/26 8:00 AM**	**6/30/27 5:00 PM**
AI parameter list definition	30 days	12/3/26 8:00 AM	1/13/27 5:00 PM
TEA	120 days?	1/14/27 8:00 AM	6/30/27 5:00 PM
Project Completion and Fianl Report	1 day?	7/1/27 8:00 AM	7/1/27 5:00 PM

Figure 2. Gantt Chart

Interim progress reports are available at any time, as BWR can access design and program progress at any point. BWR Innovations proposes interim reports based on the milestone completions of each stage. Assuming a start of July 1, 2025, those dates are approximately:

- Completion of Requirements Capture: Approximately September 1, 2025
- Completion of Conceptual Design: Approximately December 1, 2025
- Completion of Physical Design: Approximately August 1, 2026
- Completion of Design Assurance and Commissioning: Approximately December 1, 2026
- Completion of Techno-Economic Analysis: Approximately June 30, 2027

Additional reports from BWR's telemetry will be available on a monthly basis during the Design Assurance phase, starting approximately on December 1, 2026.

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 that have matching private industry investment equal to at least 50% or more of total cost.*

Project Associated Expense	NDIC's Share	Applicant's Share (Cash)	Applicant's Share (In-Kind)
Salary	$0	$0	$160,000
Fringe (21.27%)	$0	$0	$34,032
Equipment	$500,000	$335,000	$0
Site Lease	$0	$0	$0
Installation Costs	$0	$241,200	$0
Total	$500,000	$576,200	$194,032

An itemized list of the equipment is shown below:

Equipment	
Hydrogen Dispenser	$ 186,500.00
Electrolyzer	$ 120,000.00
Compressor	$ 150,000.00
Switchgear	$ 60,000.00
Transformer	$ 50,000.00
Chiller	$ 50,000.00
Electronics	$ 38,500.00
Gas Train	$ 30,000.00
Total	$835,000.00

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.

All components are commercially available, either at BWR Innovations or through our partnership with key suppliers. If less funding is available than requested, BWR is able to scale the size of the project to demonstrate the unique capabilities of the project, albeit at a lower electrical and hydrogen production level.

Salaries listed in the proposal are for BWR Innovations personnel to design, document, debug, install, and monitor the microgrid system over the period of the design project. Fringe benefits are calculated at 21.27% of the salaries. Site lease costs are in-kind support from Grand Farm for the installation of the microgrid on their facility.

If the funding amount is less than requested, the project is scaled in such a way to show capability but at a lower level. Reducing the funding level for the electrolyzer will result in a smaller production unit that has lower performance. The chiller, transformer, and chiller would be scaled back for smaller units, which impacts the economic value of the hydrogen production unit.

CONFIDENTIAL INFORMATION

Any information in the application that is entitled to confidentiality and which the applicant wants to be kept confidential should be placed in an appendix to allow for administrative ease in protecting the information from public disclosure while allowing public access to the rest of the application. The appendix must be clearly labeled as confidential and must include the following information: (a.) a general description of the nature of the information sought to be protected, (b.) an explanation of why the information derives independent economic value, actual or potential, from not being generally known to other persons, (c.) an explanation of why the information is not readily ascertainable by proper means by other persons, (d.) a general description of any person or entity that may obtain economic value from disclosure or use of the information, and how the person or entity may obtain this value, and (e.) a description of the efforts used to maintain the secrecy of the information.

If there is no confidential information, please note that below. If you plan to request confidentiality for ***reports*** *if the proposal is successful, this section must still be completed.*

At this time, BWR Innovations is not aware of any data or project information that must be kept confidential. Key attributes for this project have already been protected by BWR Innovations, through patent applications, trade secrets, copyrights, trademarks, and an issued United States patent. If future research creates new intellectual property that BWR requests to protect, BWR Innovations will work with the Renewable Energy Program for considerations.

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.

BWR Innovations has filed patent applications on fuel cell systems, including (but not limited to):

- A Means to Control Distributed Generation Through Telemetry
- A Software Means to Select Protocols,
- Virtual Power Plant Operation for Hydrogen Fuel Cell Generators,
- Distributed Generation and Storage of Renewable Energy, and
- A Fuel Cell Based Auxiliary Power Unit.

The listed intellectual property will remain in the ownership of BWR Innovations.

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.

BWR Innovations has received support from the Renewable Energy Council in 2021 in the amount of $332,159. BWR has received support from the Department of Commerce LIFT program in 2024 in the amount of $750,000.