November 1st, 2021



North Dakota Industrial Commission State Capitol – Fourteenth Floor 600 East Boulevard Avenue Bismarck, ND 58505

Re: Project titled "Unlocking the Full Potential of Produced Water as a Key Component of Clean Sustainable Energy"

NDIC & Clean Sustainable Energy Authority Program:

Triple 8 LLC dba Wellspring Hydro (WH) is submitting this application for grant funds under the North Dakota Industrial Commission Clean Sustainable Energy Authority Program. This project initiates the commercialization of a concept studied in an earlier NDIC OGRP grant supported by the University of North Dakota (UND) Institute for Energy Studies titled "Conceptual Design for Chlor-Alkali and Valuable Materials Production from Oilfield Brine."

Wellspring Hydro will utilize a unique feedstock from oilfield brines (a.k.a. produced water) that presently is treated and pumped into disposal wells. Wellspring Hydro's project will produce three commercially essential products and lithium in a sustainable format that will diversify North Dakota's economy, bolster existing industries with an improved cost position, and drive clean sustainable energy.

Wellspring Hydro, a North Dakota company, is completing its Strategic Entrepreneurial Economic Development (SEED) to complete business model and construction plans to fund full commercialization estimated to cost \$150- 200 million. When completed this business will:

- 1. create 55+ new, and 200+ local contractors to build
- 2. generate new local products and tax revenues for North Dakota
- 3. enhance North Dakota's economic diversity, sustainable energy, and environmental outlook
- 4. create feedstocks from other valuable materials that may be recovered, including lithium

We are requesting \$1,100,000 in support from the Clean Sustainable Energy Authority Program of the North Dakota Industrial Commission. In return, Triple 8 LLC commits to matching \$1,100,000 to complete the project with the equity investment from our engineering partner, Hargrove Engineers & Constructors.

If you have any questions or require additional information, please do not hesitate to contact Steve Kemp 701-770-8682 or stevek@wellspringhydro.com.

Steve Kemp, Founder

Wellspring Hydro

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
Tax Liability Statement
Letters of Support (If Applicable)
Confidentiality Request
Business Plan (Appendix)
Historical Financial Statements (3 years) (Appendix)
Budgeted Projections (Included in Business Plan)
Loan/Loan Guarantee Application (if Applicable, Appendix)
Other Appendices (If Applicable)

When the package is completed, send an electronic version to <u>sustainableenergy@nd.gov</u> and 2 hard copies by mail to:

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

For more information on the application process please visit: http://www.nd.gov/ndic/csea-infopage.htm

Questions can be addressed to Al Anderson (701) 595-9668.

Clean Sustainable Energy Authority

North Dakota Industrial Commission

Application

Project Title: Unlocking the Full Potential of Produced Water as a Key Component of Clean Sustainable Energy

Applicant: Steve Kemp

Date of Application: November 1, 2021

Amount of Request Grant: \$1,100,000 USD Loan: \$0 USD

Total Amount of Proposed Project: \$2,200,000 USD

Duration of Project: 5-8 Months

Point of Contact (POC): Steve Kemp

POC Telephone: (701) 770-8662

POC Email: stevek@wellspringhydro.com

POC Address: 4828 Highway 85 Williston, ND 58801

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ABSTRACT

Background:

Wellspring Hydro is a locally founded North Dakota company with a mission to unlock the full potential of produced water into a feedstock for sustainable clean energy. Wellspring Hydro is requesting financial support for the final developmental step prior to commercializing an innovative solution that will diversify the state's economy through an environmental solution. The Wellspring Hydro process is new and emerging technology focused on developing products from various renewable components, including produced water waste stream as the key feedstock.

Wellspring Hydro's products, specifically caustic soda, will be consumed in local and regional sustainable-clean-energy projects and designed to capture or sequester carbon from power generation. The same product will be used to extract lithium within the Wellpsring Hydro process. Wellspring Hydro will also work with local partner, Terracoh, to drive new development of sustainable clean energy within a cycle of carbon capture to power generation.

- Strategic fit in North Dakota's vision of a diversified petrochemical corridor
- Local development to create 55+ specialized jobs, \$60 M in new products.
- Sustainable and environmental solution to produced water waste, access to lithium

Wellspring Hydro's project will produce three commercially essential commodity products and lithium production to the State of North Dakota in a sustainable format that will diversify the economy, bolster existing industries (clean sustainable energy) through lower prices, and operate with a goal of zero waste or harmful emissions.

Objectives:

- Execute the final phase of front-end engineering (FEL-3) and design to recover valuable resources with commercial value from a waste stream from the Bakken oil fields
 - Facilitate planning of detailed engineering, procurement, and construction for project execution
- Confirm produced water feedstock process through pilot testing with subject matter experts to optimize high quality of recovered salt to meet stringent demands in chlor-alkali production.
 - Complete representative produced water sample for testing
 - Perform bench and pilot test to meet detailed test objectives including; chemical analysis, magnesium analysis, setting/compaction tests, sodium chloride size and purity for three conditions, evaporation process, NORM analysis, and others.
- Utilizing output of FEL-3 and produced water analysis, complete validation of lithium extraction process with Prairie Lithium to be officially included in scope (FEL-1).

Expected Results:

- Advance the novel business concept to "approved for construction" status for inclusion in the business plan to secure Series A investment and to proceed to detailed design and construction
 - Document a P&ID to control pressure on chlorine and hydrogen gas headers

- A "Fixed Bid Quotation" engineering cost estimate (accurate to +/- 10%), totally defining the project scope and control strategy to integrate multiple proven processes into one factory.
- Complete Mass & Energy Balances for the total operation to communicate with the appropriate regulatory organizations
- A refined process design will be finalized based upon additional laboratory and bench scale testing at the respective technology partner facilities
 - Completed chemical analysis with an understanding of pre-treatment and crystallization process.
- Develop full business case for lithium extraction and additional technology validation including operating and capital cost estimates (+/- 50%).

Duration:

The engineering estimate will require the most time, estimated between 5-8 months. Bench scale testing and instrumentation simulations will be coordinated based upon availability at the facilities.

Total Project Cost:

Total costs for engineering, pilot testing and FEL-3 output is quoted to be \$2,200,000.

Participants:

- Wellspring Hydro Management Team, Williston, ND
- Hargrove Engineers & Constructors EPC & Project Management, Birmingham, AL
- Veolia HPD– Evaporation/Crystallization Design, Plainfield, IL
- Prairie Lithium Lithium Extraction & Marketing Calgary, Alberta
- Instrumentation Technologies, Painesville, OH
- Neset Geology and Engineering, Tioga, ND
- Energy Labs Water Analysis Laboratoy Billings, Montana
- IsoBrine Water Analysis Laboratoy Calgary, Alberta

PROJECT DESCRIPTION

Objectives:

Wellspring Hydro will complete an FEL 3 Engineering study led by Hargrove Engineers and Construction. The purpose of the FEL 3 study will be to provide a +/- 10% estimate for a 150 ton per day chlor-alkali plant to be located outside of Williston, ND. The total plant will recover sodium chloride salt from 10,000 – 20,000 barrel per day rate of oilfield brine (a.k.a. produced water), feed that salt to the chlor-alkali process, and produce 154,000 tons per year of 35% hydrochloric acid (HCl) and 59,000 tons per year of 50% of caustic soda (NaOH).

The facility will include a pre-treatment, evaporator/crystallizer system, chlor-alkali electrolytic cells, caustic evaporator, a hydrochloric acid synthesizer, a liquid calcium chloride process and a Saltwater Disposal (SWD) well, and all associated utility, storage and loading facilities for bulk shipments via truck and rail. The business has been sized to create value by focusing on regional demand for various products that will allow Wellspring Hydro to achieve high-capacity utilization.

- Caustic soda will be sold locally and regionally for use in various heavy industries such as refineries, power stations, pulp mills and for carbon capture projects.
- The hydrochloric acid will be sold predominately into the local and regional oil and gas industry; other consumers include food processing and steel manufacturing industries in neighboring states.
- Liquid calcium chloride will be sold to meet strong regional demand in the Upper Mid-west US and Canada for dust control and snow removal/ de-icing. This process will consume hydrochloric acid internally to react with limestone to make the calcium chloride. Like WSH's other products no one makes this product in North Dakota today in spite of the high demand.
- Lithium, magnesium and other salts may be added to the product line in the future.

The produced water pilot test will be based on a representative water sample to further characterize the water, develop the pre-treatment requirements, and design the evaporator/crystallizer system. The pilot test is a critical step in the FEL-3 development and the output will have an impact on the Lithium extraction development.

Veolia's approach will first examine pretreatment (using caustic) of the produced water for magnesium removal. Once the relationship between magnesium concentration in the feed and the crystallizer pH has been established, all of the further tests will be treated to this level of magnesium in the feed.

- Perform chemical analysis on the produced water provided for the testing
- Reduce magnesium concentration in the produced water (as necessary)
- Perform settling and compaction tests for the magnesium removal step
- Determine sodium chloride size and purity for three conditions representing a single crystallization step configuration
- Measure boiling point rise and solution chemistry at the examined operating conditions
- Observe the evaporation process for physical behavior such as fouling or foaming tendency at the examined operating conditions
- Perform chemical analysis on the distillate generated from the examined operating conditions

• Track NORMs through the process circuit

Methodology:

In 2020 and 2021, Wellspring Hydro and Hargrove Engineering completed an FEL-2 process design evaluation (+/- 30% estimate) as well as a Market Study for the relevant products and geography. Learnings from those studies included:

- a. The WSH project should be designed and built to its design capacity from the beginning; a 2-Phase approach was considered but discarded due to its inefficient use of capital
- b. The hydrochloric acid market can be cyclical in demand, especially within the oil and gas sector.
 Various other products made from chlorine or acid reactions were considered to stabilize the demand patterns; and calcium chloride was identified as the clear preferred option.
- c. Wellspring Hydro hired an experienced, semi-retired engineer with calcium chloride experience to design the plant.
- d. Wellspring Hydro and Hargrove Engineering opted to repeat bench scale studies for the salt recovery process with a different technology company than was used in the FEL-2 study. The new partner, Veolia, confirmed the earlier findings directly impacting the evaporator and crystallizer design. Veolia's oil field experience added more depth, however, with designs to pre-treat the produced water prior to the evaporator and to treat the evaporator's water distillate to make it suitable for internal consumption.
- e. A detailed P&ID must be developed to allow 100% conversion of chlorine to hydrochloric acid during steady state operations.

Today, Wellspring Hydro is ready to move to the next level of detail and accuracy; the base case design will now incorporate the learnings mentioned above. As before, Wellspring Hydro's goal is to size the plant to capture a realistic share of the local and regional markets for hydrochloric acid, calcium chloride and caustic soda. The project scope will focus on; FEL-3 Development and Technology Validation, Produced Water Pilot Scale, and Lithium Extraction.

FEL-3 Development & Technology Validation:

As a first step in our business development process Wellspring Hydro hired two recognized technology/ engineering companies with strong resumes in their respective fields to perform a preliminary study for the project. The first study was referred to as an FEL-2 (Front End Loaded) estimate with a stated level of accuracy of +/- 30%. Hargrove Engineers and Constructors remains the overall project manager as well as the chlor-alkali experienced partner; we worked with a European company that specializes in salt recovery and evaporation technology. Following the completion of the FEL-2 study a decision was made to repeat some of the bench scale testing with Veolia, another specialist in that field. With over 1,000 installations in more than 30 countries, Veolia Water Technologies is a worldwide leader in the development of innovative process solutions utilizing HPD[®] evaporation and crystallization as core technologies.

The two companies, working together with Wellspring Hydro's technical consultant, completed their FEL-2 estimate in late June 2020. The FEL-2 work included laboratory and bench-scale testing at European laboratories on samples of Bakken's oilfield brine; those tests were repeated by Veolia

and will be used to design and prove-out a pre-treatment system and an evaporation/ crystallization system to make a high purity (>99.9%) salt and a distilled water condensate. A preliminary plot plan for the site is attached based upon the FEL-2 study.

Modern Chlor-Alkali technology includes sophisticated membrane cells to split apart the NaCl molecule via electrochemical reactions. The salt and water streams fed to the membrane cells must be highly purified to operate efficiently. Hargrove Engineering has designed and managed multiple chlor-alkali plant projects and will coordinate the overall project design for the entire Wellspring Hydro facility.

Hargrove will continue as the lead engineer on the next stage of evaluation. Veolia has now been engaged to design the produced water pre-treatment, evaporation and water condensate systems. Overall, they estimate that by the end of the FEL-3 study they will have spent 20-25% of the total engineering hours for the project.

Hargrove Engineers, as part of their overall project responsibility, will also include the Saltwater Disposal (SWD) well within its FEL-3 estimate. They will coordinate the design information to assure that all flows are properly accounted for; the design concept is to return any impurities removed from the produced water back into the residual produced water stream before it is pumped into the SWD. These features will require engineering details to be reviewed with the proper environmental authorities for approval. A local Williston industrial contractor will be qualified by Hargrove and the Wellspring Hydro management to participate in the scope details and cost estimating.

Produced Water Pilot Scale

Veolia validated a process to recover a high-quality salt from produced water in its first series of bench scale testing. Now Veolia will focus additional bench scale tests to characterize how different levels of pre-treatment impacts salt quality, treatment costs and waste generation. This work will determine the optimal treatment design and cost structure to be considered in the FEL-3 design.

The pilot scale testing is intended to study various design options for the production of high-quality sodium chloride from the produced water. It will also evaluate calcium chloride recovery and lithium production which was not a focus area in the previous pilot scale. Veolia has broken the test program into two parts. Part 1 has been defined to explore magnesium removal and salt purity at several operating conditions in the Crystallizer. Part 2 will explore recrystallization (if required to achieve salt purity) of the salt produced in Part 1.

Lithium Extraction Process with Prairie Lithium

The value created by Wellspring Hydro lies not just in the lithium in Williston Basin produced water but in Wellspring Hydro's patented process of removing salt from waste oilfield produced water which in turn concentrates the feed brine into a "mother liquor" stream. This concentrated mother liquor creates ideal feedstock as it increases the lithium by a factor of up to 4x. This concentration allows for even more efficient extraction by Wellspring Hydro over the standard brine process. Due to this concentration upgrade, the potential for up to 3.5 tons of lithium extraction per week is achievable and will yield nearly 3.5M in new revenue and 91,000,000 gallons of water saved over current Lithium mining practices.

Wellspring Hydro is partnered with Canadian company, Prairie Lithium, who has developed a patented technology platform capable of 99.7% lithium uptake from produced water streams. Wellspring Hydro and Prairie Lithium are now working together with the intent of licensing extraction technology for use with Wellspring Hydro's process. Water samples from Veolia's pilot scale testing were sent to Prairie Lithium to confirm appropriate uptake of lithium from Wellspring Hydro's process. Results were in line with previous Prairie Lithium of 99.6%.

Prairie Lithium and Wellspring Hydro intend to complete an FEL-1 that will involve the following steps;

- 1. Water sampling for confirmation of lithium levels and to allow for a bench and pilot scale set of tests to be completed in a laboratory and in the field, respectively.
- 2. Laboratory bench testing will be completed next to confirm lithium update numbers, chemicals dosing requirement and to make initial equipment sizing estimates.
- 3. Pilot scale testing to scale up the process live in the field by 1000X from laboratory bench scale testing to intermediate pilot scale testing.

The output from the above tasks will allow for greater than a +/- 50% estimate to be created for Wellspring Hydro's lithium ventures.

Anticipated Results:

The project results will define the technology footprint and quantify commercial inputs and outputs required to build a competitive treatment facility. The combination of the equipment pricing list and operating costs along with the marketing forecasts will determine the financial viability of the venture. For the engineering output, the key deliverables to build-out the facility will include:

- Product/plant capacity design basis
- Enhanced PFDs with stream tables, major process line sizing, and preliminary control strategy
- P&IDs to IFA Quality
- Process studies
- Utility balances
- Process equipment firm specifications and quotations
- Technical bid evaluation of process equipment proposals
- Process Patent Submission
- Water characterization and analysis to validate processes
- Initial FEL-1 inputs for lithium extraction

With the completion of this scope, Wellspring Hydro will gain the immediate value of a process patent that could be commercialized through licensing. This will also position Wellspring Hydro to progress in a capital raise to own/operate this process.

Facilities:

Veolia will conduct more pilot lab testing at its Plainfield, IL laboratories to optimize the pre-treatment process for the produced water.

An adapted pressure control system for the cell room's chlorine and hydrogen headers will be simulated at a location to be determined.

All engineering work will be done at Hargrove Engineering's offices in Birmingham, AL.

Resources:

Subject matter experts will assist in research, development and pilot testing.

- Hargrove Engineers & Constructors EPC & Project Management, Birmingham, AL
- Veolia HPD- Evaporation/Crystallization Design, Plainfield, IL
- Instrumentation Technologies, Painesville, OH
- Neset Geology and Engineering, Tioga, ND
- Prairie Lithium Lithium Extraction, Calgary, CA
- Terracoh Carbon Dioxide (CO2) Plume Geothermal, Minneapolis, MN
- Energy Labs Water Analysis Laboratoy Billings, Montana
- IsoBrine Water Analysis Laboratoy Calgary, Alberta

Other consultants or services to be used include electricity pricing experts and legal advisors for purchasing and sales agreements. Environmental consultants may also be required to assist during reviews with the North Dakota Department of Environmental Quality.

Techniques to Be Used, Their Availability and Capability:

Independent, credible third-party resources will be utilized as identified in earlier sections. Contact is on-going today with all parties mentioned in this write-up. Availability is not expected to be an issue.

Environmental and Economic Impacts while Project is Underway:

During the scope of this project, there must be interaction between the Company, Hargrove and the appropriate North Dakota regulatory agencies to communicate details about the plant design including specific plans to address environmental and safety concerns. Wellspring Hydro will complete water sampling in the field, with containment and minimal environmental impact. The research and development will be focused on by industry experts (Wellspring Hydro will utilize local contractors/services where applicable).

Ultimate Technological and Economic Impacts:

This is a first of its kind process utilizing well known and understood chlor-alkali technology that has been available since the 1970's. To our knowledge there is no other chlor-alkali plant in the world that uses oilfield produced water as its feedstock. We have patented a process to leverage this waste stream to create products which are used in the industry as well as create net new fresh surface water, water that did not exist as fresh water before.

Wellspring Hydro, a North Dakota company, is completing its Strategic Entrepreneurial Economic Development (SEED) work to prove out and refine its business model to attract funding for a project estimated to cost \$150- 200 million. When completed this business will:

- 1. create 55+ new jobs tied to the oil and gas sector, and 200+ local contractors to build
- 2. generate new local products and tax revenues for North Dakota
- 3. enhance the Bakken region's overall economic and environmental footprint in existing oil and gas fields as a key component in a petro chemical industry,
- 4. create feedstocks from other valuable materials that may be recovered, including lithium

Why the Project is Needed:

Wellspring Hydro needs to execute the final phase of front-end engineering and design to recover valuable resources with commercial value from a waste stream from the Bakken oil fields. The results of this financial support would confirm the produced water feedstock process through pilot testing with subject matter experts. Wellspring Hydro is developing the application of known evaporation and crystallization technologies to recover a high-quality salt from the oil field's produced water waste stream; the quality must be sufficient to meet the stringent demands required in chlor-alkali membrane cell plants.

This plant will be designed as much as possible to enable recovery of more valuable salts and elements such as lithium in the future. Overall Wellspring Hydro's proven concept may be utilized again as North Dakota's petrochemical industry grows.

All products to be made by Wellspring Hydro are presently consumed by residents and industries in North Dakota but are imported from other states. This project represents a new industry for North Dakota, creating sustainable jobs and tax revenues in North Dakota.

This output will benefit North Dakota by proving out a new concept to recover salt from a waste stream from the oil and gas fields and using it to make valuable products which are used in the industry, hydrochloric acid, calcium chloride, caustic soda and a small amount of sodium hypochlorite (bleach) required in the State and region. All these products are used to some extent in the oil and gas industry, excess production will be exported out of state, thus generating new income for the state. In addition to the valuable commodities that will be recovered, the current disposal zone of the Dakota is experiencing over pressurization in certain areas, this challenge will continue as development of the Williston Basin continues. Wellspring Hydro offers an environmentally useful solution to over pressurization.

Wellspring Hydro systematically manages our power, water, and carbon footprint to underpin North Dakota's goals as a multi-resource energy policy state. Our products support more efficient oil production, lower carbon capture costs, and resource attainment of previous waste streams.

STANDARDS OF SUCCESS

Various standards for success will be to identify and solve any technical hurdle that is identified. These studies examine both the technical and commercial aspects of our project.

Reduced Environmental Impacts

Oil and gas operations in the Williston Basin dispose of 1.5 - 1.8 million barrels (63-75 million gallons) of produced water per day. This is roughly 25% more than all of the industrial process water use in North Dakota. Wellspring Hydro's scope focuses on 10,000 -20,000 barrels per day, but its vision is to create valuable commodity and rare earth metals extraction through alternate water utilization.

Wellspring Hydro will separate salt and fresh water from produced water; the remaining concentrated stream (referred to as "mother liquor") will be sent to additional processes and eventually the SWD well after all useful material can be economically derived.

The elevated concentration of remaining elements in the "mother liquor" such as lithium and magnesium along with other salts and metals, create potential for further value-added processing.

Increased Energy Efficiency

While Wellspring Hydro itself will have the ability to invest in a small carbon capture facility totaling up to 23,000 tons per year (as an added scope). More importantly Wellspring Hydro will be a key chemical supplier to the burgeoning CCS/CCUS (Carbon Capture and Storage/Carbon Capture, Utilization and Storage) industry in North Dakota and surrounding states. The Northern Plains are known for their vast coal reserves and critical baseload power production however changing climates both political and weather related are now signaling the importance of CCS/CCUS. Technological advances, tax incentives, and attractive geologic CO2 target zones in North Dakota are leading to testing for storage zones and will soon place North Dakota on top as the world leader in carbon capture.

A large part of the WSH power demand will interruptible, a benefit in managing and balancing North Dakota's electrical grid during periods of high demand. To achieve the status of the world's leading carbon capture State, projects such as Tundra at Milton R. Young station and Coal Creek will require large amounts of NaOH (caustic soda). Currently all Caustic Soda is imported into the State at a premium. Wellspring Hydro will be able to supply all of the States projected needs and will have a net export for the state to surrounding states.

In addition to current power generation CCS projects, Wellspring Hydro is developing a relationship with Terracoh. Terracoh has a desire to capture Wellspring Hydro's CO2 emissions in exchange for power which is our largest variable cost. The power created by Terracoh will be considered essential baseload and will more importantly be carbon neutral. As part of Terracoh's process brine will be produced out of the target carbon storage zone. Wellspring Hydro will then be able to expand our partnership with Terracoh and utilize their brine for Chlor Alkali, thus furthering the continuous energy efficiency cycle for North Dakota.

Energy Sustainability

Lithium extraction in North Dakota by Wellspring via Prairie Lithium is attractive for the Williston area and North Dakota for many reasons; it does not require the surface area needed when compared to traditional solution mining which demands large evaporation ponds. The potential for carbon neutrality is feasible with further partnerships. The water used in Wellspring hydro's process is water that is recycled from the influent stream that is a current oilfield waste stream not being utilized. The process does not need the 500,000 gallons of water traditionally required to extract a single ton of lithium, Lastly, the process requires hydrochloric acid and caustic soda which Wellspring Hydro produces at its plant. This synergistic effect further reduces the production cost of North Dakota lithium.

The value created by Wellspring Hydro lies not just in the lithium in Williston Basin produced water but in Wellspring Hydro's patented process of removing salt from waste oilfield produced water which in turn concentrates the feed brine into a "mother liquor" stream. This concentrated mother liquor creates ideal feedstock as it increases the lithium by a factor of up to 4x. This concentration allows for even more efficient extraction by Wellspring and Prairie Lithium over the standard brine process. Due to this concentration upgrade, the potential for up to 3.5 tons of lithium extraction per week is achievable and will yield nearly 3.5M in new revenue and 91,000,000 gallons of water saved. Lithium production in North Dakota will provide sustainable energy and local supply chain to meet the growing lithium demand – specifically in electric vehicles.

Value to North Dakota

This project can lead to significant environmental, technological, and economic impacts to the state of North Dakota. Through the successful implementation of this project, Wellspring Hydro can help demonstrate the value of produced water from Oil & Gas operations. North Dakota Oil and Gas Research Program will be able to prove the technical process and validation of taking valuable resources out of produced water. The ultimate standard of success would provide North Dakota with a key piece in a future petrochemical strategy.

Explanation of How the Public and Private Sector will make use of the Projects Results, and when, and in What Way

Carbon Capture projects, oil and gas and all ND counties will enjoy up to 30% cost reduction and consistent supply essential commodities. Caustic (carbon capture), Hydrochloric Acid (oil and gas operations), and North Dakota Counties(Calcium Chloride) will all benefit from Wellspring Hydro's strategic location, differentiated feedstock, and low operating cost in Western North Dakota. These products which are all purchased outside of North Dakota currently will immediately realize a large logistical cost savings over current suppliers who rely on rail and trucking to bring current products in from thousands of miles away.

Caustic soda is essential in water treatment done at all industrial plants in North Dakota however the largest use of caustic will be sulfur dioxide scrubbing at the planned carbon capture projects at Milton R. Young and Coal Creek Station power plants. These projects will together consume nearly half of

Wellspring Hydro's caustic production. Current supply chains are not set up for this increase in use by North Dakota which would only lead to higher than projected operating costs without Wellspring Hydro to fill the increase caustic need by these essential projects.

Currently oil and gas completions and operations are finding it difficult to purchase hydrochloric acid and most transloading companies are looking to purchase product as far away as Texas. This adds delays and significant cost increase due to logistics and creates simply supply-demand constraints. Wellspring Hydro's plant would eliminate the need for North Dakota oil and gas producers to ever go outside of the State and furthermore would allow for North Dakota to become an exporter of HCl to the surrounding region.

Similar to oil and gas operators, the counties in North Dakota purchase Magnesium Chloride (MgCl2) and Calcium Chloride (CaCl2) from out of state production. North Dakota and surrounding states (SD, MT, MN) utilize a high volume of product for dust control. The annual consumption of calcium chloride for North Dakota is 5.6 thousand metric tons, and 18.1 thousand metric tons for the surrounding states. In addition, the US and Canada are large consumers of deicing products due to harsh winter conditions. CaCl2 outperforms MgCl2 and has a lower environmental impact. Wellspring Hydro has the operational flexibility to produce all of the CaCl2 uses by North Dakota and export to surrounding states.

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.

Wellspring Hydro will enhance the development and operations of technologies that reduce environmental impact by suppling crucial raw materials to processes used in carbon capture. Materials that will have the lowest environmental footprint of any commodities on the market. This is due to extremely short supply chains, a zero-emission production facility, and use of a current waste stream for a feedstock.

How it will preserve existing jobs and create new ones.

Wellspring Hydro will preserve existing jobs by supporting the oil and gas industry through lower costs, readily available commodities to ensure wells can be completed and produced a \$/barrel that is in line with that of competing states. The production plant will create up to 60 fulltime high paying jobs ranging from front office to production crews.

BACKGROUND/QUALIFICIATIONS

Leadership Team

Wellspring Hydro management team is supported by industry and local resources to develop a robust business plan and positioned to execute with investment.

Steve and Carla Kemp, Founders, Wellspring Hydro.

• Steve and Carla are local entrepreneurs that founded Wellspring Hydro in 2016 and are based in Williston, ND. Steve and Carla have started multiple ventures in IT, real estate, and financial markets.

Mark Watson, CEO, Wellspring Hydro.

• Mark has over 11 years-experience in acquisitions/mergers, project management, and entrepreneurial start-ups. Mark, MBA, specializes in developing business plans, financial modeling, marketing analysis, and valuation/capital funding.

Mat Hirst, COO, Wellspring Hydro.

• Mat has over 14 years-experience in developing sales and operations teams in the oil and gas industry. Mat, based in Bismarck, ND, specializes in water technologies with expertise in executing sales strategies, people management, and driving operational efficiencies.

Norm Christensen, Technical Advisor, Wellspring Hydro.

• Norm's career has spanned more than 40 years, including direct involvement in the chlor-alkali industry in both North and South America. A chemical engineer, Norm has held senior positions in both Fortune 100 and small companies in engineering, operations, sales and marketing and general management roles. Norm recently (2015) oversaw on the construction of a chlor-alkali facility in San Antonio, TX.

Partners & Suppliers

Wellspring Hydro has worked with subject matter experts to validate components of the business plan from our engineering leads in Hargrove and Veolia, to local partners Savage, Neset and UND.

A few key leads from the project team consists of the following individuals:

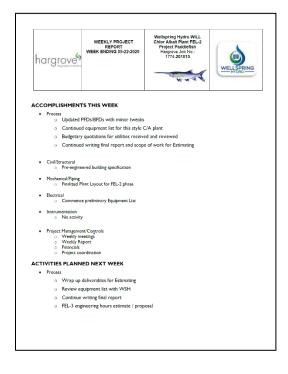
- Scott Cooper, Project Lead, Hargrove Engineers + Constructors. Scott has thirty years of experience working in project management and design engineering. Has established project procedures, coordinates changes in scope, monitors and controls engineering activities, cost analysis, planning, scheduling, estimating, procurement of process equipment. Scott is the project lead for the Wellspring Hydro FEL-2 and upcoming FEL-3 projects.
- Justin C Merritt, P.E, Hargrove Engineers + Constructors. Justin has over eighteen years of experience in a variety of process industries, including chlor-alkali, petrochemicals, minerals processing, biofuels, and lithium. Project experience includes work on six chlor-alkali plants.
- Alex Johnson, EIT, Hargrove Engineers + Constructors. Alex has over seven years of experience as a Process Engineer in the chemical industry. Experience in writing procedures, process safety management, root cause analysis, and process studies.
- **Mark Nicholson,** Sr. Project Developer, Veolia HPD Evaporation and Crystallization, Veolia. Mark has over fifteen years of experience in crystallization and evaporation, including test program development, equipment design, troubleshooting, operation optimization.
- Lisa (Drabiak) Wood, Director, IHS Markit OMDC Chemical Consulting. Lisa serves as Director, OMDC Consulting, at IHS Markit, primarily responsible for the sale and execution of consultant engagements in the Americas region.
- **Michael Mann,** Phd Engineering/MS Chemical Engineering, UND. Dr. Mann in his role of executive director/professor of the institute of energy studies has supported become a key piece to Wellspring Hydro's investment into marketing, technology, and development.
- Justin Anderson, Director of Operations, Savage Services. Justin manages operations and business development for Savage Services in the North Dakota region. Justin has helped negotiate an LOI for a logistics and transload partnership, that includes capital investment.

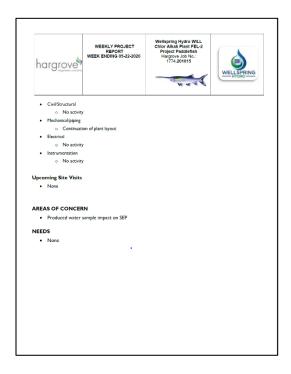


MANAGEMENT

The Wellspring Hydro leadership team meet on a weekly frequency to discuss project details, review action items and assign outstanding tasks. The meeting consists of Steve Kemp (Founder/President), Carla Kemp (Founder), Mark Watson (CEO), Mat Hirst (COO) and Norm Christensen (Technical Advisor).

Wellspring Hydro COO Mat Hirst and Technical Advisor Norm Christensen attend weekly project update meetings with Hargrove Engineering. Mat and Norm will provide weekly guidance and feedback for challenges during this process and report back to the greater Wellspring Hydro team. To provide an overview of the rigor applied to this project, directly below are meeting minutes from the most recent Hargrove meeting:





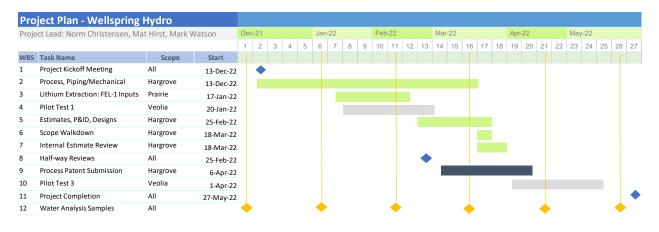
Management Process:

- 1. Weekly Wellspring Hydro Call
- 2. Weekly Hargrove/SEP Call
- 3. Change Management Process Highlighted in FEL-3 Quote
- 4. Detailed Schedule Review/Approval for Kickoff
- 5. Completion of 6-week status reports to OGRP
- 6. Monthly status change and cost reports

TIMETABLE

The timeline is based cumulative outlook for the FEL-3 study, market research study and the combined output analysis. The FEL-3 study has been estimated at 16-18 weeks and the market study at 8-10 weeks. Wellspring Hydro will plan to provide a 6-week interim reports to OGRP.

Project Timetable

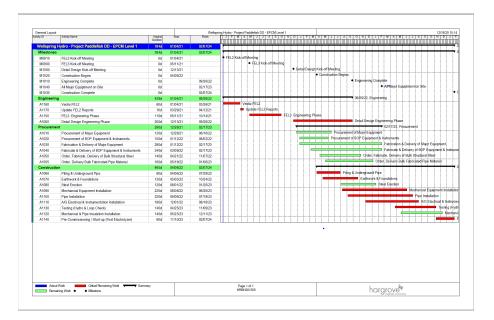


Key Timelines

Project Start – December 13th

Half-Way Review – February 22nd

Project Completion – May 27th



BUDGET

As referenced in the management section, Wellspring Hydro will have monthly updates on cost/budget reports in addition to the criteria set by the OGRP process.

Project Associated Expense	NDIC's Share	Applicant's Share (Cash)	Applicant's Share (In-Kind)	Applicant's Equity Investment	Total
Hargrove FEL-3	\$850,000	-	-	\$850,000	\$1,700,000
Veolia Pilot Plant – 2 Tests	\$150,000	-	-	\$150,000	\$300,000
Water Analysis & Sampling Plan	\$30,000			\$30,000	\$60,000
Process Patent	\$20,000			\$20,000	\$40,000
Total	\$1,100,000	-	-	\$1,100,000	\$2,200,000

All budget items are based on quotations from Hargrove, Veolia, Energy Labs and Holland & Hart.

- 1. Hargrove FEL-3 \$1,700,000 USD estimated quote on detailed engineering development
- 2. Veolia Pilot Plant \$300,000 USD estimated quote based on two pilot plan tests (one at the beginning of FEL-3 and one at the end of FEL-3)
- 3. Water Analysis \$60,000 USD estimated quote based on monthly sampling and lab analysis from Energy Labs and IsoBrine on 5 well locations. Expectation of 8 water analysis, on 5 well locations and NORM testing at \$1,500 USD per well.
- 4. Process Patent \$40,000 USD estimated quote from Holland & Hart to complete process patent with feedback from Hargrove on detailed process.

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 <u>http://www.nd.gov/ndic/CSEA-app-doc-infopage.htm</u>.

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.

This is a first of its kind process utilizing well known and understood technology that has been around since the 1970's. Based on our research, there is no other chlor-alkali plant in the world that uses oilfield produced water as its feedstock. Wellspring Hydro will complete the process patent application with the results of the FEL-3 defined engineering and design study. This process patent will illustrate a process to leverage this waste stream to create products which are used in the industry as well as create net new fresh surface water.

FILING	FIRST A	TION F	INAL REJECTION	APPI	EAL	ALLOWANCE	ISSUE
PRIC		DURING		TER CLOSE ROSECUTION	AFTER NOT		AFTER PAYMENT OF ISSUE FEE
			DVANCEMENT OF	EXAMINATION	OPTIONS		
	ck One - d Examination			al Consideration .0 (AFCP 2.0)	After Final Consid Pilot 2.0 (AFCP		ck Path Information closure Statement (QPIDS)
	elerated mination		Pre-Ap	peal Program		_	
	rative Search ot (CSP)						
	d Examination plications Only)						
	Prosecution way (PPH)						
Petition to	Make Special	Petition to Make S	ipecial				
Ombudsr	man Program	Ombudsman Pro	gram Ombuc	isman Program	Ombudsman Pro	ogram Om	budsman Program
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	al Interview ractice	General Intervi Practice		eral Interview Practice			
	INFORMATION DISCLOSURE STATEMENT (IDS) OPTIONS						
	PS - No ation or Fee	IDS - Certification or	Fee Certifi	IDS - cation and Fee	IDS - Certification an	d Fee	

Hargrove will help support the application writing, along with the expertise of Holland & Hart law firm. Through the Track One – Prioritized Examination, Wellspring Hydro anticipates 6-12 month for the patent to be for this Chlor-Alkali design. In addition, Wellspring Hydro will work with Prairie Lithium, to submit a joint process patent for lithium extraction from the Mother Liquor stream.

Cost (assumes only U.S. patent; foreign patents will significantly increase the cost):

The total lifetime cost to obtain and maintain a U.S. patent is estimated at \$40,000 USD

- Drafting phase—\$10,000 USD
- Waiting phase—\$0 USD
- Active prosecution phase—\$10,000 USD
- Patent grant and maintenance phase—\$15,000 USD
- Hargrove Engineering Support \$5,000 USD

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.

Wellspring Hydro has a long-standing partnership with North Dakota from the original concept stage supported by UND, NDIC and City of Williston. The support from the state has allowed Wellspring Hydro to fund the research and development into this novel process (patent pending).

Agreement	Company/Division	Investment	Commentary
Research Grant	NDIC	\$110,000	Concept support with UND partnership starting in 2016
Grant Match	City of Williston Star Fund	\$225,000	Investment into Concept Stage and FEL-2 Engineering with development in Trenton
Promissory Note	ND Dev Fund	\$250,000	Investment into successful FEL-2 engineering and design work in 2020
Promissory Note	ND Dev Fund	\$750,000	Investment into commercial and technical development, highlighted by Veolia Pilot Lab
Total Investment		\$1,335,000 USD	

*Promissory notes and grant detail can be provided upon request.

APPENDIX

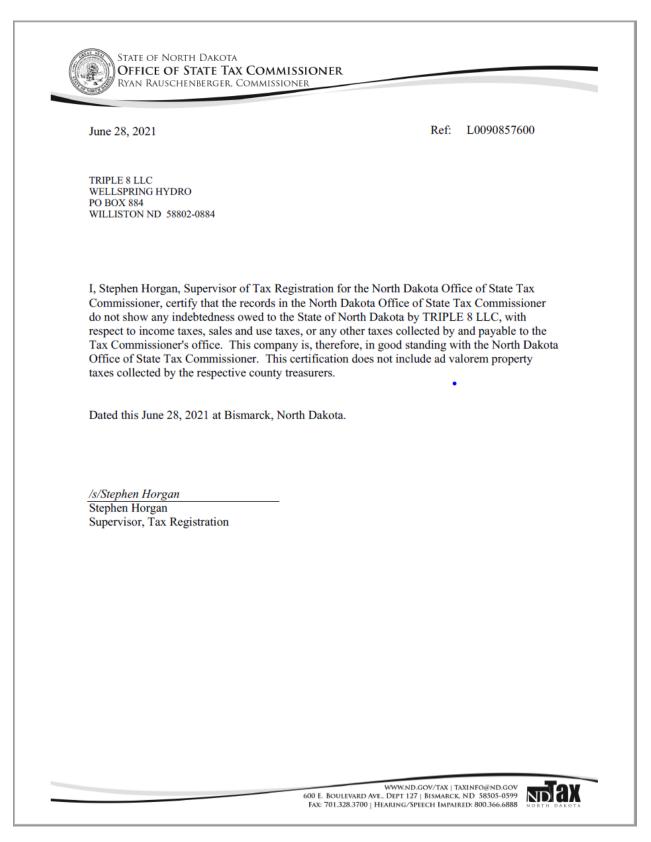


PLOT PLAN





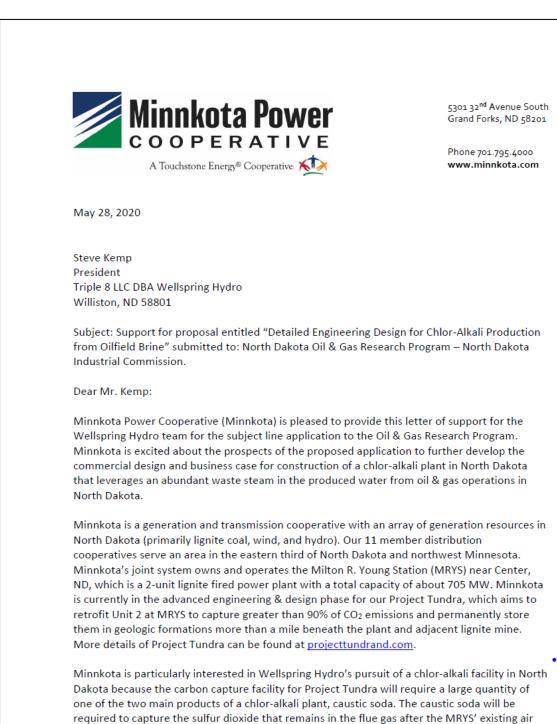
TAX LIABILITY STATEMENT



LETTER OF SUPPORT - TERRACOH



LETTER OF SUPPORT – MINNKOTA 1



pollution control systems, thus preventing it from entering the carbon capture system and

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LETTER OF SUPPORT – MINNKOTA 2

poisoning the carbon capturing solvent. We currently anticipate a caustic usage rate of about 25 tons/day at 50% concentration, which we understand is a significant fraction of the total output from the proposed chlor-alkali facility. If caustic soda can be produced in commercial quantities in North Dakota (and avoiding significant cross-country transportation charges), while leveraging a waste product as the feedstock and North Dakota's low electricity prices, then Minnkota believes there is potential for significant cost savings for Project Tundra.

Opportunities to reduce costs can significantly increase the likelihood of Project Tundra progressing to commercial reality. Project Tundra would have significant benefits not only for the lignite industry in North Dakota, but also for the North Dakota oil & gas industry when either the conventional resources or the Bakken are ready to accept the CO₂ captured for enhanced oil recovery operations. We encourage the Oil & Gas Research Program to consider funding this proposal and look forward to hearing of a positive outcome.

Please contact me if there are any questions.

Sincerely,

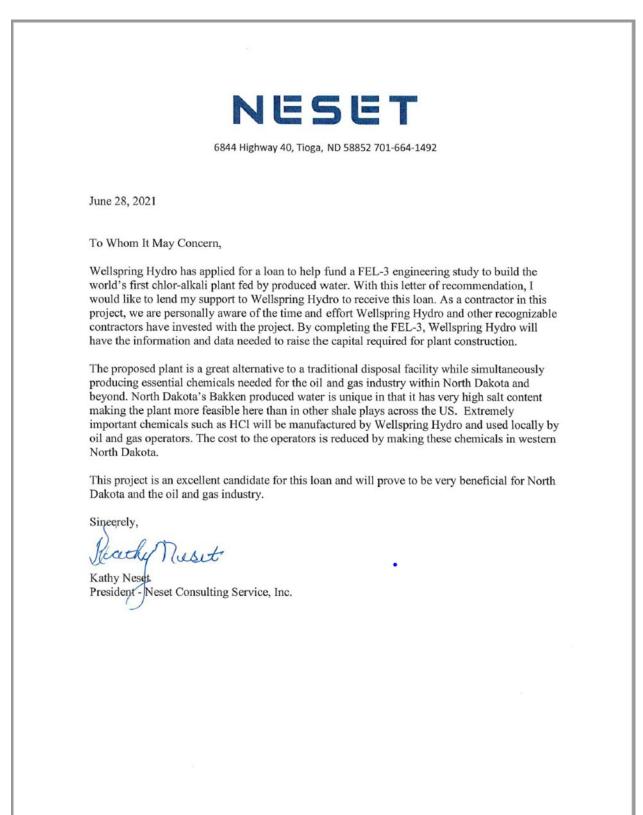
Dang Offen

Gerry Pfau Sr. Manager of Project Development Minnkota Power Cooperative <u>gpfau@minnkota.com</u> 701-794-7234

Cc: Dan Laudal Dylan Wolf



LETTER OF SUPPORT – NESET



LETTER OF RECCOMENDATION – CITY OF WILLISTON

