

North Dakota Clean Sustainable Energy Program  
Final Report

Recipient: Wellspring Hydro  
Contract Number: C-01-03  
Report for time period of: (7/22/2022 – 9/18/2023)  
Spent: \$2,023,025 USD

**Description of Project**

Please provide a brief description of the project:

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. 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 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. The objectives of the project include;

- 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
- 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.
- 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).

Summary of CSEA grant requests and payments to date:

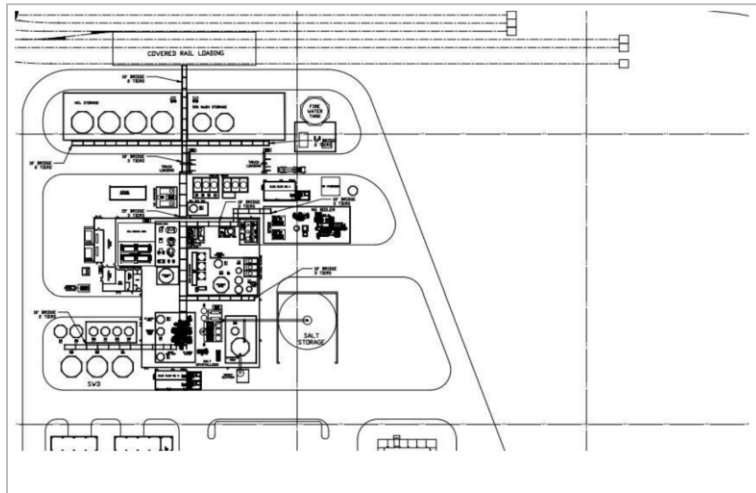
<b>Date</b>	<b>FEL-3 Invoice</b>	<b>CSEA Funds</b>	<b>Status</b>
7/20/2022	\$732,173.00	\$366,086.50	Paid
4/21/2023	\$330,000.00	\$165,000.00	Requested – Status Report 1
6/30/2023	\$427,050.00	\$213,525.00	Requested – Status Report 2
9/18/2023	\$320,288.00	\$160,144.00	Submitted – Final Report
9/18/2023	\$213,524.00	\$95,244.50	Submitted – Final Report
<b>TOTAL</b>	<b>\$2,023,025.00</b>	<b>\$1,000,000.00</b>	<b>Total Outstanding- \$633,913.50</b>

## Project Tasks

Please describe the progress on all project tasks achieved during the reporting period:

- Final FEL-3 Report is a technical and commercial report prepared for Wellspring Hydro. The output of this report was the primary deliverable for the CSEA grant and the outputs were required to support several other deliverables. As identified in next steps for Wellspring Hydro, the team has continued to refine and optimize the detailed design into an FEL-3.1 to FEL-3.2 and ultimately, FEL-3.3. The majority of the information contained in this report was supplied by the following team:
  - Hargrove: Generated and compiled the preliminary design and engineering quantities and documents to develop and support the FEL-3.1 and the estimate. This includes technology vendor packages for the process.
  - Tormod, a Hargrove Company: Developed a preliminary Commissioning Plan to serve as a basis
    - for further development during detailed design.
  - Alfa Laval: Developed a preliminary engineering proposal for the crystallizer system.
  - Mastec: Developed construction cost estimate with the support of local contractors InDemand and FCI.
  - Appendices include;
    - A. Site Layout
    - B. Process Design Criteria and Scope of Work
    - C. Mechanical/Piping Design Criteria and Scope of Work
    - D. Civil Design Criteria and Scope of Work
    - E. Structural Design Criteria and Scope of Work
    - F. Electrical Design Criteria and Scope of Work
    - G. Instrumentation Design Criteria and Scope of Work
    - H. Controls + Automation Scope of Work
    - I. Not Used
    - J. Not Used
    - K. Not Used
    - L. Estimate Management Summary
    - M. Capital Cost Estimate
    - N. Risk Register
    - O. EPC Schedule
    - P. PFDs & HMB
    - Q. P&IDs
    - R. Equipment List
    - S. Single Lines
    - T. Equipment Layout
    - U. Electric Center Layout
    - V. Buildings Layout
    - W. Control Architecture
    - X. Execution Plan for Engineering & Procurement
    - Y. Commissioning Plan
    - Z. Operating Cost Estimate Calculations
  - (*Deliverable Reference – 1, 4, 5, 6, 7*)

- Plant Layout in FEL-3.1



- Received final FEL-3 outputs and mass balance on waste streams. Wellspring Hydro has initiated the permitting process with BARR Engineering, DEQ and NDIC for future permitting submission. This was a significant dependency for progressing the permitting process. (*Deliverable Reference – 4, 5*)
- Initiated permitting process with the support of Barr engineering and work sessions with DEQ on reviewing the FEL-3 output for determination of Class 1/Class 2 saltwater disposal well. This also represents the full scope of permitting requirements for submission to the DEQ and NDIC. (*Deliverable Reference – 4, 5*)
- IHS Markit/CMA completed an updated market research report and comparative sustainability analysis to comparative producers. This was a joint marketing report prepared with Wellspring Hydro investor (Saconix/Nex-Chlor). This represents additional detail to highlight the market opportunity and impact on sustainability. Wellspring Hydro has completed a Phase 1 and Phase 2 marketing report to identify macro and micro market intel on the chlor-alkali market. (*Deliverable Reference – 1, 6, 7*)

## Deliverables

Please describe the progress on project deliverables, as stated in your contract, achieved during the reporting period:

The following deliverables have been completed in alignment with the expectations of Contract Number: C-01-03 for the Wellspring Hydro CSEA grant;

1. Report on FEL-3
  - The FEL-3 report is the focal points for all deliverables in this grant. The combination of Hargrove, Veolia and Mastec have completed the final +/- 10% estimates to give designs the build the facility. The results met all technically and commercial expectations to support the operational process to develop products from produced water waste. Wellspring Hydro will continue to optimize and improve the design of the facility, along with additional validation of the front-end design.
  - Attachment sent 9/18 - HAR-201015-EN-RPT-001 FEL 3.1 Report
  - All appendices of FEL-3 can be sent upon request with additional details on engineering, design, layout, project execution, and others.
2. Report on pilot plan tests and results
  - This third bench scale test has been completed by Veolia and considered very successful. This represents additional validation on the front-end process to create high quality salt. The bench scale results helped demonstrate the success of the feasibility (technically and commercially) of meeting and exceeding the specifications.
  - Attachment sent 8/4 – NaCl\_Test\_Report\_Lab4\_12\_23 Wellspring\_5300222062
3. Report on water analysis and results
  - The water analysis and characterization will be an ongoing deliverable for Wellspring Hydro until the facility is fully constructed and implemented. An independent third party has completed a report on water analysis and further crystallizer testing to validate multiple water samples. This work was completed with multiple different water samples and different variations of testing to optimize pretreatment.
  - Attachment sent 8/4 – Report on Produced Water Pretreatment and Crystallization
4. Report on process patent
  - Wellspring Hydro has worked with an IP consultant to understand how to build a more comprehensive strategy for the technology. With the completion of FEL-3 in June, Wellspring Hydro will plan to submit for a process patent on the front-end to chlor-alkali process. The timing of submission could depend on investors interest in approach on protecting intellectual property of this novel treatment approach.
  - Attachment sent 9/18 – Wellspring Hydro Patent Process Report
5. Report on permitting process, including verification of initiation of DEQ permitting.
  - The initiation of this deliverable was completed in building a plan with both NDIC and DEQ to follow up once more FEL-3 outputs were available. In working with Hess and Neset, Wellspring Hydro is also positioned to complete the permitting process for the salt-water-disposal well required in 2024.
  - Attachment sent 9/18 - Wellspring Hydro Permit Process Report
  - Attachment sent 9/18 - Barr\_Wellspring\_Pre-Permitting Engagement Letter 230915
6. Report on the overall estimated reduction in environmental impacts with completion of this project.
  - CMA is now working to identify the projected competitive analysis from a variable cost perspective and improved supply chain perspective. The market analysis highlights the environmental impact of the Wellspring Hydro facility compared with other chlor-alkali facilities that are under regulatory pressure and environmental scrutiny for a design with diaphragm cells. Wellspring Hydro will be able to produce market products through the produced water waste stream, as the process indicates in the FEL-3 engineering and design output.
  - Attachment sent 9/18 – Wellspring Hydro Phase 1 Marketing Report

7. Report on the overall estimate of the increased sustainability of energy production and delivery with the completion of this project.
  - o The FEL-3 report deliverable highlights the improved sustainability of energy production and delivery through the output of valuable products with a produced water waste stream. With completion of the FEL-3 report, there will be quantifiable impact of increased sustainability. In addition, there is an impact created with our produced water and lithium extraction partners on the front and back ends of the chlor-alkali process.
  - o Attachment sent 9/18 - HAR-201015-EN-RPT-001 FEL 3.1 Report