



July 1, 2022

Mr. Al Anderson
Director
Clean Sustainable Energy Authority
North Dakota Industrial Commission
State Capitol – 14th Floor
600 East Boulevard Avenue, Dept. 405
Bismarck, ND 58505-0840

Dear Mr. Anderson:

Subject: EERC Proposal No. 2022-0180 Entitled “Liberty H₂ Hub Front-End Engineering and Design”

Enclosed for your consideration is the Energy & Environmental Research Center’s (EERC’s) proposal in partnership with MPLX, TC Energy, Black & Veatch, Wood Group USA Inc., Sargent & Lundy, and ERM to complete a front-end engineering and design (FEED) feasibility study for the Liberty H₂ Hub. We request that Appendixes A, B, C, F, G, H, and I be considered confidential and protected. Thank you for considering our proposal.

If you have any questions, please contact me by phone at 701.777.5273 or by e-mail at cwocken@undeerc.org.

Sincerely,

DocuSigned by:

A handwritten signature in black ink that reads "Chad Wocken".

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Chad A. Wocken

Assistant Director, Clean Energy Solutions

Approved by:

DocuSigned by:

A handwritten signature in black ink that reads "Erin O'Leary".

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Charles D. Gorecki, CEO
Energy & Environmental Research Center

CAW/bjr

Enclosures

Clean Sustainable Energy Authority

North Dakota Industrial Commission

Application

Project Title: Liberty H₂ Hub Front-End
Engineering and Design

Applicant: Energy & Environmental Research
Center

Date of Application: July 1, 2022

Amount of Request
Grant: \$10,000,000
Loan: \$0

Total Amount of Proposed Project:
\$24,290,528

Duration of Project: 24 months.
(November 1, 2022 - October 31, 2024)

Point of Contact (POC): Chad A. Wocken

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ABSTRACT

To manage and mitigate climate change, both North Dakota and the federal government have set goals to reduce carbon emissions. Hydrogen (H₂) is one of very few forms of energy that does not emit carbon at the point of use; it emits only water when consumed. This attribute, coupled with the variety of sources and processes to manufacture H₂, makes it a valuable component of a low-carbon-energy economy. Yet, substantial investment will be required to build all the infrastructure needed to achieve carbon reduction goals and maintain North Dakota's leadership in clean, sustainable energy.

With the U.S. Department of Energy (DOE) seeking to kickstart the H₂ economy by directing \$8 billion to establish several H₂ "hubs" across the country, the time is critical for the state to take the necessary actions to maintain its standing as a major player in the national energy economy. The proposed project, the design of the Liberty H₂ Hub (LHH), is a necessary step toward that goal.

Objectives: The proposed LHH front-end engineering and design (FEED) study will result in critical development and enable a financial investment decision by the project sponsors, MPLX and TC Energy, to develop large-scale facilities for low-carbon H₂ energy development. Completion of this proposed project will support several sectors of North Dakota's economy, ensuring its long-term energy sustainability and diversification.

Expected Results: The project will support the Clean Sustainable Energy Authority's (CSEA's) mission to develop and deploy large-scale commercial projects that reduce environmental impacts and increase the sustainability of energy production. The proposed project will provide the information needed for the project team to invest in commercial deployment of clean H₂ energy that can diversify North Dakota's economy, leverage existing energy resources, create sustainable jobs, and reduce the environmental footprint of energy production and use in the region and beyond.

This project will also include the design of novel, first-of-a-kind integration of technologies, creating an optimized process that reduces cost and carbon intensity compared to the typical deployment of the individual technologies.

Duration: 24 months (November 1, 2022 – October 31, 2024)

Total Project Cost: \$24,290,528 with a \$10,000,000 CSEA grant and \$14,290,528 in cash from MPLX and TC Energy.

Participants: The project will be managed by the Energy & Environmental Research Center (EERC), with participation and sponsorship from MPLX and TC Energy. The project will be conducted in partnership with the North Dakota Industrial Commission through CSEA, Wood Group USA Inc., Black & Veatch, Sargent & Lundy, and ERM.

PROJECT DESCRIPTION

Objectives: The proposed Liberty H₂ Hub (LHH) front-end engineering and design (FEED) study will result in critical development and support investment decisions by the project sponsors, MPLX and TC Energy, to develop large-scale facilities and infrastructure for a complete supply chain of clean energy. A project of this scale requires significant front-end investment to determine its techno-economic and regulatory feasibility, and the proposed project will provide the necessary information to accurately assess that feasibility.

These objectives meet the Clean Sustainable Energy Authority's (CSEA) purpose of deploying large-scale projects that reduce the environmental impacts and increase the sustainability of energy production and delivery. Completion of this FEED study provides the necessary next step in building the H₂ infrastructure that can help diversify North Dakota's economy, leverage existing energy resources, and reduce the environmental footprint of energy production and use in the region.

Methodology: FEED can be categorized into four phases defined as front-end loading (FEL) Levels 1–4. FEL-1 typically consists of planning and screening studies. FEL-2 consists of feasibility studies and preliminary design. FEL-3 includes a complete system design with sufficient detail to enable a business decision to invest in the project. FEL-4 consists of project execution and procurement. This proposal requests funds to advance the project through FEL-3, sufficient to enable investment decisions for this innovative clean H₂ project. Project tasks developed to execute this work include the following:

- Project Management and Planning
- Engineering Design
- Permitting
- Cost Estimating

Anticipated Results: The project results will support CSEA's mission to develop and deploy large-scale commercial projects that reduce environmental impacts and increase the sustainability of energy production. The proposed LHH FEED study will provide the necessary information for the project sponsors to invest in commercial deployment of clean H₂ technologies. That investment and subsequent construction and operation would generate clean H₂ for use in multiple sectors and enable emerging H₂ use technology in North Dakota and the region.

In addition to the LHH FEED, an important result of this project will be the design of a novel, first-of-a-kind integration of commercial technologies. The proposed project will develop an optimized process that synergistically balances cost and carbon intensity.

Work products resulting from the proposed project will include business sensitive information needed to make investment decisions. Additionally, the project team will produce a final project report that can be shared with NDIC and the public. Project status reports will be provided to NDIC as defined in contract documents.

Facilities and Resources: The EERC has over 254,000 square feet of facilities for technology demonstration, process modeling, and project execution. For over 70 years, the EERC has conducted research, testing, and evaluation of fossil and renewable fuels, emission control technologies, and carbon capture and storage (CCS) technologies. The engineering and scientific research staff is equipped with state-of-the-art analytical, modeling, and engineering facilities to address a wide variety of energy,

environmental, and mineral resource research topics. The EERC is committed to providing all necessary personnel and resources to ensure the timely completion of all activities outlined in this proposal.

Marathon Petroleum Corporation (MPC) and its subsidiary MPLX owns and operates several facilities across the United States including a renewable diesel facility in Dickinson, North Dakota. MPLX has several hundred engineers who support projects throughout the United States. MPLX has extensive project development experience dedicated to large critical infrastructure projects and subject matter experts who will aid in the technical design of project assets including integrity, engineering, field services and planning, and operations.

TC Energy employs over 4,400 highly skilled engineers, developers, scientists, and project managers who have been transforming the energy landscape across North America, including the Bison and Northern Border Pipelines which stretch across North Dakota and connect with other interstate natural gas pipelines. TC Energy has significant pipeline, storage, and power assets that can be utilized to lower the cost and increase the speed of H₂ delivery. TC Energy's Power and Storage project managers provide a broad range of experience managing large, critical energy infrastructure projects. Additional strength is added to the project team from Wood Group USA, Black & Veatch (B&V), Sargent & Lundy (S&L), and ERM; recognized leaders in their fields, providing engineering design and consulting services across technical areas and geographies.

Techniques to Be Used, Their Availability and Capability:

The primary technique for data generation under this project will be to use recognized and best-available engineering practices and cost-estimating techniques for FEED-level efforts leading to the design of a novel, first-of-a-kind integration of commercial technologies. The proposed project partners and subcontractors each possess decades of experience in their respective fields. All project participants have committed the necessary resources to execute this project. These same industry experts have been a part of several engineering design projects for similar systems within North Dakota and around the world.

Environmental and Economic Impacts while Project Is Underway:

The proposed FEED study consists of engineering design and project planning. It will not result in any environmental impacts to the study area or partner facilities. Economic impacts during the FEED project will include jobs associated with performing the design and permitting work.

Ultimate Technological and Economic Impacts: The ultimate technological impacts will be realized following completion of the proposed FEED study and subsequent development of the LHH.

The LHH represents a significant economic development opportunity for North Dakota. With equipment, materials, and labor investment of more than \$500 million expected for construction in North Dakota alone, this project is projected to provide a significant boost in local wages and spending during both the construction process and throughout the life of operations. Projected economic impacts include:

- Over 600+ direct full-time jobs created during construction.
- 50–100 direct full-time jobs to facilitate long-term operation of the LHH facilities.
- Reduction of 700,000 tonnes per year of industrial CO₂ emissions.
- Millions annually in local tax revenue over the life of the project.

- Tens of millions of dollars in new economic activity in North Dakota, including construction and operations wages, landowner payments, and new local tax revenue, creating stable revenue to fund local schools and other taxing bodies.

Why the Project Is Needed: The proposed project is needed to catalyze meaningful investment in new, clean H₂ energy technology that can diversify North Dakota's economy, leverage and expand use of North Dakota's vast resources, and materially reduce the carbon intensity of the state's economy.

STANDARDS OF SUCCESS

Successful completion of the proposed FEED study will be measured primarily by the creation of a technically sound and holistic design package, including associated cost and schedule estimates for the LHH. The project team anticipates that the FEED documents generated over the course of this project will have sufficient detail to support investment decision(s). Accomplishment of this FEED and subsequent investments enables the commercial deployment of clean H₂ energy technology in North Dakota, resulting in economic and environmental benefits consistent with CSEA goals and enumerated in the previous section "Ultimate Technological and Economic Impacts."

BACKGROUND/QUALIFICATIONS

The EERC has led engineering design projects, including a retrofit pre-FEED study of a CCS system at Coal Creek Station, a retrofit pre-FEED study of a CCS system at Milton R. Young Station, and a FEED study of a CCS system for Red Trail Energy. In each of these projects, the EERC has managed multimillion-dollar contracts involving multiple engineering firms, industry partners, and public funding agencies. The EERC also has over 60 years of experience collaborating with industry and government on H₂ technology development and is recognized for its role in advancing commercial deployment of technologies for producing, purifying, and utilizing H₂ from coal, natural gas, and renewables.

MPLX is committed to North Dakota and has a proven track record of successfully executing major projects, which includes environmental, safety, and cost and schedule management. Specific North Dakota assets include petroleum refineries, renewable fuel manufacture, fuel transport terminals, gas and oil gathering pipelines, and gas processing plants.

TC Energy has over 70 years of experience and is a leader in the responsible development and reliable operation of North American energy infrastructure, including natural gas and oil pipelines, power generation, and gas storage facilities

Project Team: The EERC will serve as the lead organization for this project, with Brad Stevens, Senior Engineer as the overall project manager. Other key personnel from the EERC include Chad Wocken, Josh Strege, Kerryanne Leroux, Steven Schlasner, and John Harju (Project Advisor).

MPLX will be a project sponsor and will be responsible for co-leading engineering and design, permitting, and cost estimating activities. Key personnel from MPLX include Jacob Chenevey.

TC Energy will be a project sponsor for the proposed scope of work and will be responsible for co-leading engineering and design, permitting, and cost estimating. Key personnel from TC Energy include Andrew Isherwood, Ted McDavitt, Jim Pomillo, and Justin Gutknecht.

MANAGEMENT

The EERC will oversee all tasks, schedule regular internal and external meetings with project participants, and ensure that the project is conducted using acceptable scientific methodologies and practices in accordance with the project plan (budget, schedule, deliverables, and milestones) and is meeting quality objectives. The EERC will keep all partners informed of project progress, coordinate activities as necessary for the execution of a successful project and will be responsible for timely submission of all project deliverables and transfer of data and products to the project team.

Once the project is initiated, the project team will engage in weekly conference calls to review project status and future directions. Progress reports will be prepared and submitted to project sponsors for review. Regular meetings will be held with stakeholders to review the status and results of the project and discuss directions for future work. A broad team approach is key to successful execution of this project.

TIMETABLE

Project Schedule: The project consists of a 24-month duration and a projected start date of November 1, 2022.

BUDGET

The proposed budget is \$24,290,528; this includes \$10,000,000 from CSEA and \$14,290,528 cash from MPLX and TC Energy.

The LHH team has a strong track record of living up to its fiduciary duty to manage the capital of its stakeholders. The LHH's strategic advantage is the participation of two of the largest infrastructure companies operating in North Dakota and in North America. The capital barrier to entry into emerging technologies is significant, as demonstrated by the cost estimate above; however, it represents a massive investment on behalf of the proponents, over and above the proposed grant value. MPLX and TC Energy are dedicated to innovation and to bringing carbon reduction services to industry, but there is still significant risk involved in being a first mover. Government incentives such as the 45Q tax credit and CSEA partnership are imperative to commercializing these emerging technologies. CSEA's participation will solidify the commitment between all stakeholders to proceed through the FEED process.

TAX LIABILITY

The EERC, a department within the University of North Dakota, is a state-controlled institution of higher education and is not a taxable entity; therefore, it has no tax liability to North Dakota or any of its political subdivisions. The signed Tax Liability form is contained in Appendix J.

CONFIDENTIAL INFORMATION

This proposal contains confidential information. A confidential request form is provided in Appendix A. Additional confidential information is contained in Appendixes B, C, F, G, H, and I.

PATENTS/RIGHTS TO TECHNICAL DATA

Not applicable.

STATE PROGRAMS AND INCENTIVES (EERC)

The applicant has participated in several programs administered by NDIC, including the Lignite Research, Development and Marketing Program, the Oil and Gas Research Program, the State Energy Research Center, and the Renewable Energy Program. A complete list is provided in Appendix B.

