INDUSTRIAL COMMISSION OF NORTH DAKOTA

CLEAN SUSTAINABLE ENERGY AUTHORITY

Governor
Kelly Armstrong
Attorney General
Drew H. Wrigley
Agriculture Commissioner
Doug Goehring

Clean Sustainable Energy Authority Advisory Board
January 29, 2026 9:00 AM
Bank of North Dakota Room #238
1200 Memorial Highway, Bismarck, ND
Or Microsoft Teams
Join the meeting now
Or call in (audio only)
+1 701-328-0950,,963527793#

(approximately 9:00 am)
Call to Order and Determination of Quorum and Opening Comments – *Rep. Glenn Bosch and Sen. Dale Patten, Co-Chairs*

I. **Consideration of Meeting Minutes from the following meetings:**
   a. January 23, 2024 Grant Round 5 Meeting
   b. January 17, 2025 Meeting to discuss Rainbow Energy project loan
   c. August 4, 2025 Policy Meeting and Project Updates
   d. October 3, 2025 Meeting to discuss Minnkota's Project Tundra loan
   e. November 13, 2025 Meeting to discuss Cerilon's GTL project loan

(approximately 9:05 am)
II. Reports – *Jordan Kannianen*
   a. Project Management and Financial Reports
   b. Report on January 13th, 2026 CSEA Technical Committee Meeting

(approximately 9:20 am)
III. **Declaration/Consideration of Conflicts of Interest**

IV. Review of Grant Round 6 Applications
Each application will include a summary from the Industrial Commission followed by a presentation by the Applicant and CSEA board member questions

(approximately 9:25 am)
   a. C-06-C – ND Lithium-Ion Battery Manufacturing Plant; Submitted by Packet Digital, LLC; Total Project Costs: $100,827,845; Amount Requested: $2,297,376 grant,$18,842,659 loan

(approximately 10:10 am)
   b. C-06-D – The Forge Project; Submitted by AmeriCarbon Forge, LLC; Total Project Costs: $100,000,000; Amount Requested: $40,000,000 loan

Recess – 10 minutes

(approximately 11:05 am)
   c. C-06-E – The Forge Project: Rare Earths and Critical Materials Integration; Submitted by Ore Spring Materials, LLC; Total Project Costs: $4,500,000; Amount Requested:$2,250,000 grant

(approximately 11:50 am)

d. C-06-G – Commercial Deployment of Carbon Dioxide Capture, Transport, and Storage for Dakota Spirit AgEnergy; Submitted by Harvestone Low Carbon Partners; Total Project Costs: $94,513,473; Amount Requested: $20,000,000 loan

Lunch Recess –

(approximately 1:30 pm)
Return to Order

V. Project Report – Cerilon GTL Project

(approximately 2:00 pm)
Consideration of motion to enter Executive Session pursuant to N.D.C.C. 54-63.1-06 and 44-04-19.2

VI. Project Report – Cerilon GTL Project

VII. *Review of Confidential Application Attachments*

VIII. Report on Confidential Bank of North Dakota Information– *Courtney Heiser, Kelvin Hullet*

(approximately 4:00 pm)
Meeting Returns to Open Session

X. Consideration of Actions on Cerilon GTL Project

XI. Vote on funding recommendations for each application

XII. Other Business

XIII. Adjournment

***Bold items require Committee action.**

Minutes of a Meeting of the Clean Sustainable Energy Authority Advisory Board

held January 23rd, 2024, at 8:00 a.m.

Bank of North Dakota, 1200 Memorial Highway, Bismarck, ND

Present: Rep. Glenn Bosch, Chair
Sen. Dale Patten
Al Christianson
Chris Friez
Jim Arthaud
Joel Brown
Kathy Neset
Mac McLennan
Terry Goerger
Courtney Heiser
Reice Haase
Erin Stieg
Brenna Jessen

Also Present: Not all attendees are known, as this meeting was held through Microsoft Teams.

Rep. Glenn Bosch called the meeting of the Clean Sustainable Energy Authority (CSEA) Advisory Board meeting to order at 8:01 a.m.

Rep. Bosch stated a quorum was present.

Sen. Dale Patten said he appreciated the interest shown in the program, which has one of the most thorough vetting processes at the state level. Rep. Bosch said the Advisory Board is seeing some transformational projects, where the energy and ag industries come together for the benefit of all.

A motion was made by Ms. Kathy Neset and seconded by [inaudible] to approve the July 25, 2023, meeting minutes as presented. The motion carried unanimously.

Rep. Glenn Bosch asked the CSEA Advisory Board members to document any Declarations/Consideration of Conflict of Interest. Mr. Joel Brown noted North American Iron banks at First International Bank and Trust, where he works. He stated he is not involved in the relationship, and he does not view it as a conflict. Rep. Bosch agreed. Ms. Kathy Neset noted her team offers engineering support for the Dickinson renewable fuel facility. The committee did not view it as a conflict.

Mr. Reice Haase, Industrial Commission Deputy Executive Director, provided a CSEA project management and financial report. He gave an overview on the North Dakota Industrial Commission as a whole, as well as its grant programs and managed funds.

In relation to CSEA Funds, Haase's report detailed:

- 17 cumulative projects funded
- 14 active projects, including eight grant projects and six loan projects

- $38,785,992.37 cash balance, which includes $21,899,867.37 available for future commitments
- Funding sources included 25 million from the general fund (2021-2023 biennium), 30 million from the general fund (2023-2025 biennium) and 10 million federal ARPA (hydrogen)
- Cumulative value is $42.7 million granted, $392.5 million loaned, and $5.2 billion project value

Mr. Haase noted in the last Legislative session under House Bill No. 1546, in addition to CSEA funding, $125 million was received as a forgivable loan that CSEA is directed to use for fertilizer projects in the state of North Dakota.

Mr. Haase provided a list of active projects and asked if members have questions. Two projects have been completed, including Cerilon's "Gas-to-Liquids Plant" and Wellspring Hydro's "Produced Water Recycling." He also noted a highlight from a loan project balance, and the return on investment for the State of North Dakota has been more than $31 million in additional tax revenue back to the State because of the gas capture project they were able to complete with CSEA funding.

Mr. Haase also displayed a list of current grant and loan applicants.

Ms. Courtney Heiser with Bank of North Dakota provided this financial update. Seven loans have been committed from the fund so far, and three are in the repayment stage. There is $607,000 in cash on-hand, and $28.2 million is available for new funding.

Rep. Bosch stated if time permits, he might ask the Advisory Board to enter into Executive Session twice.

Mr. Haase provided a report on the Jan. 16, 2023, CSEA Technical Review Committee Meeting. He showed the results of the Technical Review Committee recommendations. All but one project was recommended as feasible; some projects were assigned "conditions." The Committee had a robust discussion on the infrastructure needs of each project including water. To summarize, there were no major concerns with water supply, but there may be some delays in getting water to the southwest area project due to an intake issue. There was also a report from the Pipeline Authority related to the availability of natural gas and infrastructure. There were no significant concerns. There was also a report from the Transmission Authority, and there were no significant concerns on power availability.

Mr. Shayden Akason from the Department of Commerce presented on the North Dakota Development Fund. It was established in the early 1990s. Since that time, they have accounted for more than 9,200 jobs and 892 projects funded. He stated the Development Fund is a flexible gap-financer that vets projects that can't attain funding and financing elsewhere.

- One Development Fund program they recently created is Advance ND, which awards "deal-closing" low-interest loans to companies considering a new industrial project in North Dakota. The Advisory Board did not have questions.
- Another Development Fund program Mr. Akason discussed is the Child Care Loan Program, which provides financial assistance to new and expanding child care providers. It offers two-percent interest on the loan, and in the last Legislative session, the funding limit was increased from $100,000 to $1 million. Mr. Akason expressed excited about the impact of that program. Ms. Kathy Neset asked how they measure return on investment. Mr. Akason said they take

into account a number of different factors including job creation and families served.

- Another Development Fund program Mr. Akason discussed is the Angel Match Program, which supports high-growth, early-stage primary sector North Dakota businesses by matching investor commitments of up to $250,000 per business. Ten investments have been made to-date.

The review of Grant Round Five applications began. Each application started with a review from the Industrial Commission, followed by a presentation from the applicant and then questions from the Committee.

C-05-A Clean H_2 and N-fertilizer Production Facility

- Applicant: Prairie Horizon Energy Solutions LLC
- Description: Installation of facilities capable of 73,000 tons/year (200 tons/day) of clean hydrogen via electrolysis, 419,750 tons/year (1,150 tons/day) of clean ammonia, and a urea production facility associated with the Heartland Hydrogen Hub; CO_2 reduction of 650,000 tons/year
- Category: Fertilizer
- $125,000,000 Loan Requested
- $2,200,000 Total Project Cost
- Other state programs and incentives include a $10,000,000 CSEA grant for Liberty H_2 Hub and a $65,000,000 request pending with the ND Development Fund
- Independent Technical Review Average Score: 210.75/315 (fair)
- Comments: It aligns with CSEA goals, offers economic opportunities for North Dakota, and the project has strong technical viability. Concerns included the cost to produce, regulatory and policy dependence, and the need to bid out manufacturing components.
- Technical Review Committee Score: 41.75/50
- Determination: Feasible With Conditions; metrics for determining "commercial viability" to be determined and approved later

C-05-B Spiritwood Fertilizer Project

- Applicant: NextEra Energy Resources Development LLC
- Description: Construction of production facility near Jamestown, ND, capable of 100,000 tons/year zero-carbon anhydrous ammonia through electrolysis of water; CO_2 reduction of 190,000 tons/year
- Category: Fertilizer
- $125,000,000 Loan Requested
- $1,293,000 Total Project Cost
- Other state programs and incentives include none in the last five years
- Independent Technical Review Average Score: 178.5/315 (questionable)
- Comments: This innovative technology aligns with CSEA goals and could lead to increased fertilizer production. Concerns include the cost to produce and scale-up the project, regulatory and policy dependence, and reliance on renewable energy
- Technical Review Committee Score: 39.13/50
- Determination: Feasible With Conditions; metrics for determining "commercial viability" to be determined and approved later

Rep. Bosch asked the Advisory Board if they wanted to enter into Executive Session to discuss confidential matters related to the first two projects or wait until all presentations are completed.

A motion was made by Mr. Chris Friez and seconded by Mr. Mac McLennan that under the authority of the N.D.C.C. 54-63.1-06 and 44-04-19.2.1 that the Clean Sustainable Authority Advisory Board enter into Executive Session for the purpose of considering Clean Sustainable Energy confidential information.

On a roll call vote Rep. Glenn Bosch, Sen. Dale Patten, Al Christianson, Chris Friez, Jim Arthaud, Joel Brown, Kathy Neset, Mac McLennan, and Terry Goerger voted aye. The motion carried unanimously.

Rep. Glenn Bosch stated that the Clean Sustainable Energy Authority Advisory Board is entering into Executive Session to discuss confidential information. He stated that only CSEA members and ND Industrial Commission staff will be present during Executive Session. Any formal action will be taken in Open Session. Sen. Patten reminded those present that the discussion must be limited to the announced purpose, which is projected to last approximately 45 minutes.

Executive Session began at 9:55 a.m.

The Meeting Closed to the Public for Executive Session Pursuant to NDCC 54-63.1-06 and 44-04-19.2.1.

CLEAN SUSTAINABLE ENERGY AUTHORITY ADVISORY BOARD EXECUTIVE SESSION

Present:
Rep. Glenn Bosch
Sen. Dale Patten
Al Christianson
Chris Friez
Jim Arthaud
Joel Brown
Kathy Neset
Mac McLennan
Terry Goerger
Courtney Heiser
Reice Haase
Erin Steig
Brenna Jessen

Executive Session concluded and Open Session resumed at 11:18 a.m.

Rep. Bosch recapped the discussion by noting there are two excellent fertilizer projects being proposed, and the Advisory Board had a robust discussion and had to make difficult decisions.

A motion was made by Mr. Mac McLennan to split the dollars, with $75 million going to Prairie Horizon Energy Solutions LLC and $50 million going to NextEra Energy Resources. Each applicant has 30 days to accept the offer of the funds and successful collusion of the loan convenance with the bank as it relates to final completion in terms of eligibility. If one participant chooses not to accept

the offer, the full $125 million would go to the other participant. Mr. Jim Arthaud seconded the motion.

On a roll call vote Rep. Glenn Bosch, Sen. Dale Patten, Al Christianson, Chris Friez, Jim Arthaud, Joel Brown, Kathy Neset, Mac McLennan, and Terry Goerger voted aye. The motion carried unanimously.

C-05-C <u>"Green" Pig Iron Production Facility</u>

- Applicant: Scranton Holding Company/North American Iron, Inc.
- Description: Construction of processing facility in ND capable of producing 2 million tons/year of near carbon-neutral pig iron; 0.1 ton CO_2/ton pig iron vs. 2.3 tons CO_2/ton traditional pig iron, over a 96% CO_2 reduction; CO_2 sequestration of 1.6 million tons/year
- Category: Low-carbon materials
- $12,000,000 Grant Funding Requested
- $2,000,000,000 Total Project Cost
- Other state programs and incentives include a request pending with the ND Development Fund for $3,000,000 equity investment.
- Independent Technical Review Average Score: 188/315 (questionable)
- Comments: The project is a significant economic opportunity for the state of North Dakota, as well as a technically sound proposal. Concerns included waste and permitting, if there is a need for waste disposal in North Dakota, and if there is a regulatory risk surrounding the waste disposal and permits needed. The Advisory Board would have liked to have seen firmer commitments.
- Technical Review Committee Score: 39.13/50
- Determination: Feasible With Conditions; need to clarify how project waste will be disposed of

C-05-D <u>Unlocking the Full Potential of Produced Water as a Key Component of Clean Sustainable Energy</u>

- Applicant: Wellspring Hydro
- Description: Continued engineering and design, as well as an "issue for purchase," to make downpayments on equipment for its proposed produced water recycling facility in Williams County
- Category: Produced Water Recycling
- $5,000,000 Grant Funding Requested
- 25,000,000 Loan Requested
- $324,730,000 Total Project Cost
- Other state programs and incentives include a $110,000 grant from the Renewable Energy Program; two promissory notes of $1,000,000 from the ND Development Fund, and CSEA grants for $6,000,000
- Independent Technical Review Average Score: 260/315 (good)
- Comments: This project is technically sound and presents a significant opportunity for reducing oilfield waste in North Dakota. Concerns included addressing naturally occurring radioactive materials and economics on producing from waste.
- Technical Review Committee Score: 36.25/50
- Determination: Feasible With Conditions; previous grant project (C-04-11) must be completed first before funding for this request is recommended

C-05-E <u>Blue Ammonia Facility</u>

- Applicant: Catalyst Midstream (USA) LLC
- Description: Construction of blue ammonia facility in Berthold, ND, capable of producing 1,080,000 tons/year; would use approximately 120,000 mcf gas/day; CO_2 sequestration of 2.5 million tons/year
- Category: Fertilizer
- $10,000,000 Grant Funding Requested
- $960,000,000 Total Project Cost
- Other state programs and incentives include a request pending loan application with the ND Development Fund for $27,500,000.
- Independent Technical Review Average Score: 266/315 (good)
- Comments: This project has a strong economic impact for our State, is in a great location, has solid engineering, and is technically sound. Concerns included the lower amount of private funding for the upfront feed work, reliance on Asian export markets, and a lack of information on long-term storage.
- Technical Review Committee Score: 38.88/50
- Determination: Feasible With Conditions; need to clarify if there is a firm commitment for rail transportation. Mr. Haase noted that he received communication with BNSF, and they indicated they are a carrier and there are no concerns with the transport of ammonia.

C-05-G <u>Marathon Petroleum Dickinson Renewable Fuel Facility Expansion</u>

- Applicant: EERC
- Description: Expansion of Dickinson renewable fuels refinery to add sustainable aviation fuel production; would reduce carbon-intensity of the facilities products by more than 20%
- Category: Low-Carbon Fuels
- $10,000,000 Grant Funding Requested
- $21,761,930 Total Project Cost
- Other state programs and incentives include a $100,000 Renewable Energy Program grant for a carbon capture project.
- Independent Technical Review Average Score: 259/315 (good)
- Comments: This project aligns with CSEA goals, has a strong market, interest in sustainable aviation fuel, and clear synergies with existing projects. Concerns include that it is unclear if feed stock for oils is ready to scale up for the facility, and what criteria must be met for the project to proceed past the feed study.
- Technical Review Committee Score: 41.86/50
- Determination: Feasible

C-05-H <u>Demonstration and Scale-Up of a Low-Cost, Long-Duration Energy Storage Technology for Lithium-Ion Batteries</u>

- Applicant: Dakota Lithium Materials
- Description: Construction of demonstration facility at UND for production of 1,000 tons/year of lithium iron phosphate materials; feedstock for lithium-ion batteries; 99% reduction in water use, 51% reduction in electric use, 51% reduction in CO_2 emissions
- Category: Low-Carbon Manufacturing
- $4,000,000 Grant Funding Requested
- $10,250,000 Total Project Cost
- Other state programs and incentives: none
- Independent Technical Review Average Score: 267/315 (good)

- Comments: This project has strength of product produced, a demonstrated track record of sponsors, and a technically sound proposal. Concerns included an aggressive timeframe and availability of out-of-state project management partner.
- Technical Review Committee Score: 37.57/50
- Determination: Feasible

C-05-I Grand Power North Dakota Battery Manufacturing Plant

- Applicant: Packet Digital
- Description: Construction of high-energy density lithium-ion battery manufacturing facility in Fargo, ND; 10x life cycle of currently available batteries; 2,000 batteries/day
- Category: Low-Carbon Manufacturing
- $10,000,000 Grant Funding Requested
- $17,355,992 Loan Requested
- $56,558,592 Total Project Cost
- Other state programs and incentives include $500,000 revolving working capital from the ND Development Fund, $999,999 equity investment (New Venture Fund) from the ND Development Fund, $200,000 interest-rate buydown from BND PACE, and $2,225,000 grants for five phases of work from the Renewable Energy Program.
- Independent Technical Review Average Score: 223/315 (good)
- Comments: This project offers great domestic opportunities with most batteries currently being imported, a demonstrated track record with battery technology, and strong partnerships. Concerns included that the proposal would have been stronger if it was focused on sourcing raw materials for the batteries in North Dakota, the availability of raw materials in the market, and if the data in the proposal justifies the large “ask”
- Technical Review Committee Score: 39.29/50
- Determination: Feasible

C-05-K Cerilon GTL

- Applicant: Cerilon
- Description: Continued front-end engineering and design of Trenton gas-to-liquids facility; conversion of 240,000-280,000 mcf natural gas/day into 24,000 bpd of base oils and synthetic lubricants with carbon capture up to 2 million tons per year
- Category: Value-Added Natural Gas Processing
- $20,000,000 Grant Funding Requested
- $80,000,000 Loan Requested
- $3,600,000,000 Total Project Cost
- Other state programs and incentives include a $40,000,000 loan and $7,000,000 grant with CSEA, and a $3,000,000 loan from the ND Development Fund. In addition, there is a $16,000,000 loan with Williams County and a $5,000,000 loan with McKenzie County.
- Independent Technical Review Average Score: 267/315 (good)
- Comments: The proposal is technically sound, has a strong team, and a large user of natural gas which is a strategic need for North Dakota. Concerns include a high reliance on state and local funding, and external forces could be the greatest threat with regulatory changes that could lead to challenges
- Technical Review Committee Score: 44.57/50
- Determination: Feasible

C-05-L <u>NDeV Flare Gas Mitigation Project</u>

- Applicant: ND Energy Ventures
- Description: Demonstration project for conversion of natural gas into carbon black and zero-carbon hydrogen using absolute pyrolysis technology; focused on the capture of gas that would have otherwise been flared; up to 5.7 millon tons/year of CO_2 emissions avoided
- Category: Natural Gas Capture
- $3,000,000 Grant Funding Requested
- $10,000,000 Loan Requested
- $30,000,000 Total Project Cost
- Other state programs and incentives: none within the last five years
- Independent Technical Review Average Score: 157/315 (questionable)
- Comments: The project could present an opportunity to address flaring and the flare-gas conversion process. Concerns include a lack of information on other financial support, and there is a need for a large volume of gas, and if there are enough wells to meet the need. The Advisory Board would have liked to see a firm commitment from oil and gas producers related to the project.
- Technical Review Committee Score: 29.57/50
- Determination: Not Feasible

Rep. Glenn Bosch asked for a motion to be made to enter into Executive Session to discuss confidential information.

A motion was made by Mr. (inaudible) and seconded by Mr. Terry Goerger that under the authority of the N.D.C.C. 54-63.1-06 and 44-04-19.2.1 that the Clean Sustainable Authority Advisory Board enter into Executive Session for the purpose of considering Clean Sustainable Energy confidential information.

On a roll call vote Rep. Glenn Bosch, Sen. Dale Patten, Al Christianson, Chris Friez, Jim Arthaud, Joel Brown, Kathy Neset, Mac McLennan, and Terry Goerger voted aye. The motion carried unanimously.

Rep. Glenn Bosch stated that the Clean Sustainable Energy Authority Advisory Board is entering into Executive Session to discuss confidential information. He stated that only CSEA members and ND Industrial Commission staff will be present during Executive Session. Any formal action will be taken in Open Session. Sen. Patten reminded those present that the discussion must be limited to the announced purpose, which is projected to last approximately 1 hour.

Executive Session began at 3:50 p.m.

The Meeting Closed to the Public for Executive Session Pursuant to NDCC 54-63.1-06 and 44-04-19.2.1.

CLEAN SUSTAINABLE ENERGY AUTHORITY ADVISORY BOARD EXECUTIVE SESSION

Present:
Rep. Glenn Bosch
Sen. Dale Patten
Al Christianson
Chris Friez

Jim Arthaud
Joel Brown
Kathy Neset
Mac McLennan
Terry Goerger
Courtney Heiser
Reice Haase
Erin Steig
Brenna Jessen

Executive Session concluded and Open Session resumed at 5:11 p.m.

Rep. Glenn Bosch stated it was time to vote on funding recommendations for each applicant.

Voting results are as follows:

C-05-C:

A motion was made by Ms. Kathy Nesset and seconded by Mr. Chris Friez to recommend funding a $7,000,000 grant for the "Green" Pig Iron Production Facility. No discussion was offered.

On a roll call vote Rep. Glenn Bosch, Sen. Dale Patten, Al Christianson, Chris Friez, Jim Arthaud, Joel Brown, Kathy Neset, Mac McLennan, and Terry Goerger voted aye. The motion carried unanimously.

C-05-D:

A motion was made by Mr. Joel Brown and seconded by Mr. Terry Georger to recommend funding in the amount of $2.5 million loan for the Unlocking the Full Potential of Produced Water. Discussion included Sen. Dale Patten noting this was an exception to the CSEA policy of the $10 million minimum. A committee member stated he thought the project was worthy of merit and funding in the past; they want to continue supporting the project and note it's the third time the grantee has come back and asked for support. This is the reason the amount awarded is significantly less than what was requested.

On a roll call vote Rep. Glenn Bosch, Sen. Dale Patten, Al Christianson, Chris Friez, Jim Arthaud, Joel Brown, Kathy Neset, Mac McLennan, and Terry Goerger voted aye. The motion carried unanimously.

C-05-E:

A motion was made by Ms. Kathy Nesset and seconded by Mr. Jim Arthaud not to fund the Blue Ammonia Facility. Discussion included it is a worthy project but it's too early in the work the grantee is doing. The Advisory Board would like to see more planning done in the funding model.

On a roll call vote Rep. Glenn Bosch, Sen. Dale Patten, Al Christianson, Chris Friez, Jim Arthaud, Joel Brown, Kathy Neset, Mac McLennan, and Terry Goerger voted aye. The motion carried unanimously.

C-05-G:

A motion was made by Mr. (inaudible) and seconded by Mr. Al Christianson to recommend funding a $3.3 million grant for the Dickinson Renewable Fuel Facility Expansion. No discussion was offered.

On a roll call vote Rep. Glenn Bosch, Sen. Dale Patten, Al Christianson, Chris Friez, Jim Arthaud, Joel Brown, Kathy Neset, Mac McLennan, and Terry Goerger voted aye. The motion carried unanimously.

C-05-H:

A motion was made by Mr. Chris Friez and seconded by Mr. Mac McLennan to recommend funding a $2 million grant for Energy Storage Technology for Lithium-Ion Batteries. Discussion included Mr. Friez said this project helps solve a significant problem of reliance on foreign supply and provides CSEA funding to an area we haven't funded before.

On a roll call vote Rep. Glenn Bosch, Sen. Dale Patten, Al Christianson, Chris Friez, Jim Arthaud, Joel Brown, Kathy Neset, Mac McLennan, and Terry Goerger voted aye. The motion carried unanimously.

C-05-I:

A motion was made by Mr. Al Christianson and seconded by Mr. Chris Friez to recommend funding a $17 million loan and $0 in a grant for Grand Power North Dakota Battery Manufacturing Plant. No discussion was offered.

On a roll call vote Rep. Glenn Bosch, Sen. Dale Patten, Al Christianson, Chris Friez, Jim Arthaud, Joel Brown, Kathy Neset, Mac McLennan, and Terry Goerger voted aye. The motion carried unanimously.

C-05-K:

A motion was made by Mr. (inaudible) and seconded by Mr. Joel Brown to recommend funding a $9.5 million grant and an $8.5 million loan to Cerilon GTL with the caveat that the funds need to be matched by private funds. Discussion included Sen. Dale Patten noting the loan amount is a policy exception.

On a roll call vote Rep. Glenn Bosch, Sen. Dale Patten, Al Christianson, Chris Friez, Jim Arthaud, Joel Brown, Kathy Neset, Mac McLennan, and Terry Goerger voted aye. The motion carried unanimously.

C-05-L:

A motion was made by Mr. (inaudible) and seconded by Mr. (inaudible) to recommend not funding either a loan or grant for the NDeV Flare Gas Mitigation Project. Discussion focused on the recommendation of the Technical Review Committee, who did not believe the project was technically feasible.

On a roll call vote Rep. Glenn Bosch, Sen. Dale Patten, Al Christianson, Chris Friez, Jim Arthaud, Joel Brown, Kathy Neset, Mac McLennan, and Terry Goerger voted aye. The motion carried unanimously.

Mr. Jim Arthaud asked if the applicants were aware of how much was available in the form of loans and grants. Rep. Glenn Bosch said yes.

Sen. Dale Patten thanked the Technical Review committee and the CSEA Advisory Board. He said it was a difficult process, with tremendous projects and hard decisions. He said he appreciates what has been done during the meetings, and that he is proud of the thoroughness and integrity offered to the program, and the depth they go into. He said they have the ability to make a difference, and that the work is warranted for continued funding. He also thanked the staff at Bank of North Dakota and the Industrial Commission for preparing for the meetings. Rep. Glenn Bosch agreed.

Other Business

- None

With no further business, Rep. Bosch adjourned the meeting.

Rep. Glenn Bosch, Co-Chairman

Sen. Dale Patten, Co-Chairman

Minutes of a Meeting of the Industrial Commission of North Dakota
CLEAN SUSTAINABLE ENERGY AUTHORITY

Held January 17, 2025, beginning at 3:00 p.m.
via TEAMS

Voting Members Present

- Co-Chairman Sen. Dale Patten
- Co-Chairman Rep. Glenn Bosch
- Christopher Friez
- Kathy Neset
- Terry Goerger

Non-Voting Members Present

- Don Morgan

Also present: NDIC staff Jordan Kannianen and Erin Steig; BND staff Kelvin Hullet and Courtney Heiser; Chris Faul; Tyler Hamman; Stacy Tschider

Co-Chairman Senator Dale Patten called the special meeting of the Clean Sustainable Energy Authority (CSEA) to order at 3:00 p.m.

Roll call was taken. A quorum was present.

Stacy Tschider of Rainbow Energy gave an update on their project "Lignite Combustion Product Enhancements", with which they have a CSEA loan.

Mr. Tschider presented a modification to their project that lowered the total project cost of $85 million, thus reducing the needed loan amount. Rainbow Energy is choosing not to take the FGD material to market at this time, reducing project and business costs.

Rainbow Energy's bottom ash project is fully prepared for construction and is shovel-ready. The targeted commercial operation date is Q1 2027.

A motion was made by Rep. Glenn Bosch and seconded by Terry Goerger to reduce the loan amount for Rainbow Energy from $42.5 million to $30 million for their project "Lignite Combustion Product Enhancements".

Roll call vote passed unanimously, 5-0.

Jordan Kannianen gave a portfolio update on the projects that have received grant awards from CSEA.

Kelvin Hullet gave a portfolio update on loans on CSEA projects.

With no further business, Sen. Dale Patten adjourned the meeting at 3:53 p.m.

Senator Dale Patten, Co-Chair	Representative Glenn Bosch, Co-Chair

Minutes of a Meeting of the Industrial Commission of North Dakota

CLEAN SUSTAINABLE ENERGY AUTHORITY

Held Aug. 4, 2025, beginning at 2 p.m.

Held at the Bank of North Dakota and on TEAMS

Voting Members Present

- Co-Chairman Sen. Dale Patten
- Co-Chairman Rep. Glenn Bosch
- Christopher Friez
- Jim Arthaud (online)
- Joel Brown (online)
- Kathy Neset
- Terry Goerger (online)

Non-Voting Members Present

- Dave Glatt
- Justin Kringstad
- Rich Garman
- Tom Erickson (online)
- Claire Vigesaa
- Don Morgan
- Nathan Anderson
- Reice Haase

Also present were Kelvin Hullet, Courtney Heiser, Jordan Kannianen, Erin Stieg, and Brenna Jessen (online). Not all attendees are known, as this meeting was also held on Microsoft TEAMS.

Co-Chairman Sen. Dale Patten called the special meeting of the Clean Sustainable Energy Authority (CSEA) to order at 2 p.m.

Ms. Erin Stieg took roll call. A quorum was present.

Sen. Dale Patten invited Mr. Jordan Kannianen to discuss CSEA policy updates. Mr. Kannianen gave an overview of the Century Code in relation to CSEA and proposed changes to section **1.03 Membership**. The number of voting and non-voting members must match what is presented in the Century Code in the program guidelines. Proposed changes reflect the number of members, and that one member of the Senate and one member of the House of Representatives shall serve as Committee Co-Chairs. Discussion was held.

Ms. Courtney Heiser discussed proposed changes to section **2.03 Projects Eligible for a CSEA Loan**, which relate to the Bank of North Dakota's (BND) review of loans. BND is tasked with reviewing every CSEA grant and loan application. The changes propose criteria that will help evaluate and dismiss projects that are in too early of a stage (a feasibility study or feed stage) to qualify for a loan. This reduces the number of projects presented in any given grant round and gives the Board more time to review projects that have a better chance of succeeding and being, "shovel ready." This would allow BND to revolve the loan funds faster so they can make new loans and support additional projects. Discussion was held.

Mr. Kannianen proposed changes to section **4.01 Application Format**. This change would remove the requirement of the grantee to submit two paper copies of the application to the North Dakota Industrial Commission. Discussion was requested.

Mr. Kannianen proposed changes to section **4.02 Application Deadline**. This change would eliminate scheduled meeting dates and provide flexibility on when grant rounds can be held. Discussion was held.

Ms. Heiser discussed proposed changes to section **5.05 Application Review – Authority Recommendation and Commission Decision**. When CSEA applications are received, the projects are scored by a Technical Review Committee. The scores reflect the strength of the projects. Ms. Heiser said the proposed change to this section includes the addition of this line: "If an application scores less than a total of 35 points on the 50-point scoring scale, it will not advance to be presented before the Authority." This scoring standard ensures that only strong projects are moved forward for presentation and consideration. Discussion was held.

Ms. Heiser discussed proposed changes to **Approval Dates**. Discussion was held.

Sen. Patten provided an update on Project Tundra, a $250 million program for CO_2 capture from Minnota Power Cooperative. The Legislature approved these funds specific to Project Tundra. If the funds are not used, they will expire and must be reauthorized by the Legislature in a future session. The funds are not available to CSEA to reallocate without Legislative action.

Sen. Patten discussed “priority access” and the mission of CSEA. He noted that as a state, North Dakota places a high emphasis on accessing and utilizing natural gas resources. Oil production is somewhat dependent upon the ability to manage the gas (capturing and using it). As the Advisory Board reflects on the CSEA mission, should it consider prioritizing projects that are close to commercialization, compliment other commitments that were made Legislatively, and reflect our state’s value-added resources. Ms. Heiser asked if language should be added to policy, or if applicants should be told priority will be given to projects that utilize natural gas. Discussion was held.

Sen. Patten asked Ms. Heiser to discuss some calls she regularly receives related to CSEA loans. Some are placed by current grantees who were seeking more money, and others inquire about new projects.

Sen. Patten asked for a motion to approve the proposed policy changes to the Century Code for the CSEA loan and grant program.

A motion was made by Ms. Kathy Neset and seconded by Mr. Chris Friez to accept the policy changes as presented.

On a roll call vote Rep. Glenn Bosch, Sen. Dale Patten, Chris Friez, Jim Arthaud, Joel Brown, Kathy Neset, and Terry Goerger voted aye. The motion passed unanimously.

Sen. Patten opened the discussion on portfolio updates, starting with the North Dakota Industrial Commission. Mr. Kannianen gave a high-level overview of the CSEA grant program, noting there would not be additional funding for the 2025-2027 biennium. The cash balance is $27,867,411.45. Outstanding commitments/expenses total $24,226,618.10. Uncommitted cash available is $3,640,793.35. To date, there are 20 cumulative projects totaling $74.5 million in grant awards. About $15.4 million has been returned or withdrawn and $545.5 million has been loaned. The project value is $6.2 billion.

Mr. Kannianen gave an update on the following CSEA projects:

1. Great Plains Hydrogen Hub experienced challenges, and a portion of the grant, and the entire loan, was decommitted.
2. Cerilon’s first GTL grant award has been completed and paid.
3. Wellspring Hydro’s first Produced-Water grant award has been completed and paid.
4. Midwest Ag Energy’s Blue Flint’s grant award has been completed and paid.
5. EERC’s Coal Creek carbon capture project has been completed and paid.

6. Enerplus was awarded a $1 million grant, and then the company was purchased by Chord. The contract was not signed. Chord will need to reapply if they are interested in pursuing the grant.
7. EERC's Liberty H2 Hub's experienced challenges and they chose to halt spending. NDIC received a returned commitment of more than $6.8 million.
8. Newlight's Project Phoenix grant award has been completed and paid.
9. Enerplus's geothermal power grant has a remaining commitment. The pilot project has been installed on a well pad. With new leadership under Chord, they may request a project extension.
10. Bushel's Farm Traceability Dashboard is making progress. The Final Report is due in December 2026.
11. Wellspring Hydro's Produced-Water 2 grant has a remaining commitment. The Final Report is due in December 2025.
12. Scranton Metals "Green" Pig Iron project is making progress with mineral testing and regulatory tasks. The Final Report is due in October 2025.
13. EERC's Marathon Renewable Fuels had a sponsor pull out due to market changes, and the award was decommitted.
14. Dakota Lithium's battery manufacturing project is experiencing favorable material testing. The Final Report is due in May 2027.
15. Cerilon has not submitted status reports for its second GTL loan and grant project. The Final Report is due in July 2026. Sen. Patten stated there would be an update on the loan side.

Sen. Patten asked for a motion to approve the decommission of the Enerplus grant that did not have a signed contract prior to the company merger with Chord.

A motion was made by Mr. Jim Arthaud and seconded by Ms. Kathy Neset to decommission the Enerplus grant.

On a roll call vote Rep. Glenn Bosch, Sen. Dale Patten, Chris Friez, Jim Arthaud, Joel Brown, Kathy Neset, and Terry Goerger voted aye. The motion passed unanimously.

Sen. Patten asked for a portfolio update from the Bank of North Dakota in relation to CSEA loans. Ms. Heiser provided one. Her report included the loan status of the following companies:

1. Valence Natural Gas Solutions, one loan is in P&I payments
2. Cerilon GTL, two loans are in the draw period and making interest-only payments as agreed
3. HLCP Prodco, one loan is making interest-only payments as agreed

4. Project Tundra, two loans with a commitment expiration of 12/31/2025
5. Newlight Technologies, one loan with a commitment expiration of 12/31/2025
6. Rainbow Energy Center, one loan is in a draw period and making interest-only payments as agreed
7. Wellspring Hydro, one loan with plans to draw funds in the Fall of 2025

The principal payments and interest payments total is $6,367,376.10. The total available for commitments is $20,000,000.00.

Sen. Patten called for an update on Packet Digital. Ms. Terri Zimmerman, CEO of Packet Digital, gave a presentation on the batteries they produce for autonomous systems. Some of their customers are branches of the military, NASA, Amazon, Uber, Intel, and John Deere. Their manufacturing and assembly facility opened in December 2023. She stated 95 percent of drone batters are manufactured in China, which is a huge issue for national security. Packet Digital has started production on a battery cell plant in Fargo, North Dakota. Ms. Zimmerman discussed the supply chain and stated that Packet Digital should be in a good position to supply batteries to the U.S. Department of Defense.

Sen. Patten called for an update on Wellspring Hydro. Wellspring Hydro employees Mr. Mark Watson, CEO, and COO Mat Hirst, and LibertyStream (formerly Volt) employee Alex Wylie, President and CEO, gave a presentation on lithium production opportunities in North Dakota and the work they are doing in Texas. They are leveraging support in North Dakota to enable an expansion.

Rep. Glenn Bosch requested a motion to enter into Executive Session to discuss confidential business related to Wellspring Hydro.

A motion was made by (inaudible) and seconded by Mr. Chris Friez that under the authority of the N.D.C.C. 54-63.1-06 and 44-04-19.2.1 that the Clean Sustainable Authority Advisory Board enter into Executive Session for the purpose of considering Clean Sustainable Energy confidential information.

On a roll call vote Rep. Glenn Bosch, Sen. Dale Patten, Chris Friez, Jim Arthaud, Joel Brown, Kathy Neset, and Terry Goerger voted aye. The motion passed unanimously.

Sen. Patten stated that the Clean Sustainable Energy Authority Advisory Board is entering into Executive Session to discuss confidential information. He stated that only CSEA members and ND Industrial Commission staff will be present during Executive Session. Any formal action will be taken in Open Session. Sen. Patten reminded those present that the discussion must be limited to the announced purpose, which is projected to last approximately 20 minutes.

Executive Session began at 4:09 p.m.

The Meeting Closed to the Public for Executive Session Pursuant to NDCC 54-63.1-06 and 44-04-19.2.1.

CLEAN SUSTAINABLE ENERGY AUTHORITY ADVISORY BOARD EXECUTIVE SESSION

Present:
Co-Chairman Sen. Dale Patten
Co-Chairman Rep. Glenn Bosch
Christopher Friez
Jim Arthaud (online)
Joel Brown (online)
Kathy Neset
Terry Goerger (online)
Non-Voting Members Present
Dave Glatt
Justin Kringstad
Rich Garman
Tom Erickson (online)
Claire Vigesaa
Don Morgan
Nathan Anderson
Reice Haase
Kelvin Hullet
Courtney Heiser
Jordan Kannianen
Erin Stieg
Brenna Jessen (online)

Executive Session concluded and Open Session resumed at 4:41 p.m.

Sen. Patten requested a motion, following consideration of the confidential information presented in Executive Session.

A motion was made by (inaudible) for CSEA to approve the funding request by Wellspring Hydro, allowing the Bank of North Dakota and the North Dakota Industrial Commission to include the timing of equipment being moved to North Dakota, and a claw-back of funds if the timing is not met. Ms. Kathy Neset seconded the motion.

On a roll call vote Rep. Glenn Bosch, Sen. Dale Patten, Chris Friez, Jim Arthaud, Joel Brown, Kathy Neset, and Terry Goerger voted aye. The motion passed unanimously.

Sen. Patten noted Al Christianson passed away. Christianson served on the CSEA Advisory Board, and his position, filled by the North Dakota Renewable Council, needs to be replaced. Mr. Kannianen said the seat vacancy was discussed at the last Renewable Energy Program meeting. The seat will be filled at the next meeting, which will be held in October 2025. Sen. Patten suggested they start recruiting now, to find a person who is knowledgeable and interested in serving.

Sen. Patten noted there is $4.6 million worth of CSEA grant funding and $20 million in loan funding available. He asked for a Board to decide if they should schedule a sixth grant round. Discussion was held. It was decided to hold another grant round that will be scheduled after the Industrial Commission's January 2026 meeting.

With no further business, Sen. Dale Patten adjourned the meeting.

______________________________	______________________________
Senator Dale Patten, Co-Chair	Representative Glenn Bosch, Co-Chair

Minutes of a Meeting of the Industrial Commission of North Dakota
CLEAN SUSTAINABLE ENERGY AUTHORITY

Held Oct. 3, 2025, beginning at 9 a.m.
via Zoom

Voting Members Present

- Co-Chairman Sen. Dale Patten
- Co-Chairman Rep. Glenn Bosch
- Christopher Friez
- Kathy Neset
- Terry Goerger

Non-Voting Members Present

- Kelvin Hullet (for Don Morgan)
- Nathan Anderson
- Dave Glatt
- Rachel Retterath
- Justin Kringstad
- Claire Vigesaa
- Tom Erickson
- Duane Poole (for Reice Haase)
- Rich Garman

Also present: NDIC Deputy Director Jordan Kannianen, NDIC Grant Program Specialist Carmen Devney, and BND Business Banker Courtney Heiser.

A quorum was present.

Co-Chairman Sen. Dale Patten called the special meeting of the Clean Sustainable Energy Authority to order at 9 a.m.

Mr. Jordan Kannianen took roll call.

The Committee held a discussion regarding a request from Minnkota Power Cooperative on Project Tundra, which holds a loan with the U.S. Department of Energy for $350 million. The

Clean Sustainable Energy Authority Committee had issued a letter of commitment for $250 million to support the project. The letter is set to expire on Dec. 31, 2025.

Mr. Kelvin Hullet reported Project Tundra is on hold with the U.S. Administration and U.S. Department of Energy. Minnkota Power Cooperative is evaluating alternatives to determine a path forward and investment decision by the first quarter of 2026. Minnkota Power Cooperative has requested an extension of the commitment letter to March 31, 2026, with the intention of providing an update at the January Clean Sustainable Energy Authority Committee meeting.

Co-Chairman Sen. Dale Patten requested a motion to extend the commitment letter deadline to March 31, 2026, with final approval contingent upon modifications that may be requested to the original proposal at the January Clean Sustainable Energy Authority Committee meeting. It was moved by Kathy Neset and seconded by Terry Goerger to move the motion forward.

In a roll call vote among voting members, the motion carried unanimously.

Co-Chairman Sen. Dale Patten noted a vacancy on the Clean Sustainable Energy Authority Advisory Board. Mr. Jordan Kannianen stated the Board will discuss.

Mr. Kelvin Hullet reported he received a press release regarding an offtake agreement between Cerilon GTL ND Inc. and Pembina Midstream, regarding naphtha for a gas-to-liquids project in Williams County, North Dakota. He will share it with the Committee.

A Technical Review Committee meeting is scheduled for Jan. 13, 2026, at the Bank of North Dakota. The next Clean Sustainable Energy Authority Committee meeting is scheduled for Jan. 20, 2026, at the Bank of North Dakota.

Co-Chairman Sen. Dale Patten noted the grant and loan applications deadline is Oct. 15, 2025. Mr. Jordan Kannianen stated that while none have been received, he is expecting applications.

With no further business, Co-Chairman Sen. Dale Patten adjourned the meeting at 9:10 a.m.

______________________________ ______________________________

Senator Dale Patten, Co-Chair Representative Glenn Bosch, Co-Chair

Minutes of a Meeting of the Industrial Commission of North Dakota
CLEAN SUSTAINABLE ENERGY AUTHORITY

Held Nov. 13, 2025, beginning at 3:30 p.m.
via TEAMS

Voting Members Present

- Co-Chairman Sen. Dale Patten
- Co-Chairman Rep. Glenn Bosch
- Christopher Friez
- Kathy Neset
- Jim Arthaud
- Rachel Retterath

Non-Voting Members Present

- Don Morgan and Kelvin Hullet
- Nathan Anderson
- Claire Vigesaa
- Tom Erickson
- Tom Oakland (for Rich Garman)

Also present: NDIC Deputy Director Jordan Kannianen, NDIC Grant Program Specialist Carmen Devney, Grants Officer and Fiscal Manager Brenna Jessen, Jason Ehlert, Jeff Beach, and Joseph Harris.

A quorum was present.

Co-Chairman Rep. Glenn Bosch called the special meeting of the Clean Sustainable Energy Authority (CSEA) to order at 3:30 p.m.

Ms. Carmen Devney took roll call.

The Committee held a discussion regarding a request from Cerilon to extend a loan.

Kelvin Hullet provided an update on the development of Cerilon's gas-to-liquid plant in western North Dakota. The project's loan draw period was slated to expire on 11/12/25. Cerilon requested an extension through 3/31/26.

Discussion was held. Sen. Dale Patten said it is not unusual for requests for extensions to be made close to the deadline. Rep. Glenn Bosch said the report Cerilon provided was thorough and positive.

Mr. Hullet stated the recommendation from staff is to grant the extension through 3/31/26, with the requirement that Cerilon would come to the January CSEA Board meeting and provide an update. The extension would also apply to the corresponding CSEA grant, so the loan and grant would have matching funds available through 3/31/26.

Co-Chairman Sen. Dale Patten made a motion to grant an extension to the Cerilon project until 3/31/26, with the provision that they provide a full update at the January CSEA Board meeting. It was seconded by Christopher Friez to move the motion forward.

In a roll call vote among voting members, the motion carried unanimously.

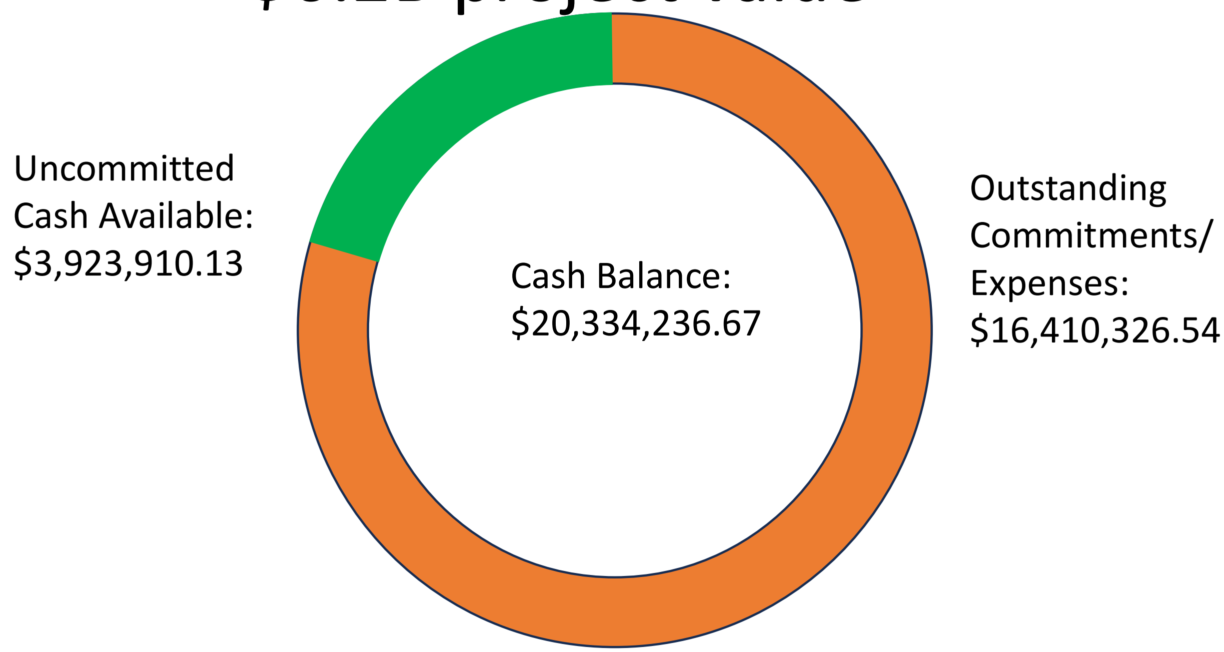
With no further business, Sen. Dale Patten adjourned the meeting at 3:39 p.m.

Senator Dale Patten, Co-Chair

Representative Glenn Bosch, Co-Chair

Current Status

20 Cumulative Projects
$74.5M in total grant awards
$15.4M in returned or withdrawn
$545.5M loaned
$6.2B project value



CSEA 2025-2027 Biennium Report

Clean Sustainable Energy Authority
Project Management Update (January 2026)

Contract Number	Project	Project Sponsor	Status	Original Grant Award	Total Spend To Date	Remaining Grant Commitment	Total Project Costs	Projected End Date
C-03-09	Enerplus Geothermal Power	Chord	Were expected to make progress in 2025, but no Status Reports were received.	$ 1,098,500	$ 150,251.00	$ 948,249.00	$ 2,197,000	7/1/2026
C-04-10	Farm Traceability Dashboard	Bushel	Progress towards software development.	$ 3,500,000	$ 968,343.76	$ 2,531,656.24	$ 12,265,250	12/31/2026
C-04-11	Produced Water 2	Wellspring Hydro	Refining unit in Texas.	$ 5,000,000	$ 3,285,282.83	$ 1,714,717.17	$ 250,000,000	12/31/2026
C-05-12	Green Pig Iron	Scranton Metals	Received final report last week.	$ 7,000,000	$ 7,000,000.00	$ -	$ 27,000,000	12/31/2025
C-05-14	Lithium Battery Manufacturing	Dakota Lithium	Construction ongoing.	$ 2,000,000	$ 584,295.87	$ 1,415,704.13	$ 10,250,000	3/31/2028
C-05-15	GTL FEL-3	Cerilon	No Status Reports received.	$ 9,500,000	$ -	$ 9,500,000.00	$ 3,600,000,000	3/31/2026

Total Remaining Commitment: $ 16,110,326.54

Project #	Project Title	Applicant	Project Decription	Grant Request	Loan Request	Project Total	Tech. Review Avg. Score (of 315)	Tech. Comm. Score
C-06-A	Hybrid Service Rig	Foremost Well Service	Kremco 600 rig. Demonstrate 24/7 operation with major reductions in diesel consumption, emissions, and fuel costs. Establish a replicable retrofit model.	$1,500,000	$0	$3,000,000	213	30.6
C-06-B	Lithium for Clean Energy Delivery: Demonstration from Produced Water	Sustainable Projects Group Inc. - SPGX	Lithium extraction from oil & gas produced water. Construction of a demonstration facility. 408-ton lithium carbonate equialent (LCE)/year facility.	$9,523,919	$0	$19,047,839	271.5	34.0
C-06-C	Packet Digital - ND Lithium-Ion Battery Manufacturing Plant	Packet Digital, LLC	Continue now-under-way construction of 80,000 sq ft lithium-ion battery cell manufacturing and research facility in Fargo. Will produce high-power and high-energy-density pouch cells for defense and aerospace systems.	$2,297,376	$18,842,659	$100,827,845	303	38.9
C-06-D	The Forge Project	AmeriCarbon Forge, LLC	Construction of first US commercial-scale facility near Underwood producing Eco-Pitch, a coal-tar-pitch from ND lignite, along with carbon byproducts. 15k tons of Eco-Pitch & 15k tons carbon byproducts annually.	$0	$40,000,000	$100,000,000	268.5	38.5

C-06-E	The Forge Project: Rare Earths and Critical Materials Integration	Ore Spring Materials, LLC	Integrate Eco-Pitch carbon manufacturing with REE and CM recovery technologies. Establish a scalable, co-located platform at Forge site near Underwood.	$2,250,000	$0	$4,500,000	252	36.8
C-06-F	Northern Plains Nitrogen (nitrogen-based fertilizer plant)	Northern Plains Nitrogen, Inc.	Construct nitrogen-based fertilizer plant west of Grand Forks which would produce up to 1.1 million short tons of urea and 65,000 short tons anhydrous ammonia. Use Bakken natural gas as feedstock via Viking pipeline.	$20,000,000	$0	$2,200,000,000	241	34.5
C-06-G	Commercial Deployment of Carbon Dioxide Capture, Transport, and Storage for Dakota Spirit AgEnergy	Harvestone Low Carbon Partners	Capture and liquify CO2 emissions from Dakota Spirit AgEnergy ethanol facility, transport to Blue Flint Sequester facility in Underwood, and permanently sequester in Class VI storage well. 250,000 metric tons/year.	$0	$20,000,000	$94,513,473	283.5	37.6
C-06-H	AirPlant Two: Flagship Synthetic Aviation Fuel Facility	Twelve Benefit Corporation	Co-locate synthetic aviation fuel plant near industrial CO2 source in eastern ND, utilizing waste CO2 to produce fuels and chemicals.	$10,000,000	$0	$152,000,000	216	33.3
			Totals	$45,571,295	$78,842,659	$2,673,889,157		
			Available Funding	$3,923,000	$50,000,000			

Project #	Project Title	Applicant	Project Decription	Grant Request	Loan Request	Project Total	Tech. Review Avg. Score (of 315)	Tech. Comm. Score
C-06-C	Packet Digital - ND Lithium-Ion Battery Manufacturing Plant	Packet Digital, LLC	Continue now-under-way construction of 80,000 sq ft lithium-ion battery cell manufacturing and research facility in Fargo. Will produce high-power and high-energy-density	$2,297,376	$18,842,659	$100,827,845	303	38.9
C-06-D	The Forge Project	AmeriCarbon Forge, LLC	Construction of first US commercial-scale facility near Underwood producing Eco-Pitch, a coal-tar-pitch from ND lignite, along with carbon byproducts. 15k tons of Eco-Pitch & 15k tons	$0	$40,000,000	$100,000,000	268.5	38.5
C-06-E	The Forge Project: Rare Earths and Critical Materials Integration	Ore Spring Materials, LLC	Integrate Eco-Pitch carbon manufacturing with REE and CM recovery technologies. Establish a scalable, co-located platform at	$2,250,000	$0	$4,500,000	252	36.8
C-06-G	Commercial Deployment of Carbon Dioxide Capture, Transport, and Storage for Dakota Spirit	Harvestone Low Carbon Partners	Capture and liquify CO2 emissions from Dakota Spirit AgEnergy ethanol facility, transport to Blue Flint Sequester facility in Underwood, and permanently sequester in Class	$0	$20,000,000	$94,513,473	283.5	37.6
			Total Requests:	$4,547,376	$78,842,659	$299,841,318		
			Available Funding	$ 3,923,000	$ 50,000,000			

CLEAN SUSTAINABLE ENERGY AUTHORITY
CONFLICT OF INTEREST
DISCLOSURE FORM

A conflict of interest may develop for Clean Sustainable Energy Authority members as a result of considering applications for funding from the Clean Sustainable Energy Authority Fund. A conflict of interest exists for an Authority member if there is a monetary or material investment or interest in a project submitted for Authority consideration, such as employment or individual investment. If a conflict of interest exists, then the member must disclose the nature of the conflict of interest prior to any vote by the Authority in consideration of the application. A motion must be approved to allow members with conflicts of interest to vote.

Grant Round 6:

Conflict of Interest		
	Yes	**No**
C-06-C: ND Lithium-Ion Battery Manufacturing Plant; Submitted by Packet Digital, LLC; Total Project Costs: $100,827,845; Amount Requested: $2,297,376 grant, $18,842,659 loan		
C-06-D: The Forge Project; Submitted by AmeriCarbon Forge, LLC; Total Project Costs: $100,000,000; Amount Requested: $40,000,000 loan		
C-06-E: The Forge Project: Rare Earths and Critical Materials Integration; Submitted by Ore Spring Materials, LLC; Total Project Costs: $4,500,000; Amount Requested: $2,250,000 grant		
C-06-G – Commercial Deployment of Carbon Dioxide Capture, Transport, and Storage for Dakota Spirit AgEnergy; Submitted by Harvestone Low Carbon Partners; Total Project Costs: $94,513,473; Amount Requested: $20,000,000 loan		

Print - CSEA Member ______________________________

Signature - CSEA Member ______________________________

CSEA Grant Round 6 Technical Review Summary

C-06-C ND Lithium-ion Battery Manufacturing Plant, Packet Digital, LLC

Grant Request: $2,297,376

Loan Request: $18,842,659

Total Project Costs: $100,827,845

Average Technical Review Score: **303/315 (Good)**

Selected Technical Reviewer Comments:

It is clear that the project team knows what is needed for the technology, equipment, and material for the manufacture of their lithium-ion battery cell production facility. Per the proposal, the majority of the equipment is already ordered. Less certain is the supply chain for the raw material of lithium which is targeting the use of lithium carbonate from North Dakota oil field brine. While pilot projects are proposed and the technology to recover this lithium is known, full scale lithium carbonate production facilities still need to be built. This project should help stimulate the creation of those lithium carbonate production projects.

This project is of strategic importance to the US, as it will strengthen the domestic supply chain for high-energy lithium-ion batteries. The project will also support the continued leadership of North Dakota's UAS industry and will benefit the State's oil and gas and lignite industries, who will be supplying much of the feed stock for the production facility. The proposal's budget and timetable are achievable, and the management team looks solid. In order for this project to succeed, it will need to be developed hand-in-hand with those local industries (oil and gas, lignite, Talon, etc.) that will need to build facilities that will produce the feedstock needed for this lithium-ion battery production plant. I recommend that this project be approved.

The largest flaw is the lack of clarity of how the request funding is to be utilized within this project. The cited categories listed in the provided table are very generic. The other thing overlooked was not citing the frequency of progress reports to the North Dakota Industrial Commission Clean Sustainable Energy Authority. So, once the detailed progress report frequency is agreed to and the specifications of how the $2.3M grant and the $18.8M loan were going to be spent, I would strongly recommend funding this project as it is solid science and essential to our national security.

The project is already under construction and is forecast to start small-scale production by the end of 2026. Should the pilot production prove successful, full-scale production is expected to begin in 2030. This project would further grow the leading role North Dakota has in the UAS industry and would benefit the oil and gas industry and lignite industry and grow a high tech workforce. This project is also a national strategic imperative to grow the domestic lithium-battery industry versus relying on overseas sources like China.

October 15, 2025

North Dakota Industrial Commission
ATTN: Clean Sustainable Energy Program
State Capitol – 14th Floor
600 East Boulevard
Bismarck, ND 58505-0840

Dear Clean Sustainable Energy Program,

Packet Digital is submitting the enclosed grant/loan application to request funding in support of the Clean Sustainable Energy Project, "Packet Digital LLC – North Dakota Lithium-Ion Battery Cell Manufacturing Plant" in the amount of **$21,140,035 ($2,297,376 Grant, $18,842,659 Loan**). Construction began in October 2024 at an 80,000-square-foot warehouse in Fargo, North Dakota, with commissioning and pilot production scheduled for June 2026 and full-scale production beginning in August 2026. The facility will have an initial production capacity of 24 MWh annually (approx. 2,000 cells per 8-hour shift), scalable up to 120 MWh annually (up to 15,000 cells per day). This project will create 60 direct construction jobs and sustain 33-100 long-term operations and engineering roles, with average salaries exceeding $71,500. For this $101 million project, Packet Digital has currently secured $75 million in financing.

The development of high-performance US made Li-Ion battery cells for autonomous systems satisfies an Executive Order 14017 on strengthening U.S. supply chains and fulfills the 2025 National Defense Authorization Act (NDAA) requirement for domestic sourcing of critical defense components. End-to-end U.S. ownership of lithium-ion battery manufacturing is essential for national security, economic resilience, and the safety of the American people. The reliable, high-energy batteries produced by this facility will power a new generation of clean, sustainable Unmanned Aircraft Systems (UAS) and other autonomous technologies across air, space, ground, and underwater domains.

Should you have questions, I can be reached at 701-365-4421 or terri.zimmerman@packetdigital.com.

This letter sets forth a binding commitment on behalf of Packet Digital to complete the project as described in the application. We appreciate your consideration and continued support of North Dakota's clean energy and advanced manufacturing initiatives.

Sincerely,

Terri Gunn Zimmerman, CEO
Packet Digital, LLC
3241 University Dr. S
Fargo, ND 58104

Clean Sustainable Energy Authority

North Dakota Industrial Commission

Application

Project Title:

Packet Digital – North Dakota Lithium-Ion Battery Manufacturing Plant

Applicant:

Packet Digital, LLC

Date of Application:

October 15, 2025

Amount of Request

Grant: $2,297,376
Loan: $18,842,659

Total Amount of Proposed Project:

$100,827,845

Duration of Project:

36 months - Jan 1, 2023, to Dec 31, 2026

Point of Contact (POC):

Terri Zimmerman

POC Telephone:

701-365-4421

POC Email:

terri.zimmerman@packetdigital.com

POC Address:

3241 University Dr., Fargo ND 58104

TABLE OF CONTENTS

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ABSTRACT

Objective: Packet Digital proposes to establish an end-to-end lithium-ion battery cell manufacturing and research facility in Fargo, North Dakota. This project directly supports Executive Order 14017 and Executive Order "Unleashing American Drone Dominance", the National Defense Authorization Act of 2025, and the mission of the North Dakota Clean Sustainable Energy Program by onshoring critical supply chain capabilities, reducing reliance on foreign sources of energy technology, and positioning North Dakota as a national hub for sustainable, advanced energy manufacturing.

The 80,000-square-foot Fargo facility, now under construction, will produce high-power and high-energy-density pouch cells for defense and aerospace systems. Operations will include material receiving, testing, assembly, formation cycling, quality assurance, and packaging. A co-located R&D center will develop next-generation chemistries - silicon-composite anodes with University of North Dakota (UND), NMC cathodes with rare earth element doping in partnership with UND, WellSpring Hydro, and Talon Metals, and graphene and synthetic graphite derived from North Dakota lignite with Energy & Environmental Research Center (EERC) - ensuring local resources and research play a central role in the U.S. battery supply chain.

Currently, over 95% of drone batteries are imported, mostly from China. Starting in 2027, the NDAA prohibits DoD contractors from sourcing Chinese-made cells. This project provides the secure, domestic alternative defense contractors need, serving customers such as Lockheed Martin, Anduril, Sierra Nevada, Griffon Aerospace, the U.S. Navy, and the U.S. Air Force and more.

Expected Results: The expected output at launch in July 2026 is approximately 2,000 cells per 8-hour shift (~24 MWh annually), with the facility designed for scalability to 15,000 cells per 24 hours (~150 MWh annually) by 2029, to produce high-performance pouch cells for uncrewed aircraft systems (UAS) and other defense and commercial applications and develop next generation batteries to maximize the utilization of local raw materials. These production capabilities will be supported by advanced cell attributes, including: **Energy density:** 250 - 350 Wh/kg, **Discharge rates:** 5 - 20C, **Operating temperature:** - 40 °C to +60 °C, **Applications:** drones, satellites, submersibles, light ground vehicles.

Construction began October 2024 and will be completed by June 2026. All permits are secured, contractors selected, and equipment procured. The project will create 33–100 skilled long-term jobs with average annual salaries over $71,500, while supporting 60 construction jobs and building a lasting clean-energy manufacturing base in North Dakota.

Duration: The battery cell plant factory will be commissioned by July 2026, pilot runs are planned for Q3 of 2026, and production ramp up by Q4 2026.

Total Project Cost: $100,827,845, financed through public and private sources, including: $17 M CSEA loan, $24.3 M bank financing, $10 M Navy grant, $14.8 M equity, $5.4 M SBA 504, $3.2 M Dakota Business Lending NMTC, and is requesting an additional $21.1 M from CSEA and $5 M from NDDF.

Participants: Packet Digital, US Navy, Rainbow Energy, NDSU, UND, EERC, WellSpring Hydro, Talon Metal, US Airforce Research Laboratory, Toyota and Lockheed Martin.

Impact: This project will strengthen U.S. energy security, reduce foreign dependence, and anchor a clean-energy technology ecosystem and supply chain in North Dakota, integrating local research (UND, NDSU, and EERC) and resources into national defense and commercial supply chains while creating high-wage jobs and advancing sustainable innovation.

PROJECT DESCRIPTION

Objectives:

The Packet Digital – Packet Digital - project is designed to directly support Executive Order 14017, which calls for the onshoring of critical supply chain components for advanced technologies, including lithium-ion batteries (Fig. 1), and the Executive Order *Unleashing American Drone Dominance* accelerating domestic drones manufacturing capability. It also responds to the National Defense Authorization Act of 2025, which prohibits Department of Defense contractors from sourcing batteries from China starting in 2026, and it advances North Dakota's vision of becoming a national leader in both clean energy and unmanned aerial systems (UAS) technology.

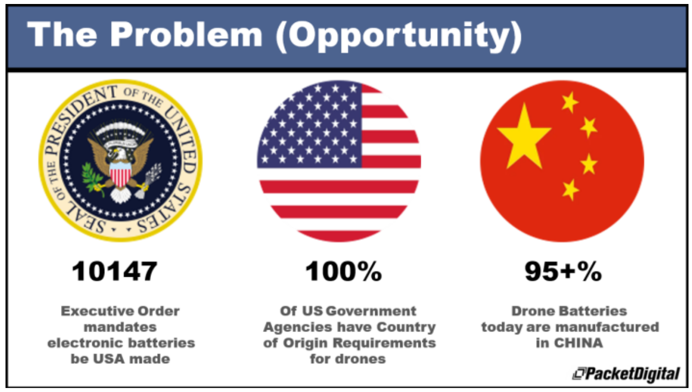


Figure 1: The Problem

Building on two decades of innovation at Packet Digital, a Fargo-based leader in smart batteries, charging systems, and fleet battery management, Packet Digital is constructing a lithium-ion battery cell manufacturing and research facility in Fargo, North Dakota. Construction began in October 2024, with completion expected in June 2026 and operations beginning in July 2026. The facility will provide end-to-end capabilities, including raw material receiving and storage, electrode preparation, cell assembly, formation cycling, quality assurance, compliance testing, and final packaging and shipping. A dedicated R&D center within the facility will develop next-generation chemistries, including silicon-oxide anodes, nickel-manganese-cobalt cathodes, and rare earth element applications, with a specific emphasis on maximizing the use of North Dakota's raw materials and university research partnerships.

This capability is essential to the national defense and energy security of the United States. Lithium-ion batteries are integrated into nearly every Department of Defense platform, from soldier-carried communications equipment to drones, munitions, and satellites. Yet, more than 95% of drone batteries are currently imported, primarily from China, raising both supply chain and cybersecurity risks. Military platforms increasingly require batteries that not only deliver high performance but also communicate real-time system data. Ensuring that such critical power sources come from trusted domestic suppliers is vital to protecting U.S. defense systems from adversarial vulnerabilities.

The project requires approximately $100 million in public and private financing to complete facility improvements, acquire manufacturing equipment, develop advanced production processes, and scale next-generation chemistries. The facility is projected to achieve profitability and positive cash flow within four years of full production.

Lithium-ion batteries are not only indispensable to defense applications but also to the future of the U.S. economy. They power electric vehicles, drones, munitions, soldier communications, and reconnaissance systems - technologies that are reshaping transportation, energy, and national security. However, the U.S. currently produces only about 1% of global lithium supply and less than 10% of global cell manufacturing capacity, according to the Department of Energy. With global demand projected to grow more than 500% by 2030, the establishment of a domestic cell production facility is vital to ensuring U.S. competitiveness, energy independence, and security.

The impact on North Dakota will be substantial. The project will create 50 construction jobs and between 33–100 long-term skilled manufacturing and engineering positions, with average annual salaries exceeding $71,500. It will anchor a clean energy manufacturing ecosystem in the state, drive tax base growth, and expand workforce training opportunities through partnerships with the University of North Dakota, North Dakota State University, and the Energy & Environmental Research Center (EERC).

Finally, this project will serve as a measurable driver of U.S. competitiveness. By 2030, global demand for lithium-ion batteries is projected to grow by over 500%, yet the U.S. currently produces less than 10% of global cell capacity. By establishing this domestic facility, Packet Digital will reduce reliance on imports, accelerate the commercialization of advanced battery chemistries in partnership with WellSpring Hydro, Talon Metal, UND and EERC, strengthen U.S. national security, and position North Dakota as a national hub for clean, sustainable energy innovation.

Methodology: The Packet Digital project will establish a flexible, scalable, and secure lithium-ion battery cell manufacturing facility in Fargo, North Dakota. The methodology integrates facility design, equipment procurement, compliance, workforce development, advanced R&D, and phased commissioning to ensure the project is delivered on time and aligned with the objectives of energy sustainability, national security, and economic impact for North Dakota.

Facility Design and Production Flow: The facility has been designed to provide an end-to-end domestic supply chain for high-power, high-energy-density pouch cells. The production line will support:

- **Cell sizes from 3–30 Ah**, Thickness: 3 to 12 mm, Width: 43 to 100 mm, Length: 80 to 200 mm.
- Throughput of **2,000 cells per 8-hour shift at launch (~24 MWh annually)**, scalable to **15,000 cells per day (~120 MWh annually)**.
- Each manufacturing stage - electrode preparation, coating, calendaring, stacking, electrolyte filling, formation cycling, and testing - will be equipped with highly automated systems to maximize quality, consistency, and yield. The manufacturing process in Packet Digital factory is summarized in Fig. 2.
- Clean/dry room environments maintained at **- 40 °C dew point** will allow for compatibility with multiple chemistries, including **NMC, LCO, LFP, and advanced Si-C composites**.

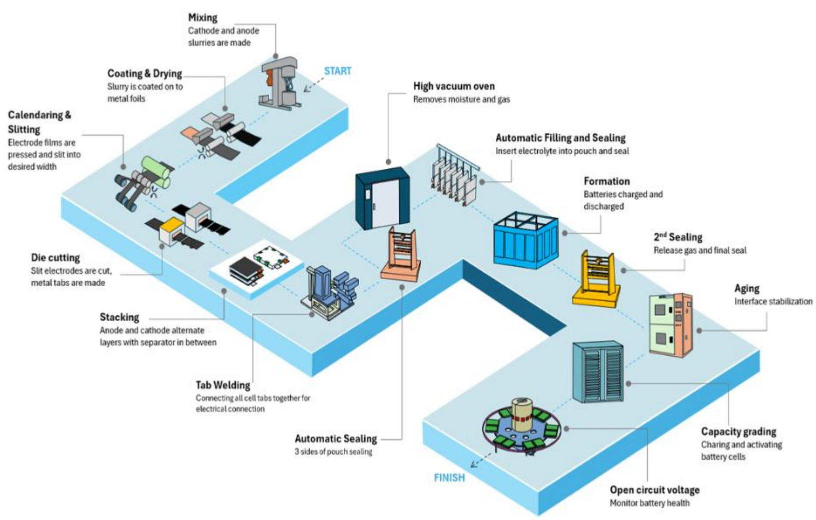


Figure 2: Packet Digital Li-ion cell manufacturing process process

Advanced R&D in house: A dedicated R&D center within the facility will ensure long-term innovation and technology transfer. Focus areas include:

- Next-gen silicon composite anodes and NMC cathodes to increase energy density and power density in collaboration with the University of North Dakota, WellSpring Hydro, and Talon Metal,
- Graphene-enhanced materials and synthetic graphite sourced from North Dakota lignite byproducts, in collaboration with both EERC and UND,

- Novel electrolytes to improve cycle life and thermal stability, aim of increasing the cycle life by 150% of the current specification and expanding the working temperature range to -50 °C to + 60 °C.
- Smart manufacturing AI algorithms for predictive maintenance and defect reduction.

Compliance and Safety: All facility design requirements were developed in collaboration with design firms specializing in lithium-ion battery manufacturing as well as local contractors and regulatory authorities to ensure full compliance with safety, environmental, and construction standards. Packet Digital has partnered with multiple professional consulting firms to support each aspect of the design and construction process, including YHR (Architectural), Sandman (Structural), MBN (Civil), KFI (Fire Detection and Protection), and CMTA (Electrical, Mechanical, and Plumbing). These partners have been instrumental in defining the plant layout, integrating process and equipment design requirements, and implementing all applicable codes and regulations. A summary of the technical and regulatory requirements used to initiate the design process is provided in the table below.

Category	Item	Requirements and Parameters
1. Production line capacity requirements	1.1 Chemical platform	The manufacturing facility will need to be compatible with current and future development cell chemistries for Lithium-ion Batteries for drone and UAS applications, that provides extremely high power and high energy density. Cathode can be compatible with: pure LCO, LFP, NCM and high Nickel NMC. Anode can be compatible with Graphite and Graphite + Silicon/SiO/Si composite.
	1.2 Production capacity requirement	(1) Starting at 2,000 pcs/8hrs (2) Expanding capability to 5,000 pcs/8hrs
	1.3 Compatible size and capacity of the production line	The manufacturing line will be able to produce cells with following dimensions and capacity range: Dimensions: Thickness: 3 to 12 millimetres, Width: 43 to 100 millimetres, Length: 80 to 200 millimetres Capacity range: 3Ah to 30Ah
	1.4 Flexible design needs of production line	Able to manufacture multiple pouch cell formats to meet customer needs.
	1.5 Expansibility	The manufacturing capability would start with small capacity and production could be ramped up later by procuring more manufacturing equipment.
2. Plant data and related requirements	2.1 Plant size and existing layout	Drawings, survey of the building existing conditions.
	2.2 Requirements for Fire protection standards	Fire protection standards required by the City of Fargo
	2.3 Compressed air/Nitrogen configuration	Local regulation related to the use of Nitrogen gas.
	2.4 Power distribution capacity and requirements	Energy/power consumption estimation for the plant, given the availability voltage ranges of 120V, 277V, and 480V 1-3 phases at the plant site. Temperature and humidity distribution in Fargo around the year.
3. Equipment & materials requirements	3.1 Requirements for manufacturing equipment and auxiliary equipment	Requirements for Manufacturing equipment and Auxiliary equipment
4. Other related laws, regulations and licenses	4.1 Air emission, water discharge	Investigate required air emission and water discharge permits
	4.2 The treatment of hazardous waste, chemical substance and defective cells	Investigate the required regulations for treatment of hazardous waste, chemical substances and defective cells
	4.3 Radioactive sources	In battery equipment, β-RAY are used in coating machine for anode, and X-RAY is used after stacking process. Local special requirements regarding the procurement and use of these radioactive sources.
5. Certification systems	5.1 Management system certification	Management system certification
6. Software system	6.1 Management software	Software for collecting and analyzing data collecting during the raw materials analyzing and manufacturing processes.

Design: Technical data has been created to establish the target cell models with performance indicators reaching the levels for energy and power density requirements for unmanned aircraft, including cell formula, materials standards, material supplier lists, manufacturing instructions, standard operating procedures, quality control plan, and failure modes and effects analysis (a step-by-step approach for identifying all possible failures in design, manufacturing process, and the manufactured product). The design of the production line and the process flow of battery production were optimized, considering the capacity, volume, power, **clean/dry room area** - which is the most **critical and expensive investment -** and airflow requirements of each piece of equipment, and expected output, functional module distribution, and overall plant layout (Fig. 3).

Local authorities have been supporting the Packet Digital battery cell plant project since the very beginning by providing comments and discussions on the requirements, allowing us to optimize our factory design. Packet Digital has secured all permits, including an air emission permit exemption (emissions are well below regulatory thresholds). The facility voluntarily complies with the latest fire codes for lithium-ion manufacturing, has completed a Dust Hazard Analysis, and incorporates advanced fire detection and dust collection systems. These measures ensure a safe, sustainable, and regulation-compliant operation. The final permit was issued in June 2025.

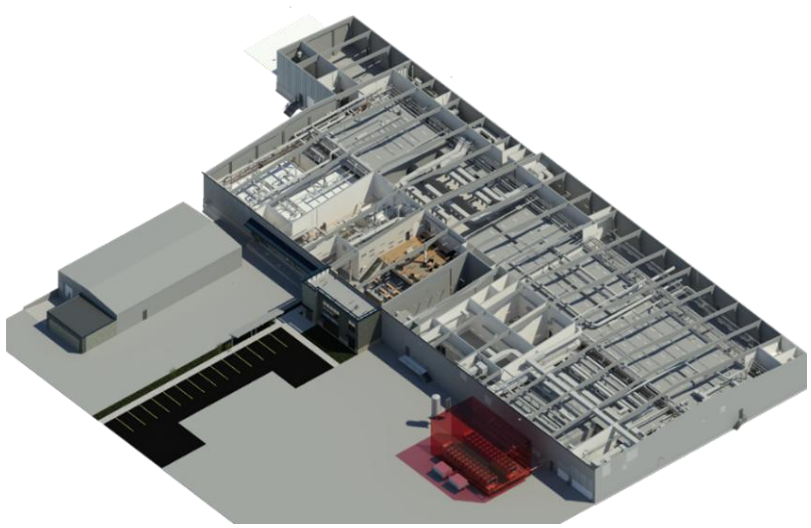


Figure 3: Packet Digital battery cell plant -3D rendering

Equipment Selection and Procurement: Packet Digital finalized procurement of over 125 pieces of equipment in April 2025, including:

- Auxiliary equipment: dehumidifiers, air handling units, dust collection systems, boiler, chiller, compressed air system, vacuum system, nitrogen system, waste gas treatment system, NMP recovery system, and heat recovery system.
- Performance and material testing systems: Cyclers (low and high current up to 600 Amps), thermal chambers, a full set of UN 38.3 testing equipment, SEM/EDS, particle size analyzer, surface area measurement, thermal camera, etc.
- Segmented automatic manufacturing line: mixers, coaters, calendaring/ splitting machines, die cutting machines, stacking, welding, packaging, X-ray machine, filling, sealing, formation, second sealing, and capacity grading machines.

This equipment was selected based on performance, automation capability, and cost efficiency. Factory Acceptance Tests (FATs) are conducted by Packet Digital representatives before shipment. Installation and commissioning will be completed with vendor technicians and Packet Digital engineers by **June 2026**. Fig. 4 shows the overall equipment layout inside and outside the plant.

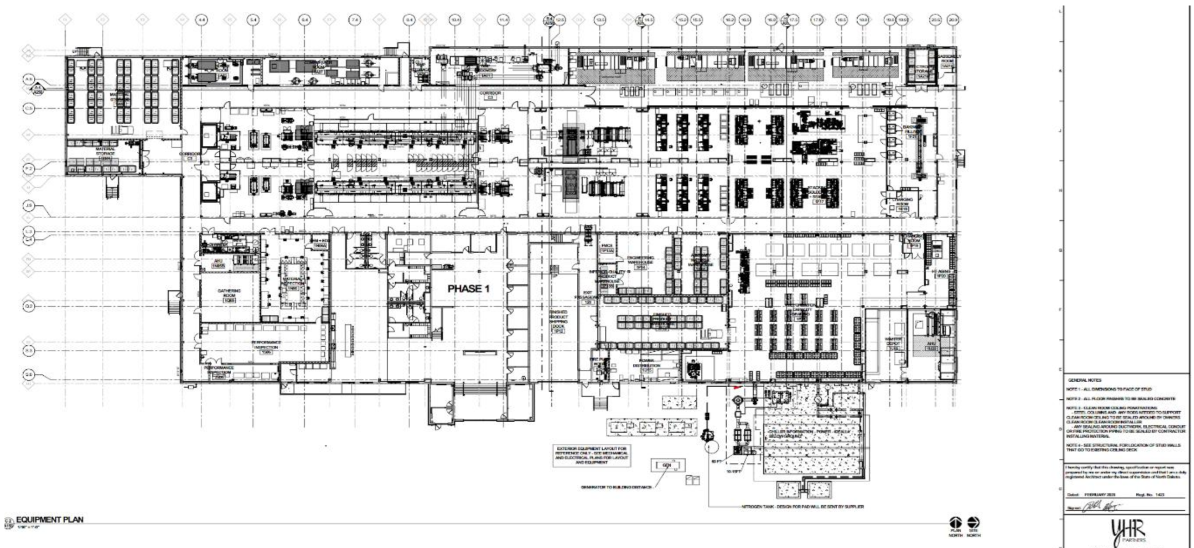


Figure 4: Packet Digital cell plant engineering layout

Workforce Development: Personnel - including design engineers, production managers, technicians, and quality control specialists - will be trained throughout the equipment installation and pilot production phases. Partnerships with NDSU, UND, and NDSCS will ensure workforce pipelines and opportunities for student internships and research collaborations.

Pilot and Mass Production: Two pilot production runs will validate yield, safety, and performance metrics, with verification periods for energy density (≥250 Wh/kg), cycle life (≥500 cycles), and thermal performance. Upon successful verification, the facility will transition to mass production in October 2026, initially operating one shift per day before expanding to three shifts, five days per week.

Updated Packet Digital project progress through October 2025: Fig. 5 summarizes the main progress of our project, which includes both manufacturing and R&D facilities.

Evaluation and Success Metrics: Project success will be measured at defined checkpoints:

- Construction Completion (June 2026): Facility fully built, inspected, and commissioned.
- Pilot Production (Q3 2026): Verification of output, yields, and energy density.
- Mass Production (Oct 2026): 24 MWh annual capacity achieved.
- Scale-up (2028–2029): Expansion to 120 MWh annual capacity.
- Workforce Development: Hiring of 33 - 100 full-time employees, averaging $71,500 annual salary.

Items	Percentage	Status	Timeline to
Factory Engineering Design: Construction design	**100%**	Finished	June 2025
Clean/Dry room Construction Design	**100%**	Finished	Feb 2025
Obtain necessary permits from related authorities	**100%**	Finished	June 2025
Manufacturing Equipment Ordering progress	**100%**	Finished	April 2025
MEP Equipment Ordering Progress	**60%**	Ontrack	Oct 2025
Factory Construction	**50%**	Ontrack	Dec 2025
Clean/Dry room Procurement/ Construction	**30%**	Ontrack	March 2026
MEP Construction	**25%**	Ontrack	April 2026
Equipment Installation and Commissioning	**0%**	Not Started	Mar 2026
Pilot Run	**0%**	Not Started	Jun 2026
Project Acceptance	**0%**	Not Started	Oct 2026
R&D center starts to operate	**80%**	Ontrack	April 2026

Figure 5: Packet Digital cell plant project status –Oct 2025

- Sustainability: Emissions kept below regulatory thresholds, waste managed via best practices, and local materials integrated into the supply chain.

This structured methodology ensures that Packet Digital will deliver a world-class, sustainable, and secure lithium-ion manufacturing facility that achieves technical, economic, and environmental objectives while creating lasting value for North Dakota.

Anticipated Results: Anticipated results is an end-to-end Li-Ion battery R&D and manufacturing facility in North Dakota to produce the best-in-class extreme high power and high energy density batteries for autonomous systems, creating a domestic UAS supply chain, reducing dependence on foreign adversaries. This will position North Dakota as a national leader in defense and clean energy manufacturing. Upon award Packet Digital will conclude the construction process and commence the equipment installation and commissioning, staffing and training of personnel, pilot production runs, verification, and ultimately mass production, operation, and ongoing maintenance of the facility**.** Packet Digital expects to begin operations of the proposed cell factory within 12 months of funding approval. Prior to single shift operation, the battery cell team will expand from currently 6 to 33 employees. At three shifts of operation, our manufacturing and R&D facilities will create up to 100 high-paying jobs for the local communities. Fig. 6 provides an overview of the ongoing construction at our cell plant.

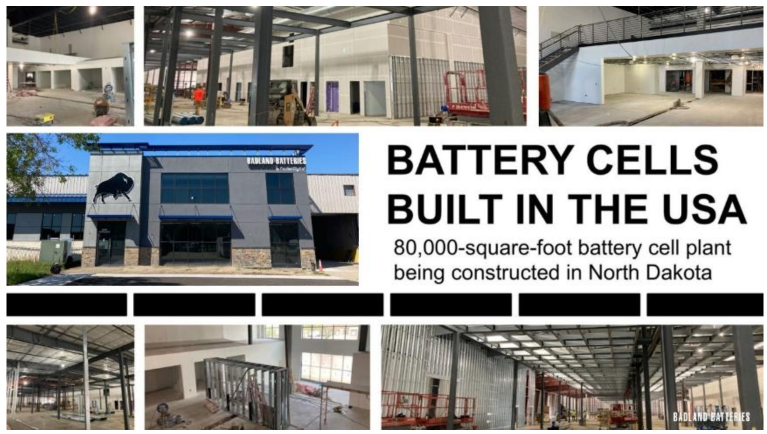


Figure 6: Packet Digital cell plant construction update

Multiple advanced material research and development projects in collaboration with UND, WellSpring Hydro, and Talon Metal will also be initiated. These projects aim to combine Li_2CO_3 from oilfield brine, a byproduct of oil production (WellSpring Hydro), Rare Earth Elements (REEs) including Cobalt (UND), and Nickel based material (Talon Metal) and coal (EERC) to synthesize Cathode materials such as Lithium Cobalt Oxide and Lithium Nickel Manganese Cobalt Oxide and Anode materials such as synthetic graphite and graphene. These materials provide an excellent opportunity for partnership to create a local critical material supply chain for our cell factory. Fig. 7 explains Packet Digital's supply chain strategy in collaboration with local companies and out-of-state customers.

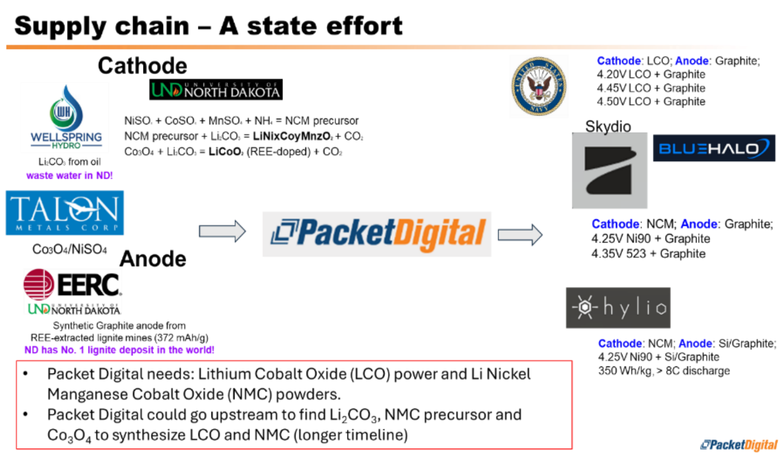


Figure 7: Packet Digital Supply strategy

Facilities: The 80,000 sq ft. new cell manufacturing plant is currently under construction at 1358 39th N, Fargo, ND, which is relatively close to Packet Digital's engineering and prototyping location on University Drive South, and to their 25,000 sq ft. manufacturing and assembly plant on 7th Ave North. The facility is purpose-built to support the manufacturing process required for cell assembly and supports expansion through a modular expansion model. The building will include engineering/administrative, multiple material warehouses for different types of materials, engineering warehouse, mechanical, and auxiliary rooms. The heart of the facility is a 29,000 sq ft. high-performance clean/dry room housing current and next generation cell manufacturing, material testing facility, cell performance testing facility - including brand new equipment to perform UN 38.3 test on cells - and a 7,000 sq ft R&D center for material study and cell prototyping located at the same address.

Resources: Packet Digital will call upon its experienced resources, developed partnership resources, and its geographic location.

Expertise – Packet Digital has been working on power solutions since its inception 22 years ago and with decades of experience building high performing power solutions for military and consumer solutions and is acutely aware of current and future requirements. Currently, Packet Digital is developing the power safety standards for the US Navy Fleet for batteries, charging, stowage, and transport, as well as developing power solutions with the US Air Force to be deployed in space, in addition to multiple commercial and battery customers. Packet Digital has a broad range of customers to draw upon for requirements capture. Packet Digital has battery and engineering expertise and is adding additional battery chemistry capabilities.

Developed Partnerships – Packet Digital has established a robust network of strategic partnerships to support the design, commissioning, and operation of the new lithium-ion battery cell manufacturing facility in Fargo, North Dakota. These collaborations provide technical expertise, material supply, workforce training, and testing capabilities essential to the project's success. Letters of support have been secured from the U.S. Navy, U.S. Air Force Research Laboratory, Rainbow Energy, Lockheed Martin, EERC, WellSpring Hydro, Talon Metals, Toyota, UND, and NDSU.

Defense and Industry Partnerships: Collaboration with the U.S. Navy, U.S. Air Force, Lockheed Martin, Toyota, and other commercial partners enables direct alignment of the facility's design and production requirements with Department of Defense and commercial customer standards. These partnerships accelerate the definition of performance specifications, support technology validation, and ensure secure, U.S.-based supply of mission-critical batteries for defense and commercial applications.

Raw Material & Supply Chain Partnerships: Packet Digital is forming strategic collaborations with Wellspring Hydro, Talon Metals, and Rainbow Energy to establish a domestic, sustainable materials supply chain for high-performance battery production. These partnerships will provide lithium carbonate, "Green Nickel™", cobalt, and rare-earth materials while reducing dependence on foreign sources and leveraging North Dakota's resource capacity. Through these collaborations, Packet Digital will secure key raw materials, streamline logistics, and support the emergence of a vertically integrated battery manufacturing ecosystem in North Dakota.

Research & Academic Partnerships: Packet Digital is collaborating with the UND, NDSU, and EERC to strengthen R&D, workforce development, and local resource utilization. UND contributes expertise in energy storage systems, advanced materials, and lithium-ion battery technologies, as well as access to its state-of-the-art material testing facility and workforce joint development. Joint research will focus on integrating locally derived materials - such as silicon oxide/composite, and rare earth elements from North Dakota lignite, NMC cathode materials - into next-generation cell chemistries. NDSU provides state-of-the-art laboratory and testing facilities, supporting prototype validation, reliability testing, and materials characterization for high-performance battery cells. EERC brings experience in extracting rare earth elements and producing synthetic graphene from lignite. Packet Digital will collaborate to test and incorporate EERC-developed materials into cell development. Together, these partnerships will accelerate innovation, develop North Dakota's clean-energy workforce, and anchor a sustainable battery technology ecosystem in the region.

Commercial Partnerships: Packet Digital's long-standing relationships with Lockheed Martin, Anduril, Kraus Aerospace, PteroDynamics, Shield AI, L3Harris, and Skyways bring both commercial and defense-sector expertise to the requirements development process. These customers represent strong early demand for U.S.-made, high-performance lithium-ion cells and are expected to support significant production volumes once the Fargo facility becomes operational.

<u>Geographic Locations</u> – The Packet Digital manufacturing facility is located in an industrial zone in Fargo, North Dakota, with direct access to Interstate 29 and rail infrastructure, enabling efficient transportation of raw materials and finished products. North Dakota provides an ideal environment for battery manufacturing. The state offers abundant industrial land, a cool climate that supports thermal control during production, and a business-friendly regulatory environment. It has also made significant, synergistic investments in Uncrewed Aircraft Systems technology, including designation as one of the seven FAA national UAS test sites and participation in the U.S. Department of Transportation's UAS Integration Pilot Program. North Dakota is also among the first states to deploy statewide Beyond Visual Line of Sight network, reinforcing its leadership in autonomous systems. As a leading energy-producing state, North Dakota is actively investing in domestic raw material processing, which Packet Digital will leverage to strengthen the regional battery supply chain. The presence of NDSU and the UND - both with advanced research programs in battery science and energy systems - provides a steady pipeline of technical talent and a foundation for continued innovation and workforce development.

Techniques to Be Used, Their Availability and Capability: While lithium-ion battery cell manufacturing is complex, it is a well-established process supported by a mature global supply chain and proven production methodologies. Each cell chemistry presents unique design and manufacturing challenges; for UAS applications, cells must combine high power density for takeoff and landing with ultra-low weight for extended flight duration.

To address these requirements, Packet Digital has established technical partnerships with leading domestic and international battery producers, ensuring access to state-of-the-art process knowledge, training, and equipment commissioning support during the factory ramp-up phase. The Fargo facility will employ specialized cathode and anode formulations, optimized for high-rate performance and thermal stability. A proprietary electrolyte system will enable safe, high-discharge operation under demanding conditions. The manufacturing process integrates Standard Operating Procedures - over 200 in total - covering electrode coating, electrolyte injection, cell assembly, formation cycling, inspection, and quality assurance. Each process incorporates in-line quality control and failure-mode analysis, ensuring consistent output and traceability.

Partnering with leading battery manufacturing companies provides Packet Digital with a solid foundation to safely start and ramp up its production technology. In parallel, Packet Digital is developing in-house R&D capabilities to advance proprietary cathode, anode, and electrolyte chemistries. The company's cell technology roadmap (Fig. 8) defines annual development milestones through 2030, positioning Packet Digital and Packet Digital as leaders in UAS battery innovation and domestic cell manufacturing.

Packet Digital is a highly experienced producer of very high energy density battery packs and has attained up to 10X the cycle life of most drone batteries available today with smart power management capabilities and patented unique algorithms with proof points including:

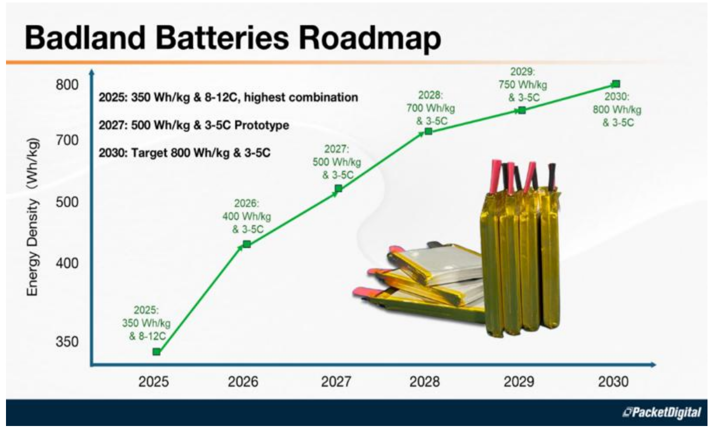


Figure 8: Packet Digital cell technology road map

- A 30 – 40% increased performance/efficiency for **Lockheed Martin** with 10X cycle life
- Software that automatically manages battery health of fleet of batteries for **Bell Helicopter** for commercial 100-pound payload UAS
- High efficiency batteries for **Anduril,** a DoD contractor for border protection
- Extended endurance from 90 minutes to 15-18 hours on **US Marine Corps** program
- Achieved multi day flight for **OSD** Operational Energy Office.
- Enhanced reliability and doubled endurance on Talon (UAS platform) for **NAVAIR**
- Designing battery for space power beaming for **Northrop Grumman SSPIDR** and designing next generation power solution for **AFRL** and their suppliers for small spacecraft.
- Designing battery for a sea glider drone that flies and submerges for 6 months for **NRL.**
- Developing drone batteries and chargers for the **Navy fleet.**

Figure 9: Packet Digital customers

In addition, Packet Digital has built a team with experts in battery cell chemistry and will continue to add to their team additional personnel with experience in battery manufacturing, production, and QA/QC.

Environmental and Economic Impacts while Project is Underway: The Packet Digital team has been actively working with State officials and local authorities in identifying the potential impacts on the environment, such as air emissions during operation, wastewater discharge, and utilities consumption and in partnership with leading experts it was determined our project has very little impact on the environment. Air emissions are well below the limit so that it is exempt from permitting. The facility requires a small amount of water and gas supply during operation.

From an economic point of view, we are working with multiple trades (local engineering consultants) and construction workers in developing the new facility, resulting in 100's of thousands of labor hours during the construction phase. In the first three years into production, this manufacturing plant will require over 200,000 hours of labor from current and future hires, with a go-forward rate of approximately 120,000 hours per year.

Ultimate Technological and Economic Impacts: This project will create the foundation for a center for excellence, a battery technology innovation center in North Dakota. The need for lighter, safer, and more powerful battery technology is a never-ending journey. By providing leading technology from a US source with end-to-end supply chain ownership it is our goal to push the boundaries of battery technology and research, development, and delivery faster than anyone in the market. Packet Digital will create clean sustainable energy jobs, wealth, and tax revenues for North Dakota. The cell plant will attract and retain talent to North Dakota. Packet Digital will promote the efficient, economic, and environmentally sound development and use of North Dakota's energy resources, materials, and products to maximize the market potential for clean sustainable energy resources and associated byproducts.

Why the Project is Needed: This effort is essential to support a critical national security issue and enable us to produce critical components of battery production for the US military in the United States. In addition, this project has a solid business case: the $8 billion drone battery market is growing at 20.4% CAGR and is expected to grow to $42 Billion in 2034. With a large growing market, the strong push for US made solutions, the demand from our military and commercial customers for US made cells, and Packet Digital's battery expertise, this plant will achieve profitability and be cash flow positive in four years.

Packet Digital brings more than a decade of experience in advanced power and energy solutions, supporting both military and commercial applications. Over the past 11 years, the company has built strong relationships with defense and industry partners and assembled a proven leadership team capable of executing complex technology programs and ensuring the success of this project. This funding, when combined with private funding, will enable Packet Digital to execute on this critical project for our national security and the safety and independence of the American people.

STANDARDS OF SUCCESS

The success of the Packet Digital project will be measured by its ability to deliver clear environmental, economic, job creation, and technological benefits for both North Dakota and the United States.

Emissions Reduction and Environmental Impact: At the foundation of this project is the commitment to reducing emissions and minimizing environmental impacts. By establishing a domestic manufacturing facility for lithium-ion cells, the company will eliminate the need for overseas shipping of imported batteries, which today make up more than 95% of the drone power supply chain and are predominantly sourced from China. This reduction in transport alone is expected to save hundreds of metric tons of carbon dioxide annually. Furthermore, the new facility will utilize energy-efficient production systems, including NMP recovery, heat recovery, and AI-driven quality control and predictive maintenance, which together will reduce waste, optimize equipment use, and further decrease the overall energy footprint compared to legacy facilities abroad.

Increased Energy Sustainability: Another measure of success lies in the project's contribution to energy sustainability. Packet Digital will produce advanced lithium-ion cells with higher energy density and longer lifespans, meaning fewer replacements are needed over the lifetime of defense and commercial platforms. This durability reduces waste while improving mission readiness. The integration of silicon anodes, high-nickel cathodes, and novel electrolyte systems in second-generation products will represent a step-change in performance, while the use of locally sourced graphene from Lignite mines in North Dakota strengthens material sustainability and creates a vertically integrated, resource-efficient supply chain.

Value to North Dakota: The project also carries significant value for the state of North Dakota. With a capital investment of $100 million, the manufacturing facility represents one of the largest clean energy infrastructure projects in the region. It generates 60 direct construction jobs during the buildout phase and sustains between 33 and 100 permanent high-skill positions once the plant is in full operation. These positions, which average salaries above $71,500 annually, will provide strong, stable employment opportunities that will retain skilled workers in the state while attracting new talent. Workforce training partnerships with North Dakota State University, the University of North Dakota, and the North Dakota State College of Science will prepare students and workers for careers in advanced clean energy manufacturing, positioning the state as a hub for lithium-ion battery expertise. In addition, partnerships with Rainbow Energy, Wellspring Hydro, and Talon Metals will promote vertical supply chain integration, enabling the use of locally sourced raw materials in Packet Digital's products. This collaboration strengthens North Dakota's role in the domestic energy supply chain and reinforces its leadership in clean, secure, and sustainable energy development.

Public and Private Sector Utilization: A further standard of success is the adoption of the facility's products by both public and private sector customers. On the public side, the U.S. Navy and Air Force will begin integrating the cells into defense platforms as soon as 2026, in compliance with the National Defense Authorization Act of 2025, which prohibits the use of Chinese batteries in defense applications. Major defense contractors, including Lockheed Martin, Anduril, Sierra Nevada, Griffon Aerospace, and Kraus Aerospace, have already expressed interest in the plant's output and are anticipated to become early adopters. On the private side, commercial drone fleets and aerospace companies will benefit from the high energy density and reliability of these cells, with pilot deployments expected to begin in 2026 and large-scale adoption following in 2027.

Commercialization Potential: Commercialization potential represents another benchmark for project success. By establishing the first U.S.-based cell manufacturing facility dedicated to drone and defense applications, Packet Digital will capture a critical share of the domestic market while opening opportunities to expand into adjacent markets such as renewable energy storage. Projections show the facility will achieve profitability within four years of operations.

Advancing Research and Development in North Dakota: The project will have an impact on research and development within North Dakota. Packet Digital will strengthen ongoing collaborations with NDSU, UND, EERC, WellSpring Hydro, and Talon Metals to pioneer advancements in cathode and anode materials, novel electrolytes, and AI-driven smart manufacturing. These partnerships will accelerate the development of technologies that both reduce the environmental impacts of energy production and improve the sustainability of energy delivery systems in the state.

Job Preservation and Creation: Finally, success will be measured in terms of job preservation and creation. The facility will preserve high-technology positions currently at Packet Digital while creating 33 - 100 new permanent roles in Fargo. Beyond direct employment, the project is expected to generate indirect jobs across supply chains, construction, logistics, and services, producing a multiplier effect that will deliver sustained economic benefits for North Dakota.

Alignment with Program Mission: Taken together, these outcomes demonstrate how the Packet Digital project fulfills the mission of the Clean Sustainable Energy Program: reducing environmental impacts, leverages North Dakota's natural resources and byproducts: graphene, synthetic graphite, rare earth elements, and lithium carbonate, enhancing energy sustainability, creating new economic opportunities, and strengthening U.S. national security.

BACKGROUND/QUALIFICATIONS

Packet Digital is an engineering firm with over two decades of experience in designing and building power management solutions for autonomous systems and has market leading military and commercial customers. Packet Digital has developed patented innovative algorithms that bring advanced power system performance to many applications. Packet Digital has integrated these algorithms into smart batteries and secured a patent for our Smart Batteries that have extended life. We have also developed innovative algorithms for our Maximum Power Point Tracking power system for unmanned aerial systems (UAS). One of the key differentiators of our technology is that it offers active power savings, meaning the circuitry does not have to be put into sleep mode to save power. This is critical in UAS applications because of the importance of maintaining full functionality while in flight. With our technology, we have extended battery life 400% in wireless sensors, 40% in a portable radio for the military, and reduced power consumption by 20% in data center servers. We are bringing expertise to building power efficient systems and intelligent power management algorithms for autonomous systems in the air, space, ground, and underwater.

After Packet Digital's success with military radios, the US Marine Corp called on Packet Digital in 2014 to extend endurance in an existing UAS platform. Packet Digital built high performance battery systems and a Maximum Power Point Tracking System and successfully extended the flight times of the UAS from 90 minutes to 15-18 hours. Following this program, the Office of the Secretary of Defense called on Packet Digital for further innovations to extend flight times through the night and Packet Digital's power systems successfully enabled multiple days of flight time on this military UAS program. The visibility from these programs enabled Packet Digital to begin securing commercial customers. In collaboration with Lockheed Martin, Packet Digital improved power efficiency by 30% and cycle times to 10X of any battery Lockheed had ever worked with. Today, Packet Digital has contracts to set the battery and charging and safety standards for UAS power solutions for the US Navy Fleet (adding 5 new drone manufacturers as customers), to create power solutions for the Airforce Research Laboratory's space efforts, and with multiple commercial companies including Anduril, Lockheed Martin, Kraus Aerospace, Pterodynamics, L3 Harris, Shield AI, Skyways, and Textron Systems. All of Packet Digital's customers are seeking a US made end-to-end battery solution including battery cells from Packet Digital.

Packet Digital has a very experienced team including key personnel:
Terri Zimmerman, Experienced CEO | Board Member | Leader with a demonstrated history of success with 30 years of working in the power, batteries, application-specific integrated circuits, software, unmanned systems industries. Strategic financial leader experienced at assessing, planning, and implementing large-scale projects with key alliances raising more than $600 Million in capital. Industry Chairperson of Research Institute of Autonomous Systems. Appointed by three governors to state economic development boards. Previous experience at Deloitte & Touche and C-Level executive at Great Plains Software.
Andrew Paulsen, CTO. Mr. Paulsen has led the development of new products and technologies since 2005. Extensive research, testing, and product development expertise in the batteries, power algorithms and power electronics, including air and ground based solar powered vehicles, batteries & electronics, and other technologies enabling electrification and autonomy.
Matt Steele, Director of Operations. 15+ years designing and manufacturing advanced electronics with an education in engineering and business.
Peng Liao, PhD, Director of Cell R&D, 23+ years of experience in Auto, Mobile, and Aviation batteries - R&D and mass production lines at leading battery facilities.
Tan Nguyen, PhD, Director of Battery Cell Plant, 15+ years of experience in standing up R&D and manufacturing facilities in Li-Ion batteries.
Matt Sather, Director of Marketing**,** 12+ years of sales, marketing, and vendor management in the UAS and E-Commerce market.
Other participants in the project include:

The US Navy is a key participant in the project providing both expertise and requirements as well as funding. The US Navy is funding a separate project for standardized batteries to be utilized in the Navy Fleet for all UASs. For this project, the Navy will provide matching dollars of $9,996,000 for engineering labor, facility improvement, and inventory costs.

WellSpring Hydro, Talon Metal, and Rainbow Energy will provide raw materials and UND will assist in synthesizing cathode materials and anode Silicon composite materials. Packet Digital will provide prototype cells at our R&D facility to test and quantify the performance of the raw materials.

MANAGEMENT

Packet Digital has established a management and oversight structure designed to ensure that this project is executed on schedule, within budget, and with full alignment to its objectives.

Project Oversight

The project will be directed by Terri Zimmerman, CEO of Packet Digital, who will provide executive oversight of financing, customer engagement, and strategic alignment. Andrew Paulsen, CTO, and Peng Liao, Director of Cell R&D, will oversee cell design, R&D progress, and compliance with defense performance standards. Tan Nguyen, Director of Cell Plant, will oversee technical elements of the project, including, timeline, technology transfer, personnel hiring plan, construction progress in coordination with different trades, equipment procurement, installation, commissioning, and transition to full production.

To ensure accountability, a dedicated Program Management Office (PMO) was established within Packet Digital. The PMO coordinates daily/weekly activities, met with General Contractor and Sub-contractors weekly, tracks progress against schedule and budget, and reports monthly to the executive team and quarterly to the Board of Directors.

The project is managed according to industry best practices in systems engineering and program management, including:

- Baseline scheduling and Gantt tracking of milestones from construction through mass production.
- Earned Value Management (EVM) techniques to track budget adherence and progress.
- ISO 9001 / AS9100 quality management systems, ensuring traceability and compliance with aerospace and defense requirements.
- Risk management protocols, with identification, mitigation, and escalation processes in place for technical, financial, or operational risks.

Weekly internal reviews will track short-term deliverables, while monthly stakeholder reviews will assess broader progress. The Clean Sustainable Energy Authority administrators will be provided with updates on progress against milestones, and risks addressed.

Continuous Improvement

Moving forward into operation, Packet Digital will employ a continuous improvement process using data from AI-driven quality control systems. Process metrics such as yield, defect rates, and downtime will be reviewed weekly, ensuring proactive improvements and alignment with DoD and commercial customer requirements. Through this structured management approach, coupled with transparent reporting and clearly defined evaluation points, Packet Digital will ensure that the project is carried out efficiently, meets its technical and commercial objectives, and delivers measurable benefits to North Dakota and the United States.

TIMETABLE

The project is structured around phased milestones, with each phase including measurable evaluation points to track progress and success. The left most green bar indicates the quarter when a task in the project started and the right most bar for a task indicates the quarter in which we expect the work to complete. The completed items are in green, while items to be completed are in blue.

The project will be evaluated against a series of defined checkpoints, including:

Construction Milestone (Q3 2024–Q1 2026): Completion of 80,000 sq. ft. facility upgrades, including dry/clean rooms, warehouses, office expansion, and R&D center. Success will be measured by building inspection approvals and readiness for equipment installation.

Equipment Procurement & Installation (Q2 2025–Q2 2026): Delivery and installation of electrode prep lines, coating ovens, formation racks, and testing systems. Progress will be measured by installation completion and commissioning tests.
Commissioning & Pilot Production (Q2–Q3 2026): Verification of initial cell production at pilot scale, including energy density (≥250 Wh/kg), discharge rates (≥5C), and cycle life (≥500). Metrics will include yield rates, defect levels, and energy density verification against design targets.
Transition to Mass Production (Q4 2026): Facility output of 24 MWh annually will serve as the benchmark for success at launch. Monthly output data, cycle life testing, and independent validation reports will be used as evaluation points.
Expansion Milestones (2028–2029): Incremental scale-up to 120 MWh annual capacity. Metrics will include throughput efficiency, workforce expansion, customer contracts secured, and revenue performance.
Workforce Development and Jobs Created: Tracking of direct hires (technicians, engineers, managers) against the target of 33–100 full-time employees, with evaluation based on both numbers hired and retention rates.

Expected Project Timelines

procedure	Estimated time required (weeks)	Q1 1	Q2 14	Q3 27	Q4 40	Q5 53	Q6 66	Q7 79	Q8 92	Q9 105	Q10 118	Q11 131	Q12 144	Q13 157	Q14 170	Q15 183	Q16 196
1. Document Requirements for Production Line Capacity																	
1.1 Finalize Production Line Requirements	2																
1.2 Finalize Production Capacity Requirements	3																
2. Document requirements for flexible production line, related laws, and regulations																	
2.1 Finalize flexible production line requirements	2																
2.2 Research and document local applicable laws	3																
2.3 Research and document applicable local and federal regulations.	3																
3. Obtain Approvals																	
3.1 Identify optimal areas in the city of Fargo area	2																
3.2 Search for potential Locations	2																
3.3 Review and Select site	2																
3.4 Close on Land Purchase	8																
4. Design and Build Facilities																	
4.1 Finalize the technical process details	2																
4.2 Plant layout design	8																
4.3 Technical and after-sales requirements for production, testing and other equipment and instruments	8																
4.4 ITB (Invitation to Bid) released, Vendors Proposal Evaluation	6																
4.6 Obtain Necessary Permit	6																
4.7 Construction	52																
4.8 Receive Certificate of Occupancy	1																
5. Select and Procure Equipment																	
5.1 Summary List of Equipment & Asset Purchased.	1																
5.2 Equipment selection	8																
5.3 Equipment and instrument manufacturing supervision and certification	40																
5.4 (FAT) Factory acceptance test (FAT) for equipment and instrument	3																
5.5 Equipment transportation	6																
6. Install and Commission Equipment																	
6.1 Equipment Machinery Installation	8																
6.2 Equipment commissioning	8																
7. Train Personnel																	
7.1 Personnel training	8																
7.2 Various tests and analysis	8																
8. Execute Pilot Production																	
8.1 Preparation before pilot production	4																
8.2 Minor and pilot tests	12																
8.3 Project Final Acceptance	1																
9. Start Mass Production																	
9.1 Start 1 Shift Operation	36																
10. Transition to 3 shift operation																	
10.1 Start Two Shift Operation	36																
10.2 Start 3 Shift Operation	1																

BUDGET

The total development cost of the Packet Digital project is $100,827,845, financed through a combination of public and private sources. This budget reflects the high degree of safety, automation, and environmental compliance required for lithium-ion cell manufacturing. The first column describes the expense, and the first row shows the contribution from different stakeholders.

Expense	NDIC	Packet Digital	PD - Navy	Bank Sponsor	SBA 504	NMTC	NDDF	NDIC-2	NDIC-2 Grant	Sum Total	%
Land/Building	$1,470,000			$5,880,000						**$ 7,350,000**	7%
Improvements	$1,377,483	$237,459	$2,200,000	$12,463,500	$5,381,200		$5,000,000	$12,794,389		**$ 39,454,031**	39%
R&D									$2,297,376	**$ 2,297,376**	2%
Interest	$511,661	$848,543								**$ 1,360,204**	1%
Fees	$106,781	$138,062				$868,103				**$ 1,112,946**	1%
Equipment	$7,305,400			$5,961,213		$2,305,897		$1,048,270		**$ 16,620,780**	16%
Inventory	$56,340	$2,419,868	$476,471							**$ 2,952,679**	3%
Technology, Consulting, Patents	$6,172,335	$6,827,665						$5,000,000		**$ 18,000,000**	18%
1st Yr Eng & Exp			$620,000							**$ 620,000**	1%
2nd Yr Eng & Exp			$1,059,040							**$ 1,059,040**	1%
3rd Yr Eng & Exp			$3,228,988							**$ 3,228,988**	3%
4rd Yr Eng & Exp		$4,360,300	$2,411,501							**$ 6,771,801**	7%
Total	**$17,000,000**	**$14,831,897**	**$9,996,000**	**$24,304,713**	**$5,381,200**	**$3,174,000**	**$5,000,000**	**$18,842,659**	**$2,297,376**	**$ 100,827,845**	**100%**
%	17%	15%	10%	24%	5%	3%	5%	19%	2%	100%	

<u>Facility costs (Land/Building and Improvements)</u>: The Fargo facility is being designed to meet the stringent safety and performance requirements of lithium-ion battery production, including the construction of clean and dry rooms at - 40 °C dew point. These specialized environments, which account for a significant share of construction costs, are essential to ensuring both a safe workplace and the consistent quality of finished cells.

<u>Equipment costs</u>: The project requires highly specialized, automated equipment for electrode preparation, coating, calendaring, stacking, electrolyte filling, formation cycling, and testing. Equipment selection was made in consultation with experienced industry partners to ensure both safety and performance. All major equipment was procured in April 2025, and manufacturing is underway at supplier facilities. Delivery is expected by March 2026, followed by installation and commissioning.

<u>Labor Costs</u>: Personnel costs are phased in over the first three years of operation. Initial hiring focuses on engineers and technicians to support equipment installation and pilot production. Full workforce ramp-up to 100 skilled employees will occur as production scales. Average salaries are projected at $71,500 annually, ensuring high-quality employment opportunities in North Dakota.

<u>Technology Transfer</u>: The budget includes provisions for technology transfer from partners, ensuring efficient startup and process optimization. In parallel, a dedicated R&D program will advance next-generation chemistries (SiOx, NMC, graphene-enhanced electrodes) and expand long-term production capability.

<u>Financing Sources: </u>The $100,827,845 project is funded through a combination of secured and pending sources, including: $17.0M – Clean Sustainable Energy Program loan (secured), $24.3M – Private bank loan (secured), $10M – Navy grant (secured), $15M – Equity contributions from owners , $5.4M – SBA 504 program (pending), $3.2M –Dakota Business Lending NMTC program (secured), $21M – Additional requests (this application), $5.0M – NDDF request (pending).

Detailed project budgets have been created, providing further backing for the expenses we have documented and can be made available if needed.

The cost and complexity of this project is high and without funding near the requested levels it would be difficult for us to proceed with this much-needed capability.

CONFIDENTIAL INFORMATION

We are requesting that some of the information in our submittal package be kept confidential. Please see attached confidentiality request template.

PATENTS/RIGHTS TO TECHNICAL DATA

Packet Digital reserves the right to file patents related to the intellectual property generated from this proposal and will work with legal counsel to determine if additional patents could be filed. Our power management algorithms and methodology are protected by our patent portfolio. We also have copyrights and our registered trademarks include On-Demand Power®, PowerSage®, and Packet Digital ®.

STATE PROGRAMS AND INCENTIVES

Below are the State Programs that we have participated in within the last five years:

Clean Sustainable Energy Authority – 2% Interest Loans program of $17,000,000 starting from 2023.

North Dakota Development Fund – Revolving Working Capital Available Line of Credit of $500,000 from 2006 to 2021– Paid off Feb 2, 2021.

North Dakota Development Fund and Bank of North Dakota (New Venture Fund) – Preferred Equity invested of $999,999 Oct 19, 2009. On May 25, 2022, an agreement was made to commence repayment. Accrued dividend payment of $300,000 has been paid, and payments to return equity to the state on term schedule have commenced – Current balance $829,817.

Bank of ND Interest Rate Buydown– PACE Program – 3241 University Dr S, Fargo ND $200,000 – May 4, 2021, running for 81 months.

Bank of ND Interest Rate Buydown – PACE Program – 704 38th St N, Fargo ND – commenced July of 2024

North Dakota Renewable Energy Council – Solar Soaring Phase I, II, III - $1,225,000 - Feb 2017 – Aug 2017 – Naval Research Lab and US Marine Corp provided matching dollars for UAS power systems. The first extended endurance UAS power system built by Packet Digital.

North Dakota Renewable Energy Council – Portable Solar Array Modules Phase I & II – $1,000,000 - May 2018 – Sep 2020 – DoD contractor and Naval Research Lab through Office of Secretary of Defense provided matching funds - last customer revisions occurred Sept 2023. Systems currently shipping to customers.

Clean Sustainable Energy Authority Briefing

North Dakota Lithium-Ion Battery Manufacturing Plant

Amount of Request

Grant: $2,297,376

Loan: $18,842,659

Terri Zimmerman CEO
Email: terri.zimmerman@packetdigital.com
Phone: (701) 365 4421
packetdigital.com


POWER TO THE (DRONES)
That's Our Battery
PacketDigital

Military and Commercial Customers

UNITED STATES ARMY

UNITED STATES NAVY

UNITED STATES MARINE CORPS

AIR FORCE RESEARCH LABORATORY

UNITED STATES NAVY NAVAL RESEARCH LABORATORY

NASA

UNITED STATES SPACE FORCE DEPARTMENT OF THE AIR FORCE MMXIX

LOCKHEED MARTIN

ANDURIL

KRAUS AEROSPACE

GRIFFON AEROSPACE

Platform AEROSPACE

SNC SIERRA NEVADA CORPORATION

SHIELD AI

BELL

CISCO

JOHN DEERE

intel

Uber


U.S. ARMY
AMERICA'S NAVY
MARINES
AFRL
AIR FORCE RESEARCH LABORATORY
U.S. NAVAL RESEARCH LABORATORY
NASA
UNITED STATES SPACE FORCE
PacketDigital


SKYWAYS
PTERO DYNAMICS
L3HARRIS
SHIELD AI
KRAUS HAMDANI AEROSPACE
LOCKHEED MARTIN
ANDURIL
GRIFFON AEROSPACE
PacketDigital

Our Superpower

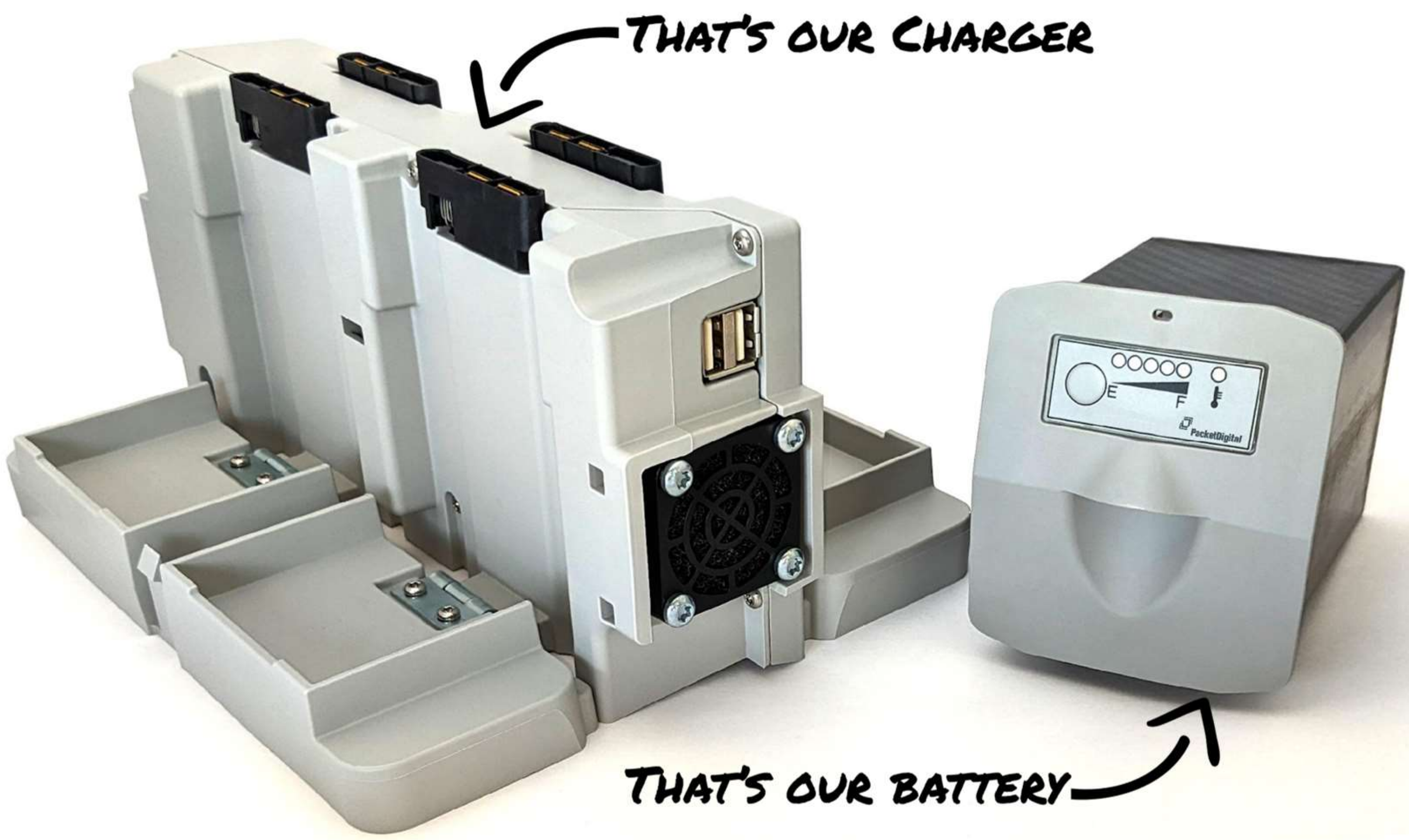
We Build
Great Batteries

Highest Performance

Longest Lasting

Safest

Made in the USA



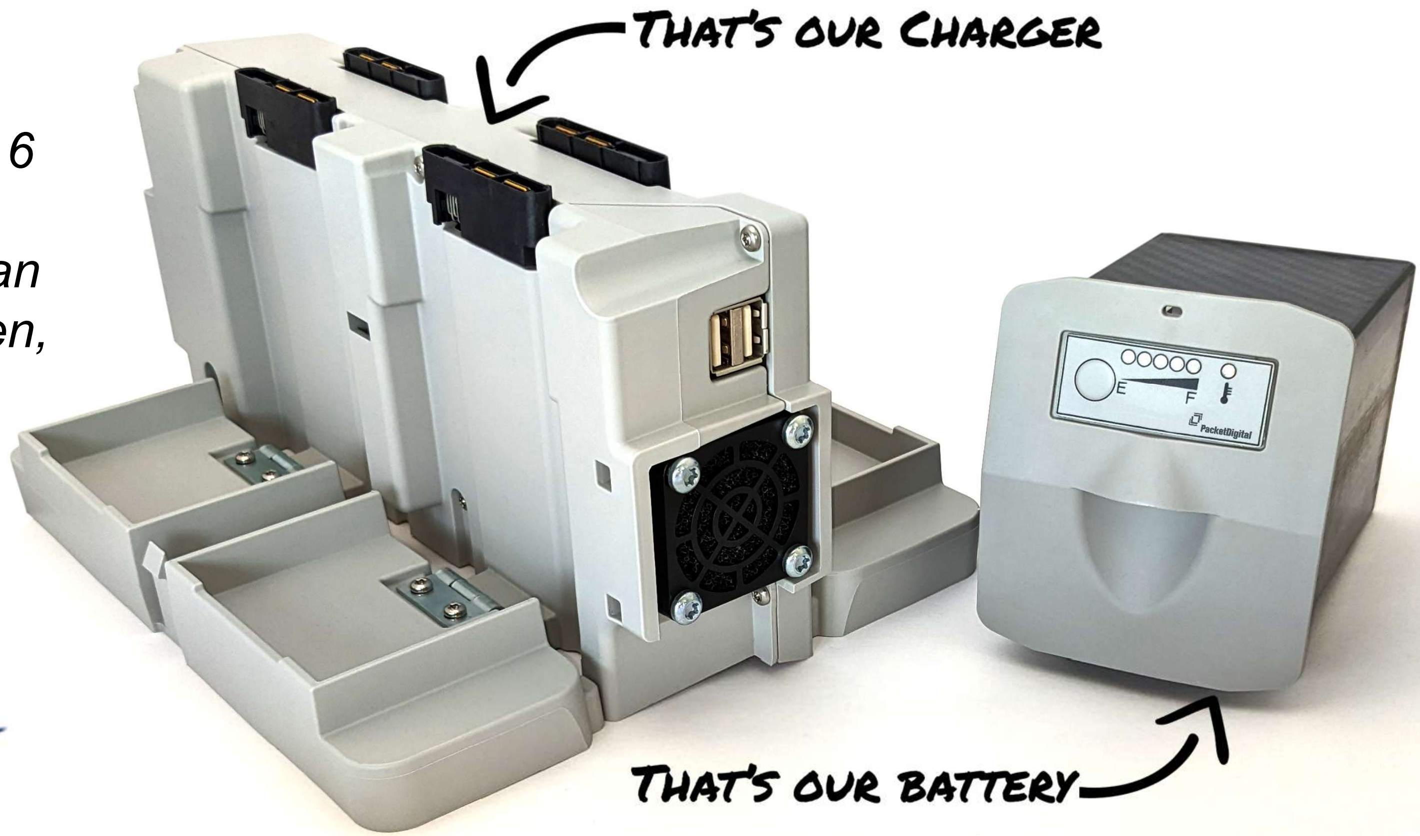
PacketDigital

Our Superpower

We have been cycling Packet Digital's battery for 6 months. It is now at 1000 cycles that's 10X better than anything we have ever seen, and it only shows 11% degradation"

Lockheed Martin, Chief Engineer

LOCKHEED MARTIN




BADLAND
BATTERIES
LiHV
BADLAND BATTERIES
12S 17000 mAh
6S 23000 mAh
High Capacity Lithium-Ion Battery
6S 17000 mAh
PacketDigital

Smart Charging

4 Port Charger

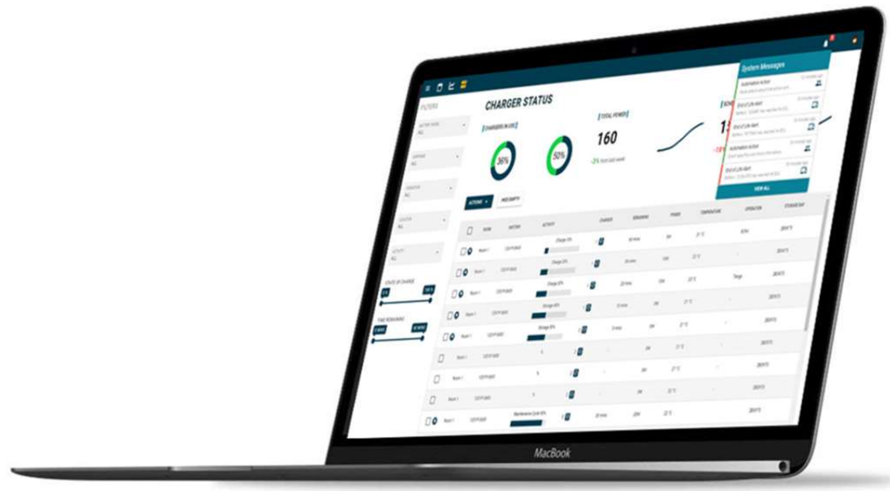
- Field charger for up to 4 batteries with data collection
- Charge or discharge 2 batteries simultaneously at up to 22A each
- Supports LiPo, LiHV, LiFe, and Li-Ion chemistries

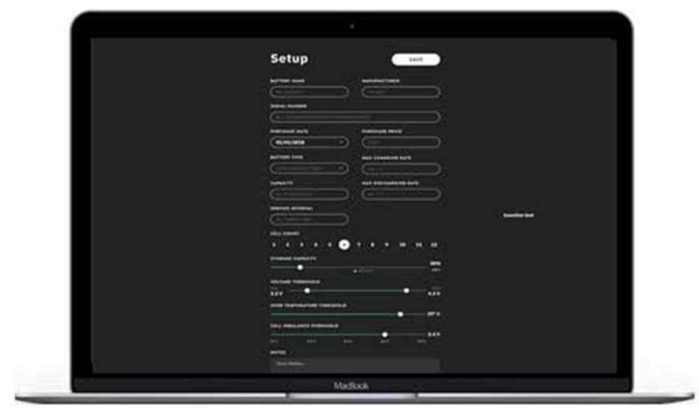
Rack Mounted Chargers

- Batteries slide into rack systems
- No user interface, battery fleet software tracks the batteries
- Heavy duty steel construction built to withstand a battery failure event
- Notifies user when battery should be replaced

Battery Fleet Management Software

- See latest status, notifications of faults and end-of-life
- Battery profile inventory
- Smart battery creates its own profile
- Data is synced to the cloud during charger operations
- Automated reporting
- Summary of healthy and unhealthy batteries
- Proactive battery replacement notification





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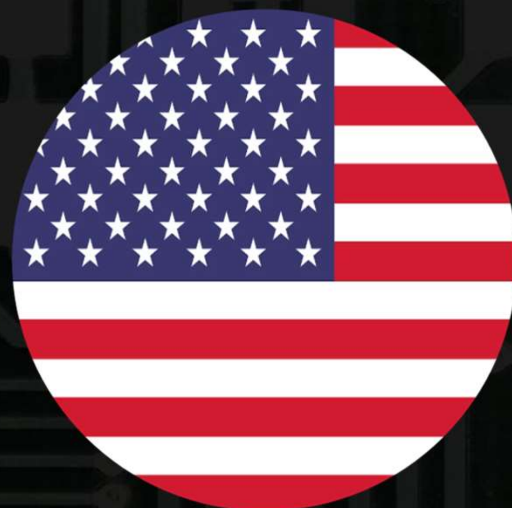
The Problem (Opportunity)

14307

Executive order
to secure drone supply
chain, including batteries



100%

Of U.S. government
agencies have country of
origin requirements
for drones

95+%

Drone batteries today are
manufactured
in China

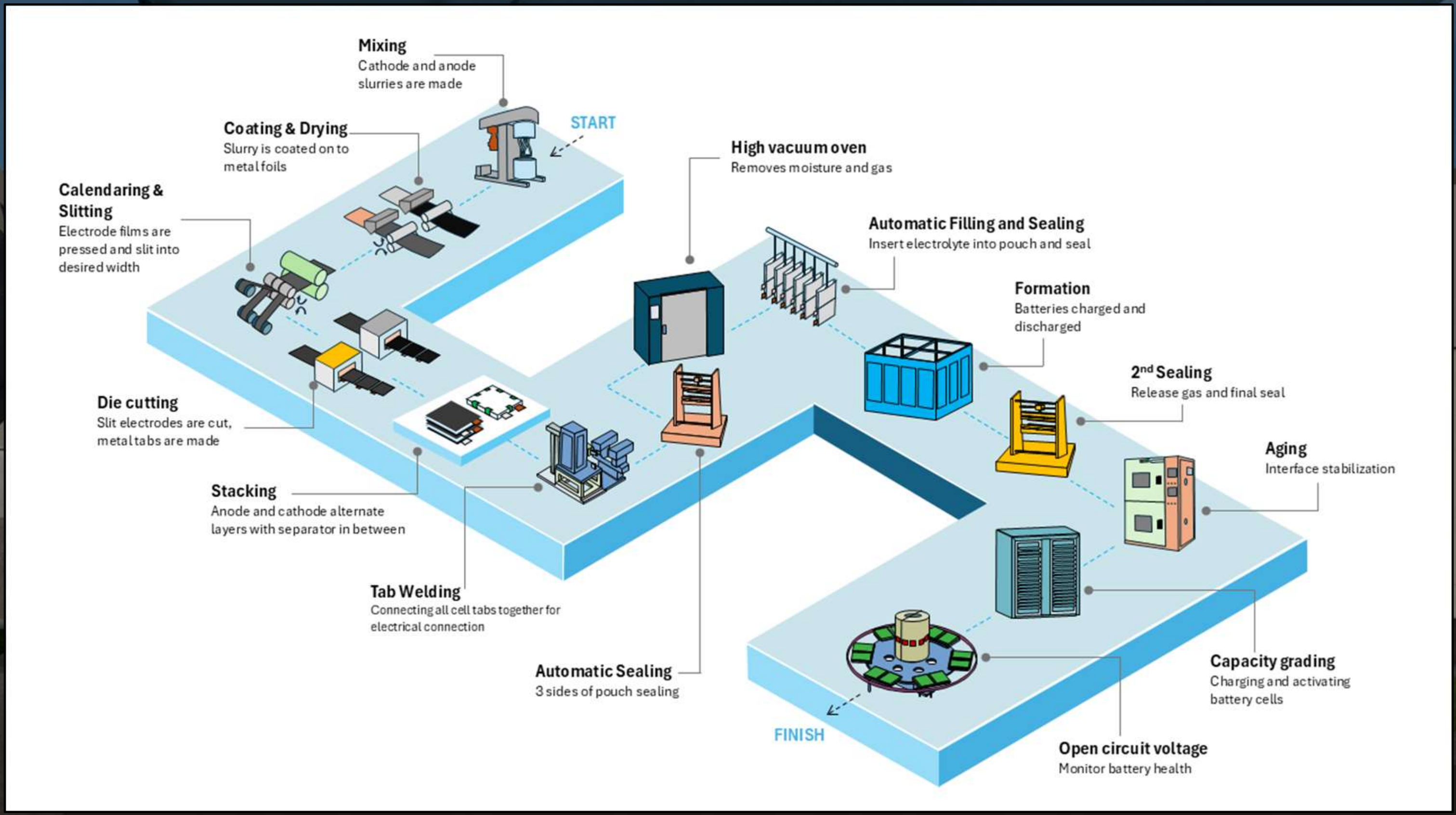
Our Solution

A Battery Cell Factory in North Dakota

PacketDigital

Badland Batteries End-to-End Manufacturing

- Packet Digital commercializes High-performance Lithium-ion pouch cell manufacturing technology designated for the UAS market.
- Packet Digital's Trade Secret and Know-how are not disclosed to the public.



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Technology Commercialization Timeline

Plant design

- Plant design, permitting, and construction
- Equipment selection and negotiation

Pilot and Production ramp-up

- Production equipment installation and commissioning
- Pilot run and Production ramp up
- 1 Shift/day, 2,000 pcs/day (3-30 Ah pouch)

- **3 most popular cell technologies**
- **Products serving existing DoD and Commercial customers**

2024 — **2025** — **2026** — **2028**

Power cell Done UAS systems (LCO, NMC cathode/ low Si content anode)

Factory build-out
MEP Equipment installation, Commissioning

- Equipment and Material ordering
- MEP equipment installation and commissioning

- **Sample cells: R&D, Evaluation, Test and Performance evaluation**

48 MWh

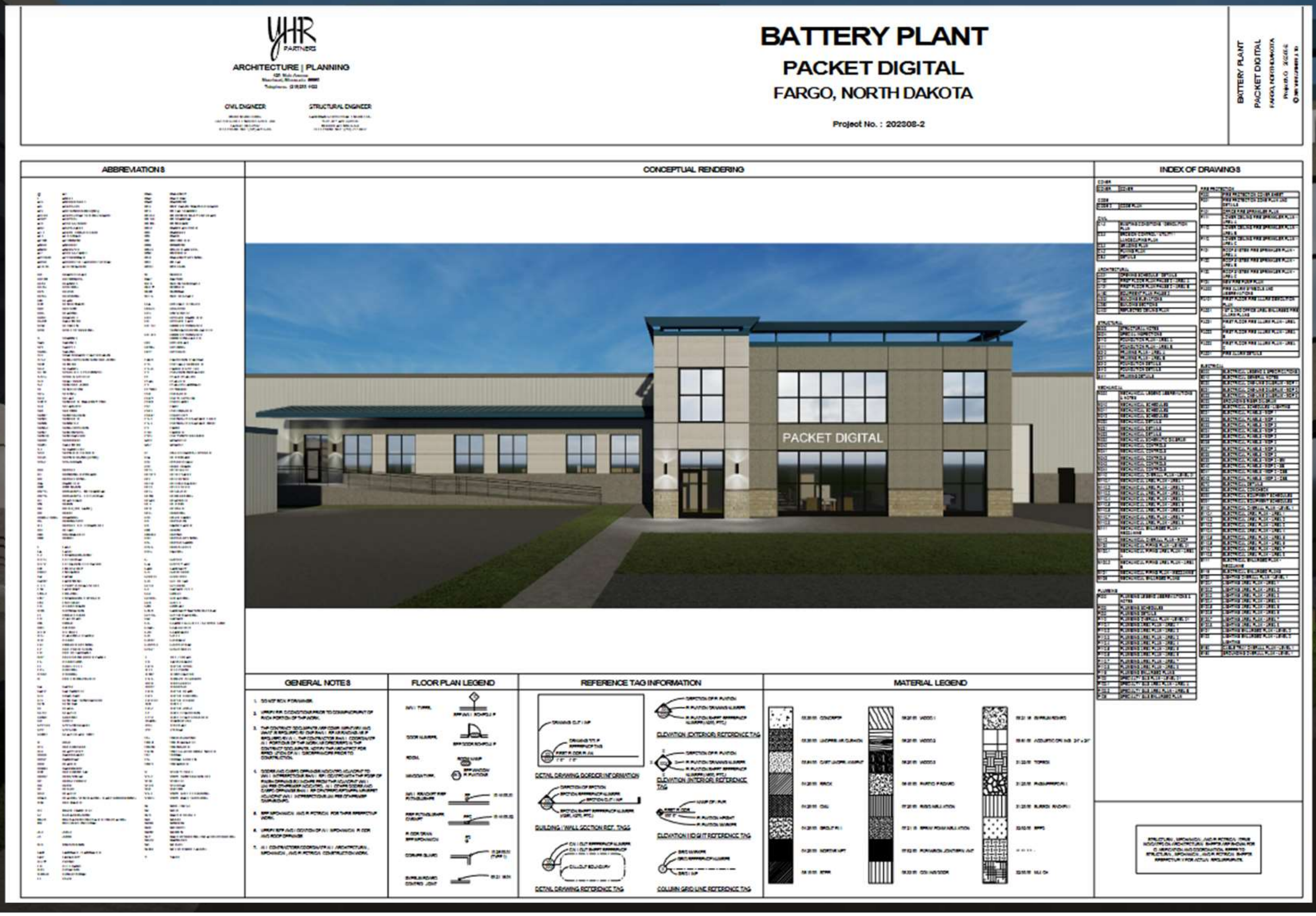
- Production expansion: equipment procurement
- 1 Shifts/day
- 5,000 pcs/day (3-30 Ah pouch)

- **3 existing cell technologies + 2 advanced new technologies**
- **Products mainly serving new commercial customers**

Cell Plant Construction update

Items	Percentage	Status	Timeline to finish
Factory Engineering Design: Construction design	100%	Finished	June 2025
Clean/Dry room Construction Design	100%	Finished	Feb 2025
Obtain necessary permits from related authorities	100%	Finished	June 2025
Manufacturing Equipment Ordering progress	100%	Finished	April 2025
MEP Equipment Ordering Progress	100%	Ontrack	Oct 2025
Manufacturing Equipment FAT	95%		Feb 2026
Factory Construction	65%	Ontrack	Feb 2026
Clean/Dry room Procurement/ Construction	65%	Ontrack	April 2026
MEP Construction	55%	Ontrack	June 2026
Equipment Installation and Commissioning	0%	Not Started	July 2026
Pilot Run	0%	Not Started	Oct 2026
Project Acceptance	0%	Not Started	Nov 2026
R&D center starts to operate	45%	Ontrack	May 2026

Badland Batteries – Detailed layout



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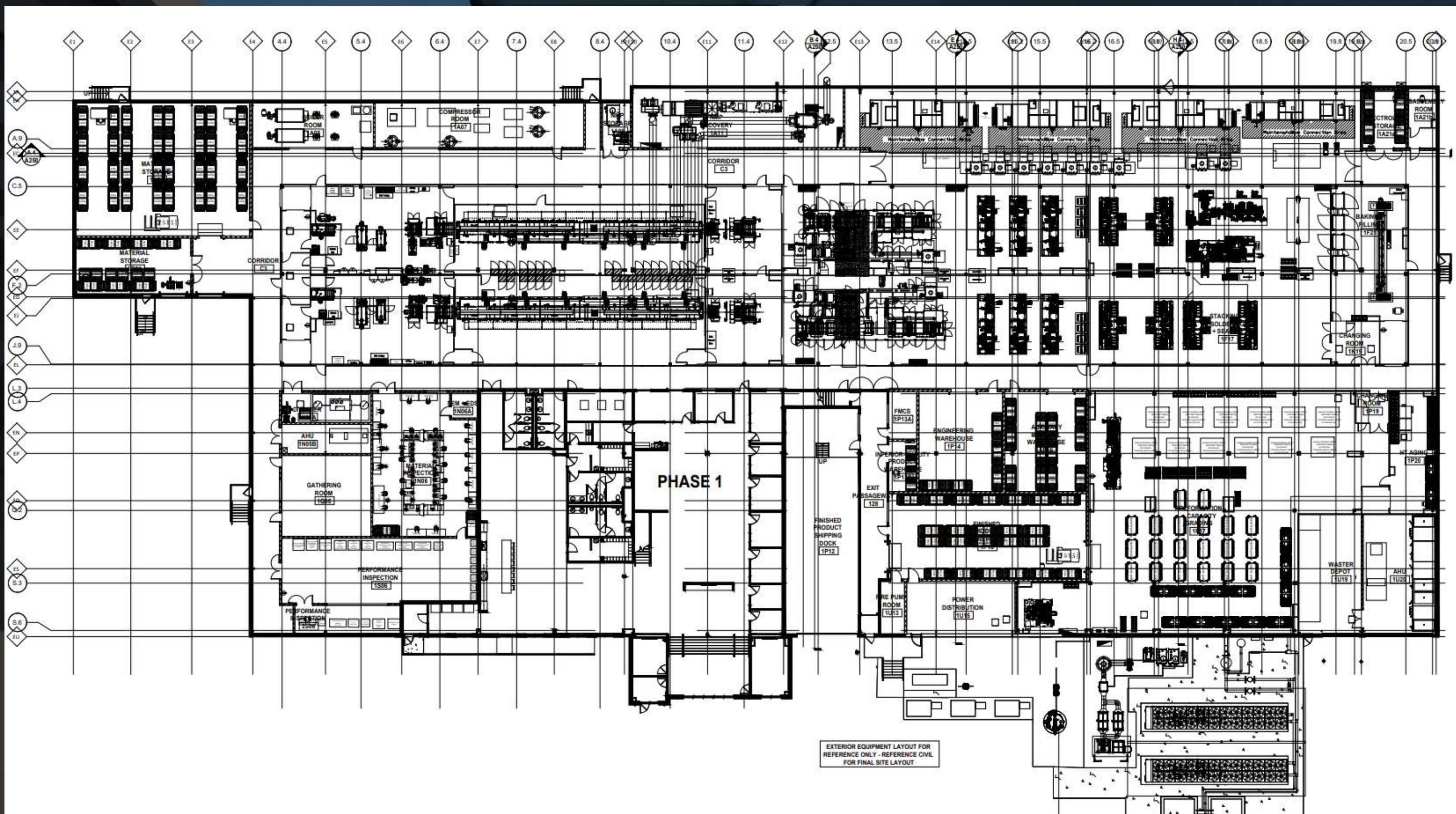
Badland Batteries – Equipment Layout



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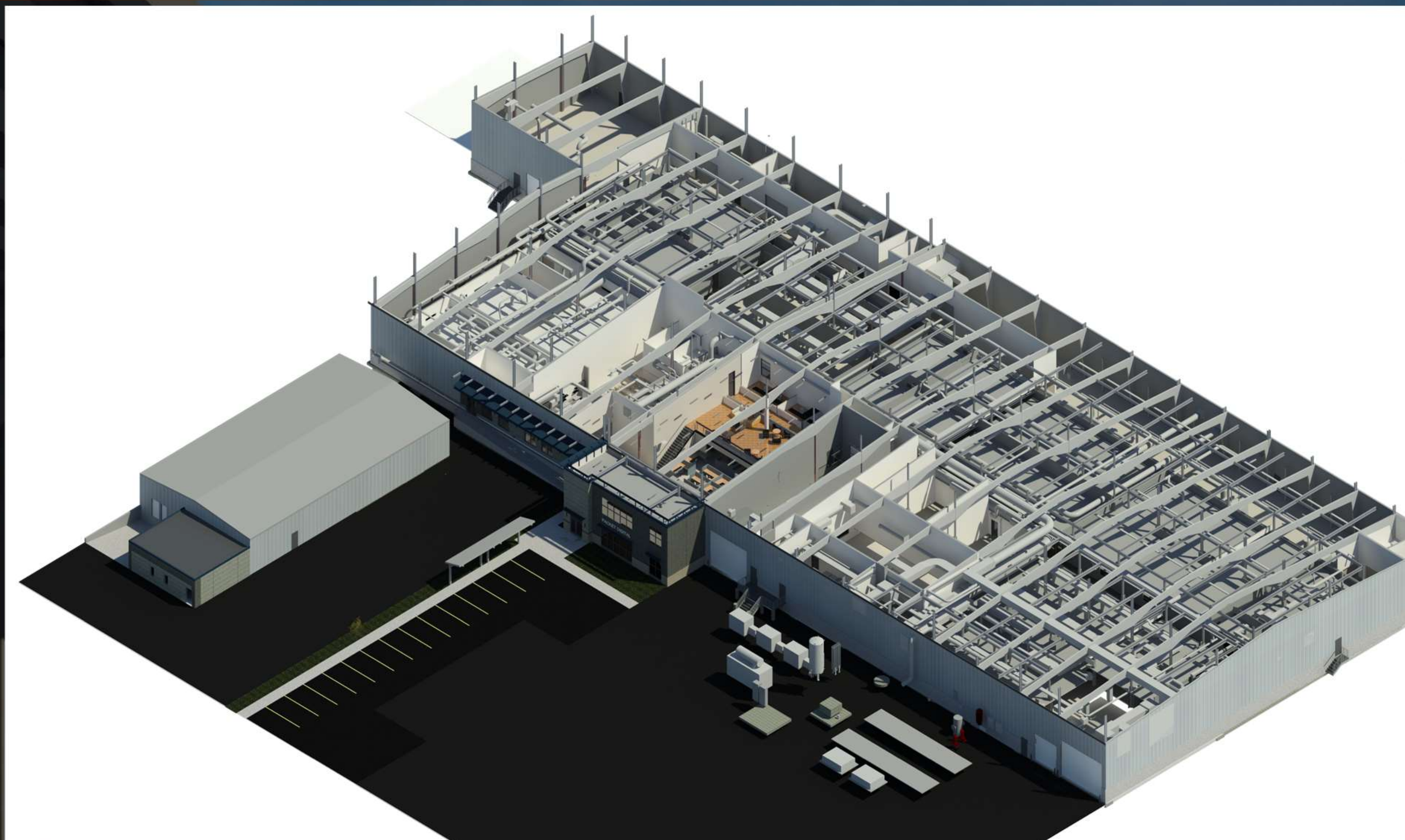
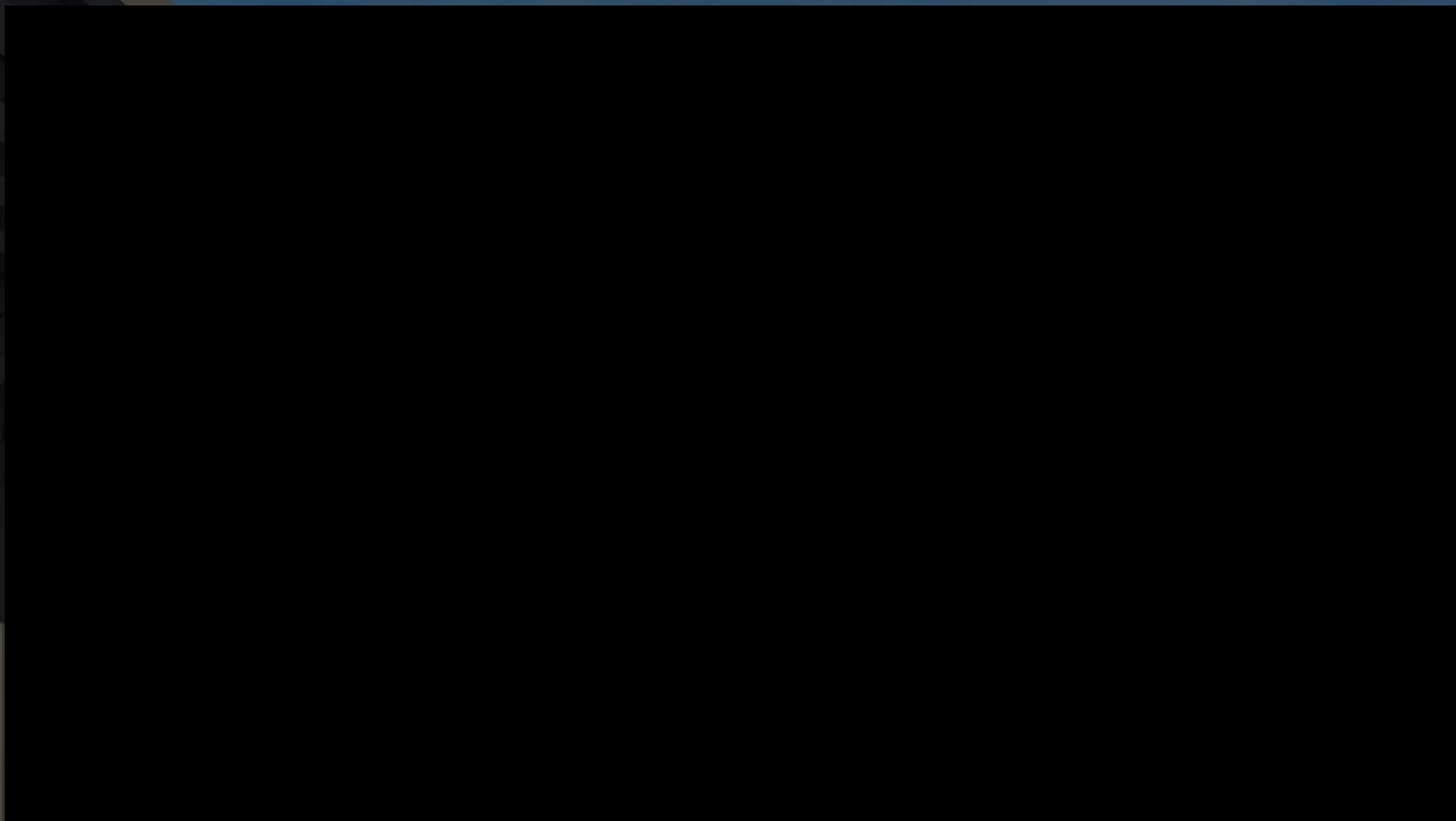
Badland Batteries – Equipment snapshot

Badland Batteries – 3D design rendering



PacketDigital

Badland Batteries - Construction update



Increased capacity to meet the increased demand

Rapidly Growing Defense Demand
Missiles, satellites, drones, and directed-energy systems require advanced battery technologies at increasing scale.

New Contract and proposal requests & Strategic Contract Requirements
As an awardee, we must deliver reliable, scalable U.S.-made energy systems to support mission-critical programs.

Strengthening U.S. Supply Chain Security
Foreign-sourced batteries and components face new restrictions and vulnerabilities. Expanding U.S. production ensures resilience and national security.

Ability to Meet Large-Scale Orders
Higher throughput allows us to respond quickly to surge needs, program ramp-ups, and multi-year government procurements.

Accelerating Innovation-to-Production
Increased factory capability shortens the path from prototype → qualification → fielded systems.

Badland Batteries Cell Facility Costs

Expense	2,000/8hr (Original budget)	5,000 pcs/8hr (CSEA2 Design future expansion)
Land/Building	$ 2,500,000	$ 7,350,000
Improvements	$ 14,334,500	$ 33,860,031
R&D	$ -	$ 2,297,376
Interest	$ 1,136,564	$ 1,360,204
Fees	$ 252,518	$ 1,112,946
Equipment	$ 13,872,649	$ 16,620,780
Dry/Clean room		$ 5,594,000
Inventory	$ 2,952,679	$ 2,952,679
Technology, Consulting, Patents	$ 14,346,265	$ 18,000,000
1st Yr Eng & Exp	$ 1,019,368	$ 620,000
2nd Yr Eng & Exp	$ 2,587,755	$ 1,059,040
3rd Yr Eng & Exp	$ 4,385,333	$ 3,228,988
4th Yr Eng & Exp	$ -	$ 6,771,801
Total	$57,387,630	$ 100,827,845

PacketDigital

Project Financial Sources and Uses

Expense	NDIC	Packet Digital	PD - Navy	Bank Sponsor	SBA 504	NMTC	NDDF	NDIC-2	NDIC-2 Grant	Sum Total	%
Land/Building	$1,470,000			$5,880,000						$ 7,350,000	7%
Improvements	$1,377,483	$237,459	$2,200,000	$12,463,500	$5,381,200		$5,000,000	$12,794,389		$ 39,454,031	39%
R&D									$2,297,376	$ 2,297,376	2%
Interest	$511,661	$848,543								$ 1,360,204	1%
Fees	$106,781	$138,062				$868,103				$ 1,112,946	1%
Equipment	$7,305,400			$5,961,213		$2,305,897		$1,048,270		$ 16,620,780	16%
Inventory	$56,340	$2,419,868	$476,471							$ 2,952,679	3%
Technology, Consulting, Patents	$6,172,335	$6,827,665						$5,000,000		$ 18,000,000	18%
1st Yr Eng & Exp			$620,000							$ 620,000	1%
2nd Yr Eng & Exp			$1,059,040							$ 1,059,040	1%
3rd Yr Eng & Exp			$3,228,988							$ 3,228,988	3%
4rd Yr Eng & Exp		$4,360,300	$2,411,501							$ 6,771,801	7%
Total	**$17,000,000**	**$14,831,897**	**$9,996,000**	**$24,304,713**	**$5,381,200**	**$3,174,000**	**$5,000,000**	**$18,842,659**	**$2,297,376**	**$ 100,827,845**	**100%**
%	17%	15%	10%	24%	5%	3%	5%	19%	2%	100%	

Project Financial Sources and Uses

	Total Requested Funding			Total Secured Funding					
Expense	**NDIC**	**NDIC-2**	**NDIC-2 Grant**	**Packet Digital**	**PD - Navy 1**	**PD - Navy 2**	**Bank Sponsor**	**SBA 504**	**NMTC**
Land/Building	$1,470,000						$5,880,000		
Improvements	$1,377,483	$12,794,389		$1,991,269	$2,200,000		$12,463,500	$5,381,200	
R&D			$2,050,000						
Interest	$511,661			$721,996					
Fees	$106,781			$107,447					$868,103
Equipment	$7,305,400	$1,048,270					$5,961,213		$2,305,897
Inventory	$56,340				$476,471	$639,700			
Technology, Consulting, Patents	$6,172,335	$5,000,000							
Reserve Account				$1,504,648					
1st Yr Eng & Exp					$620,000				
2nd Yr Eng & Exp					$1,059,040				
3rd Yr Eng & Exp					$3,228,988				
4rd Yr Eng & Exp					$2,411,501	$4,360,300			
Total	**$17,000,000**	**$18,842,659**	**$2,050,000**	**$4,325,360**	**$9,996,000**	**$5,000,000**	**$24,304,713**	**$5,381,200**	**$3,174,000**
Total	$37,892,659			Current spent			$52,181,273		
% of total project cost	38%			52%					

Requested amounts and Uses

$18,842,659 in Loan

$12,794,389:

- Cover a portion of Mechanical (1 Boiler, 4 Chillers, 1 Compressed air system, 3 Vacuum systems, 1 Nitrogen system, 4 Dehumidifiers and 3 Air handling units), Plumbing (piping systems for the mechanical system and underground plumbing), Electrical (Switchgears, Transformers, Electrical Cabinets, Power distribution, lighting and fire alarm system), Fire protection (Sprinkler system)

$1,048,270

- Cover a portion of the Production equipment, amounted at $11,321,054

$5,000,000

- Cover the expense for the core technology bundle (Cathode, anode and electrolyte formula, Cathode and anode mixing technology, BOM, Raw Material vendor lists, Raw Material specification requirements, etc.

$2,297,376 in Grant

- R&D Lab Equipment (Equipment for making prototype cells for developing new chemistries and sample cells for customers)
- Chemical Material Test Facility (Equipment for Physical and Electrochemical testing of the raw materials, electrodes, and post-molten analysis)
- Equipment FAT Material Cost (Material cost that is needed for conducting FAT for the Equipment)

Supply Chain: Domestic and allied countries

Item	Sub-Components	Raw Materials	Description	Potential Supplies
1	Cathode Electrode	Cathode Material	Li_2CoO_2	Japan
2		Cathode Binder	PVDF	Europe
3		Cathode Electric Conductive #1	Super P	USA
4		Cathode Electric Conductive #2	CNTs	USA
5		Cathode Electric Conductive #3	Graphene	USA
6		Cathode Solvent	NMP	USA
7		Cathode Slurry Dispersant	PNP K30	Japan
8		Cathode Current Collector	Al Foil	USA
9	Anode Electrode	Anode Material	Synthetic Graphite	USA
10		Anode Binder #1	SBR	USA
11		Anode Binder #2	CMC	USA
12		Anode Electric Conductive #1	Super P	USA
13		Anode Solvent	De-ionized Water	USA
14		Anode Current Collector	Cu foil	USA
15	Separator	Separator	PE/PP	USA
16	Auxiliary material	Yellow Tape	PI	Japan
17		Green Tape	PI	Japan
18		Cathode Tab	Al/Tab Glue	South Korea
19		Anode Tab	Ni plated Cu/Tab Glue	South Korea
20		Al Laminated Film	PET/PP/40um Al foil/PP	USA
21	Electrolyte	Electrolyte	$LiPF_6$/EC/PC/PP+EP/nitrile/FEC/VC/PS/D013	South Korea
22	Solvent	Solvent	NMP	USA

PacketDigital

Supply chain – A state effort

Cathode

UNIVERSITY OF NORTH DAKOTA

WELLSPRING HYDRO

Li_2CO_3 from oil
waste water in ND!

$NiSO_4$ + $CoSO_4$ + $MnSO_4$ + NH_4 = NCM precursor
NCM precursor + Li_2CO_3 = **$LiNixCoyMnzO_2$** + CO_2
Co_3O_4 + Li_2CO_3 = **$LiCoO_2$** (REE-doped) + CO_2

TALON METALS CORP

Co_3O_4/$NiSO_4$

Anode

EERC
UNIVERSITY OF NORTH DAKOTA

Synthetic Graphite anode from
REE-extracted lignite mines (372 mAh/g)
ND has No. 1 lignite deposit in the world!

PacketDigital

Cathode: LCO; **Anode**: Graphite;
4.20V LCO + Graphite
4.45V LCO + Graphite
4.50V LCO + Graphite

Skydio

Teal

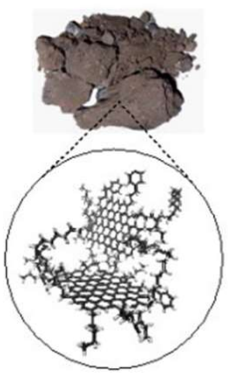
TEAL™
A RED CAT COMPANY

Cathode: NCM; **Anode**: Graphite;
4.25V Ni90 + Graphite
4.35V 523 + Graphite

- Packet Digital needs: Lithium Cobalt Oxide (LCO) power and Li Nickel Manganese Cobalt Oxide (NMC) powders.
- Packet Digital could go upstream to find Li_2CO_3, NMC precursor and Co_3O_4 to synthesize LCO and NMC (longer timeline)

Collaboration with EERC

North Dakota Lignite Mines:
- 120 - 500 ppm REEs
- 2X higher than average
- 25-35% Carbon



Lignite

Alkaline Extraction

EERC
UNIVERSITY OF NORTH DAKOTA

Synthetic Graphite (SG):
- Fast Charge Anode materials

Synthetic Graphite Pilot Plant

PacketDigital

BADLAND BATTERIES by PacketDigital

Collaboration with WellSpring Hydro

WELLSPRING HYDRO

Produced Water Recycling and Mining facility

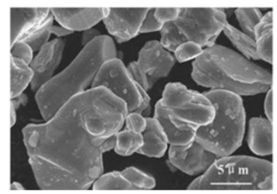
Li_2CO_3

PacketDigital

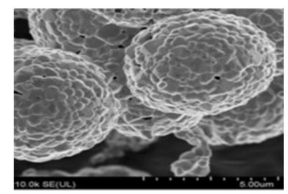
Co_3O_4 or MHP

PacketDigital

BADLAND BATTERIES by PacketDigital



REEs-doped Li_2CoO_2



REEs-doped $Li_2Ni_xCo_yMn_zO_2$

Economic and Community Impact

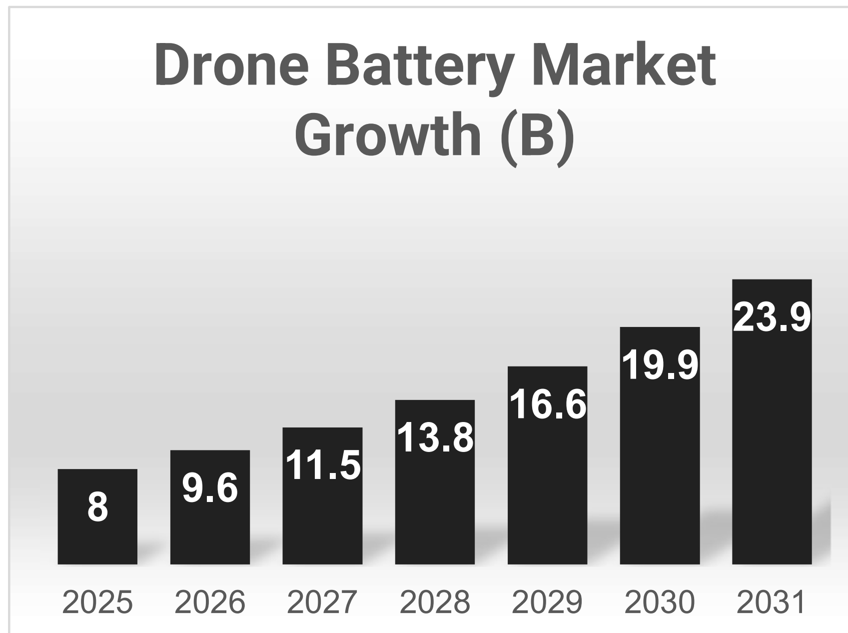
100 Full-time Job creation Jobs per shift:	Job creation during the construction phase
• 6 Manufacturing engineers • 3 Factory engineers and 3 Quality engineers • 16 Operators • 6 Supporting staff	• ~200,000 hrs of labor for the construction • ~100,000 hrs of labor during equipment installation and commissioning

Our Focus: LARGE Niche Market

North America projected to lead the battery market for drones owing to increased demand for commercial and military drones

Market Drivers

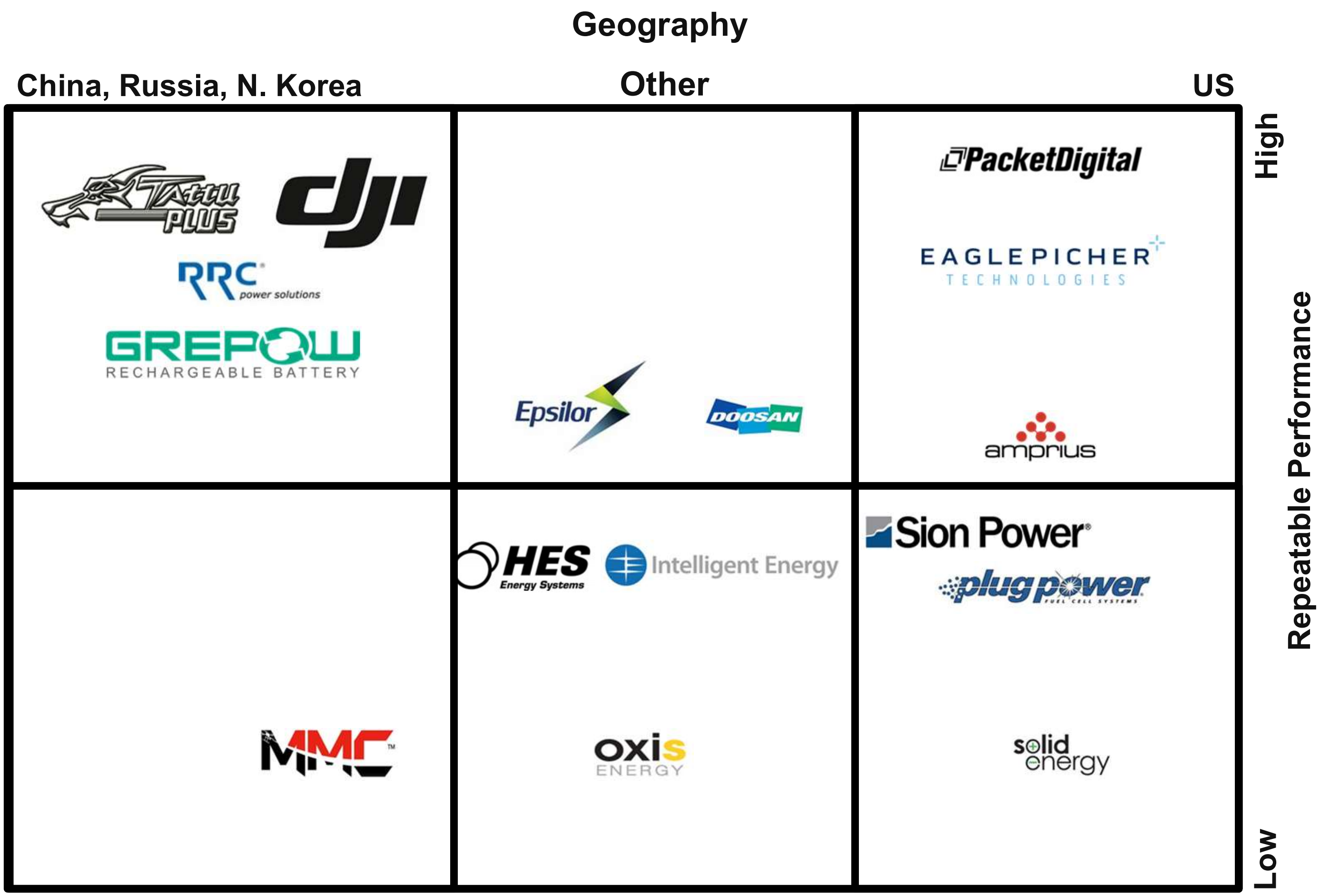
- Drone Service providers require multiple batteries per drone in order to maintain required turnaround times
- Policy changes and technology improvements are enabling viability of increased Drone application breadth
- Increasing complexity of UAS operations requires smarter and more innovative battery solutions



19% CAGR from 2025 to 2031

PacketDigital

Our Competitive Position



Competitive Differentiation

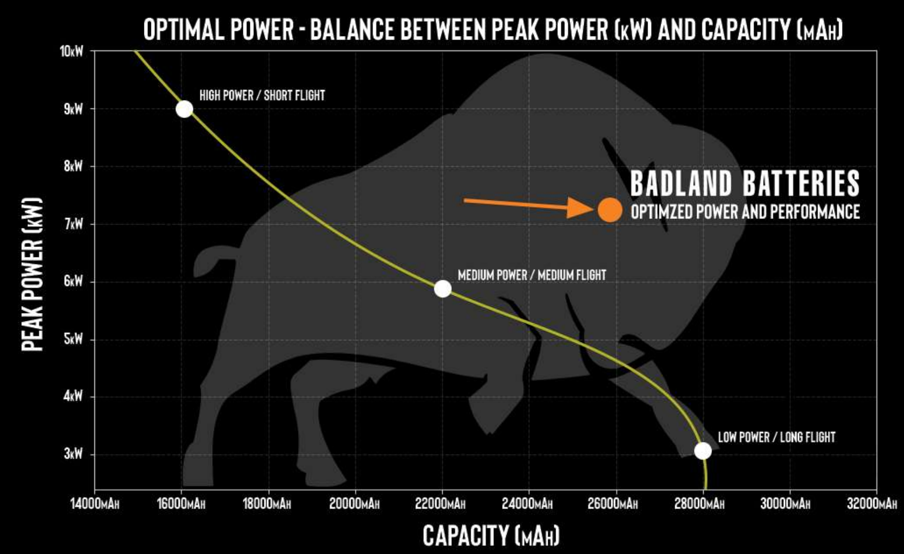
Geography

Repeatable Performance
- Quality
- Availability at scale
- Performance
- Cycle Life

Packet Digital, a US company, gets highest marks in both metrics due to our end-to-end solution, very high performance and unparalleled cycle life.

Packet Digital Competitive Advantage

- NDAA compliance
- Innovative chemistry
- Scalability and flexibility
- Only US manufacturer with dedicated facilities to make UAS cells and packs



PacketDigital

Our Leaders: Experienced/Visionary

Operations

Matt Steele

15 years designing and manufacturing advanced electronics with an education in engineering and business.

CTO

Andrew Paulsen

Key Technical Leader for the company since the inception. Well versed in all areas of the product responsible for technical strategy.

CEO

Terri Zimmerman

Over 30 Years of C-Suite Experience with multiple exits to her Credit. Nine Years as Packet Digital CEO

Director of Cell R&D

Peng Liao

23+ years of experience in Auto, Mobile, and Aviation batteries - R&D and mass production lines at leading battery facilities.

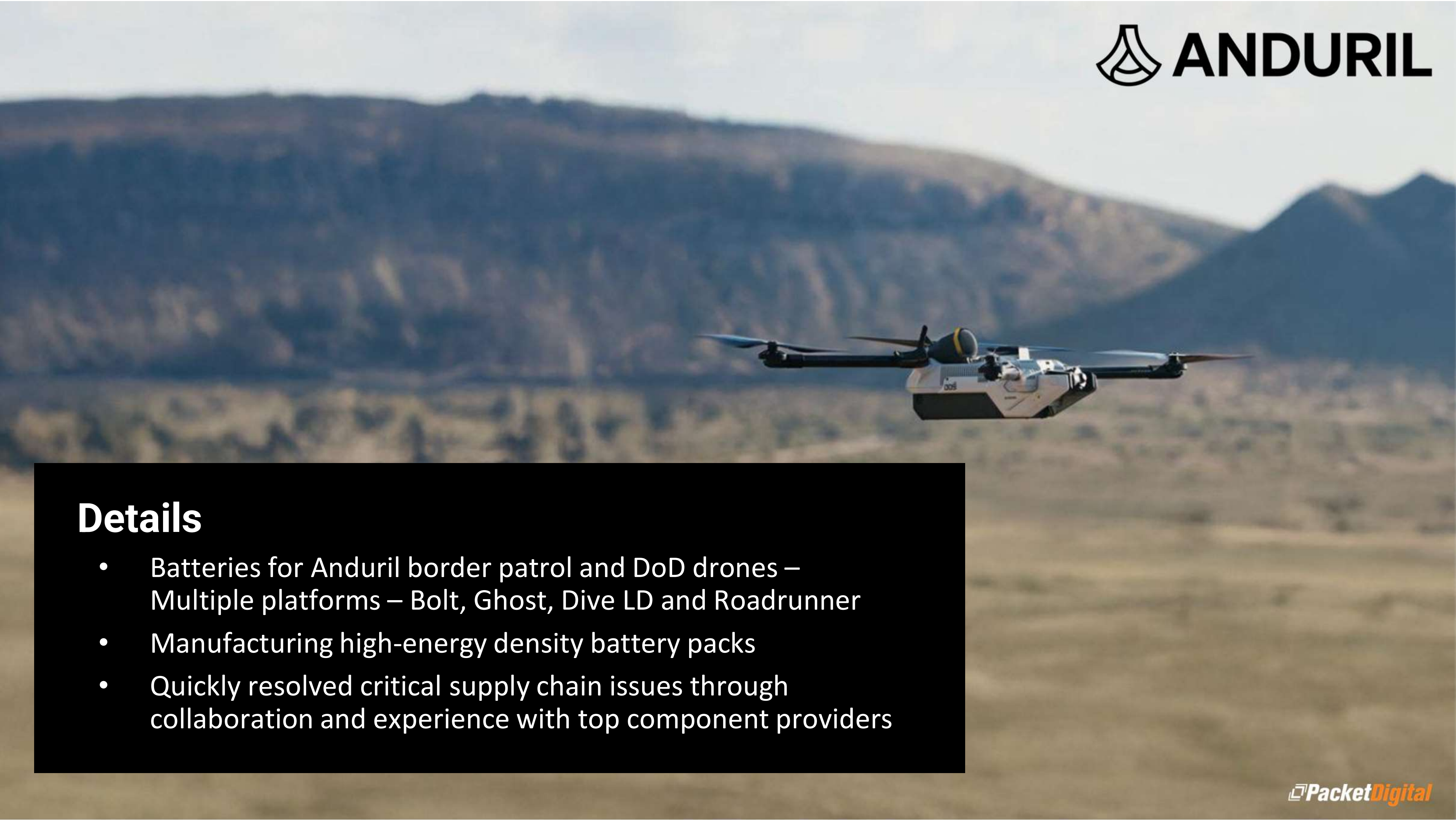
Battery Cell Director

Tan Nguyen, PhD

15+ years of experience in standing up R&D and manufacturing facilities of Li-Ion batteries

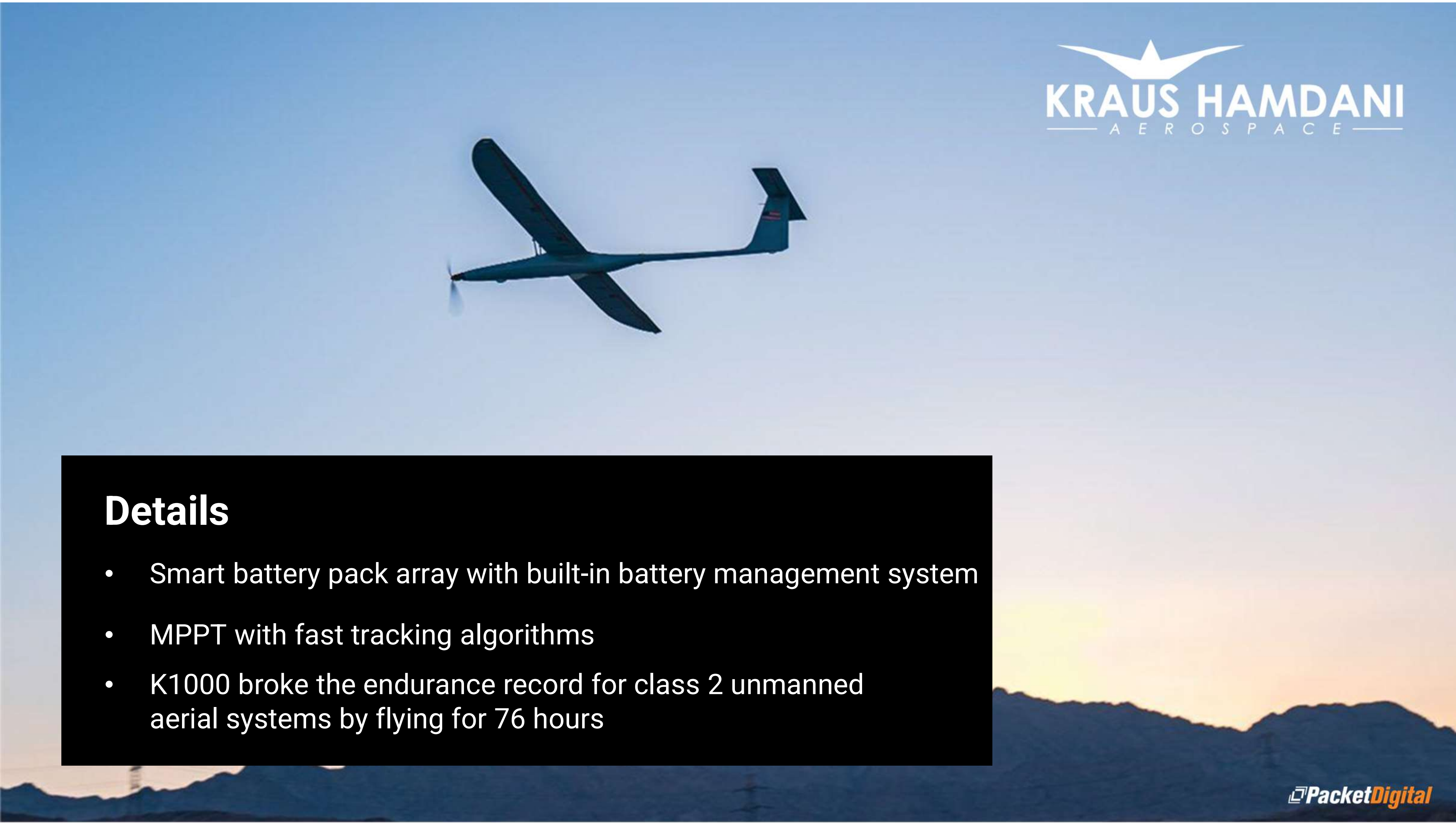
PacketDigital

New Developments



Details

- Batteries for Anduril border patrol and DoD drones – Multiple platforms – Bolt, Ghost, Dive LD and Roadrunner
- Manufacturing high-energy density battery packs
- Quickly resolved critical supply chain issues through collaboration and experience with top component providers



Details

- Smart battery pack array with built-in battery management system
- MPPT with fast tracking algorithms
- K1000 broke the endurance record for class 2 unmanned aerial systems by flying for 76 hours

Smart Battery & Charger for Lockheed Martin

“We have been cycling Packet Digital’s battery for 6 months. It is now at 1,000 cycles that’s 10X better than anything we have ever seen, and it only shows 11% degradation.”

— Lockheed Martin Chief Engineer

Textron EVTOL

Details

Manufacturing 12S 5040mAh 30C batteries and battery management systems. Manufacturing Aircraft Dock system for VTOL subsystem.

TEXTRON Systems | PacketDigital

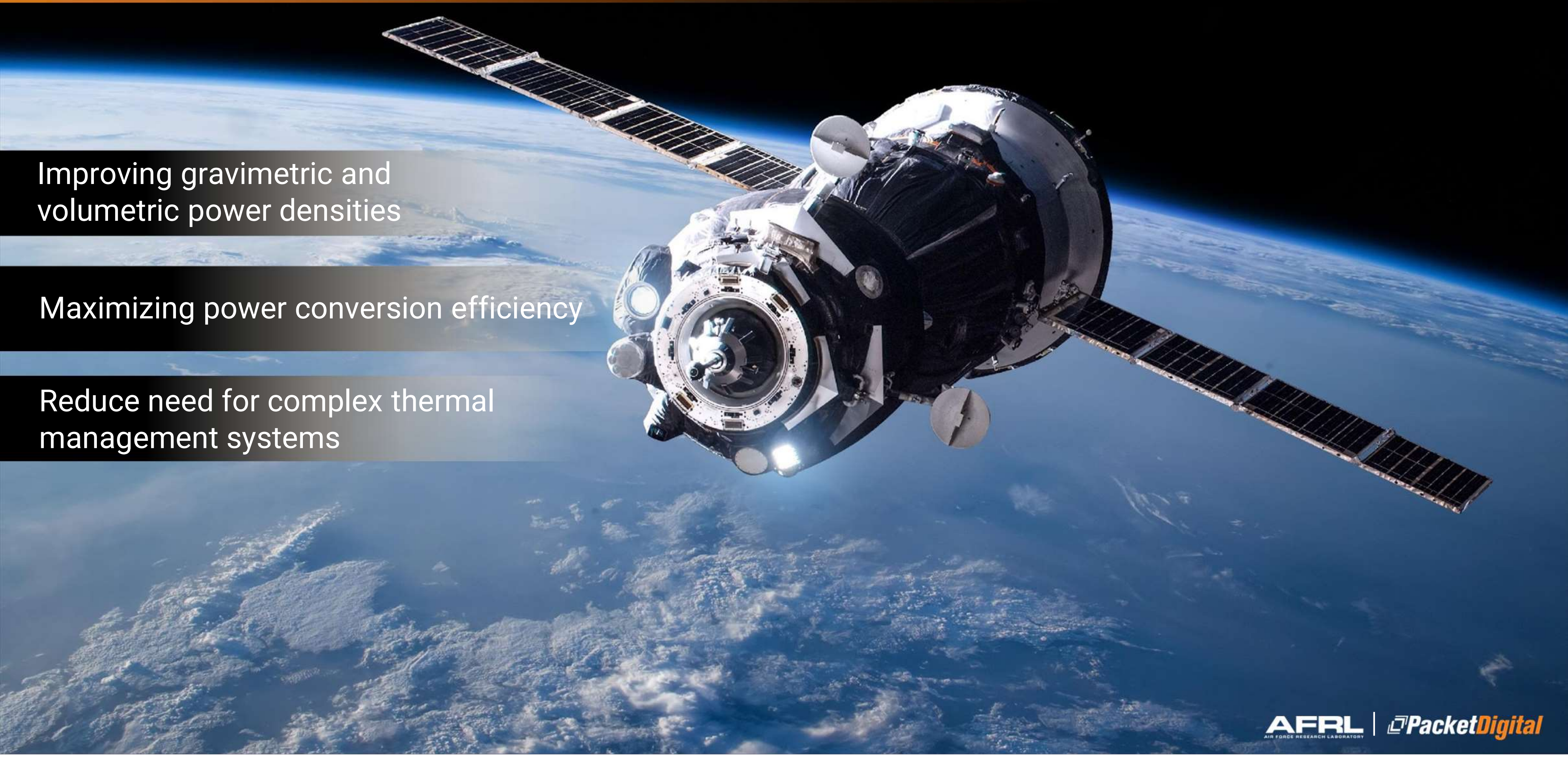
Follow-On Navy Contract Award

Awarded $5M follow-on contract with the U.S. Navy

- Expands mission-critical battery cell facility
- Strengthens long-term partnership supporting defense readiness
- Enables scaling of advanced energy systems for naval platforms

Awarded Follow-On Space Contract with Air Force

- Improving gravimetric and volumetric power densities
- Maximizing power conversion efficiency
- Reduce need for complex thermal management systems



Packet Digital secures up to $50M APFIT award

Packet Digital has been awarded up to $50 million through the Department of Defense's Accelerate the Procurement and Fielding of Innovative Technologies (APFIT) program.

This award will drive the development and production of advanced, high-performance batteries for unmanned aerial systems (UAS), supporting the U.S. Navy, Army, Air Force, and Special Operations Command.

- **U.S.-Made Battery Cells**
- **Supply Chain Resilience**
- **Defense Innovation**

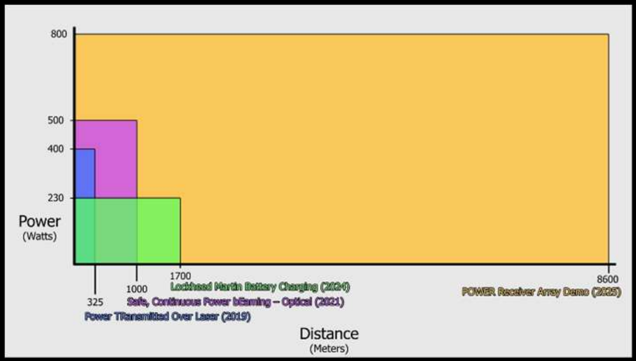
PacketDigital

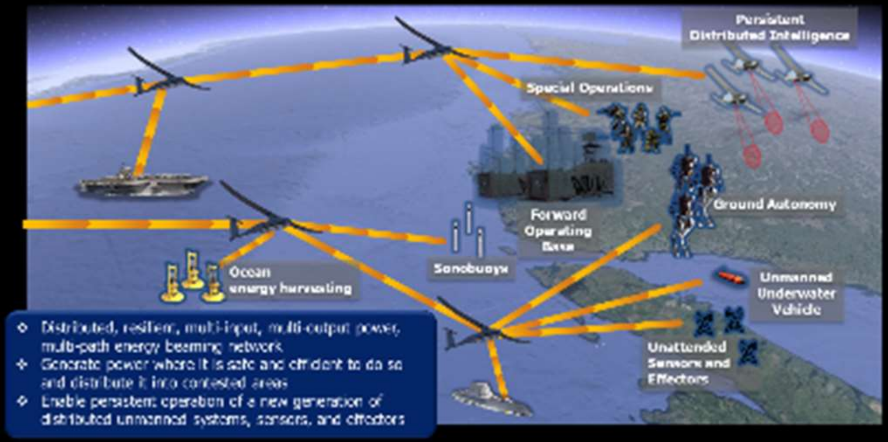
World Record in Laser Power Beaming with DARPA at White Sands Missile Range

Through a Pentagon wireless energy relay program, we achieved a record transmission of power over a distance.

The Persistent Optical Wireless Energy Relay (POWER) program team delivered 800 watts of power in 30 seconds from a laser 5.3 miles away.

Teravec Technologies, NRL, **Packet Digital** and the Rochester Institute of Technology.



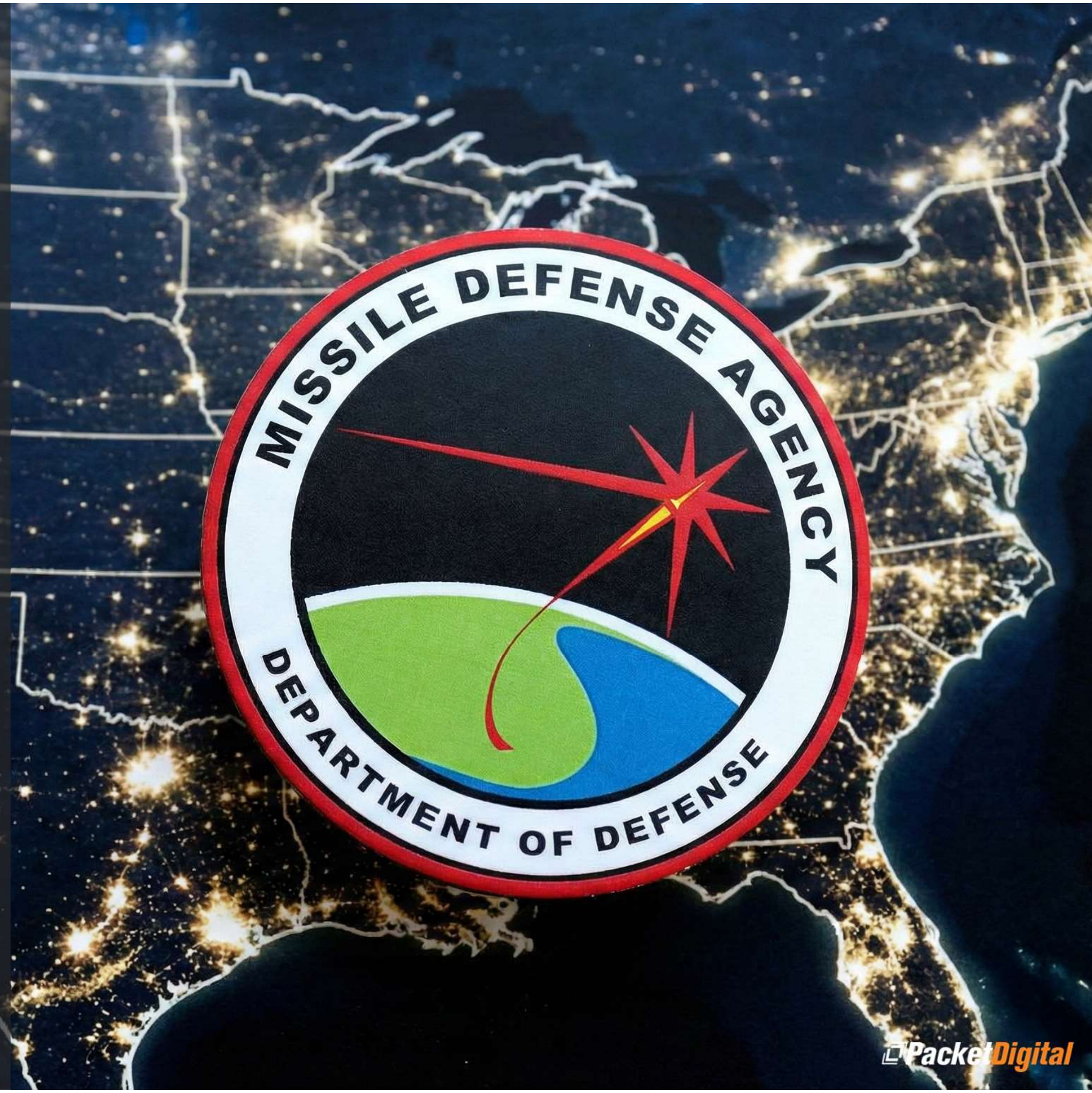


PacketDigital

SHIELD IDIQ award

Awardee under SHIELD IDIQ Contract

- Developing advanced batteries for missiles, satellites, drones
- Innovating laser power beaming energy solutions



Drone Dominance: The New Era of U.S. Unmanned Power (2025-2026)

Rapid Expansion. Industrial Mobilization. Battlefield Transformation

Historic Scale-Up of Drone Production

- The U.S. War Department launched a $1B Dominance Program aiming to purchase 60,000 by August 2026, and more than 200,000 by 2027, with long-term planning for 300,000.

Policy & Regulatory Shifts Accelerating Domestic Dominance

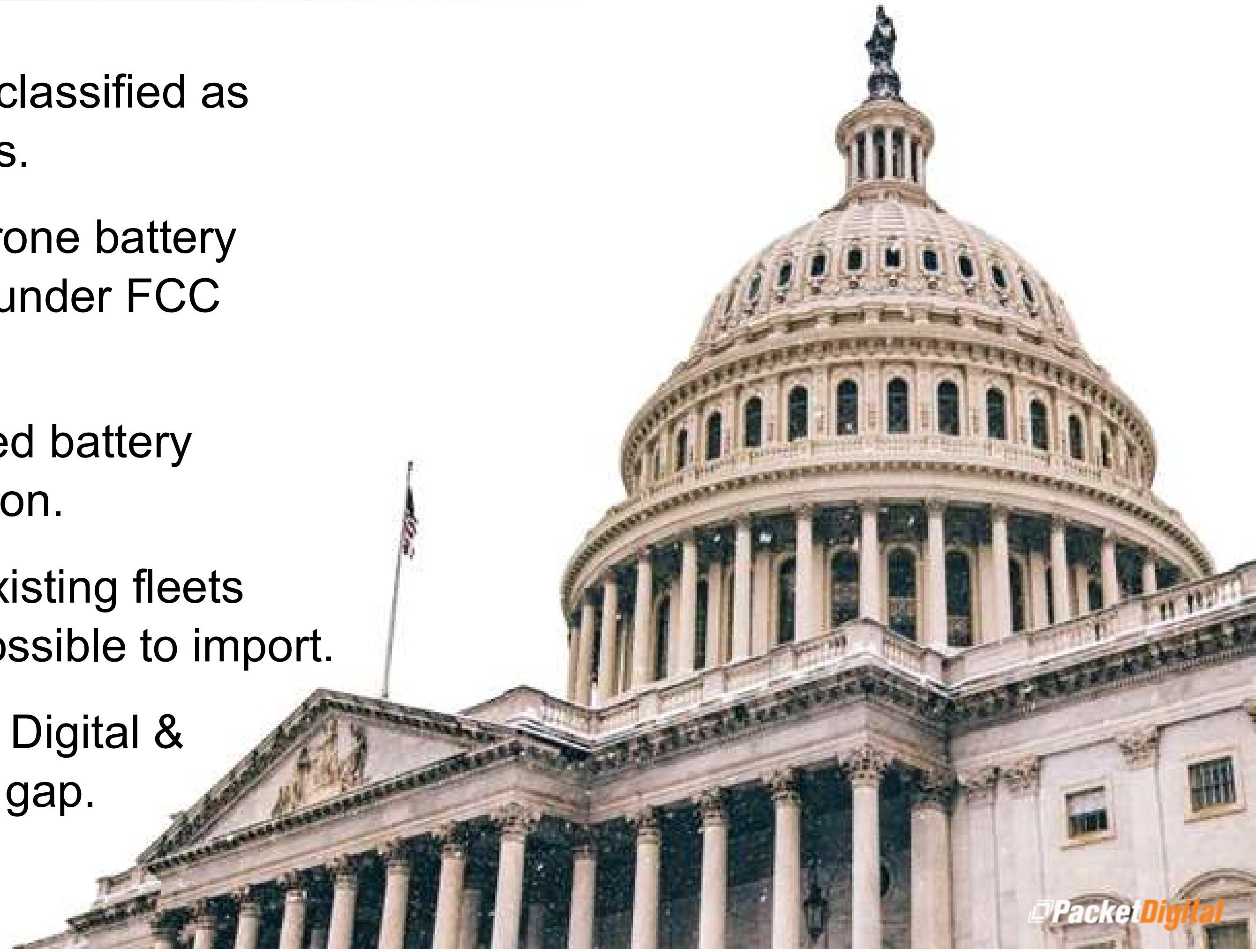
- FCC introduced pathways to fast-track approval of US made drones after expanding Covered List restrictions against foreign made systems.
- NDAA FY 2026 strengthening UAS Supply Chain.

Industrial Base Strengthening

- Executive actions aimed at reducing reliance on foreign suppliers and reinforcing US Supply.

FCC Ban: Why it Matters for Batteries

- Batteries and BMS are now classified as restricted critical components.
- China controls 99% of the drone battery supply chain—now blocked under FCC ruling.
- U.S. companies already faced battery embargoes prior to FCC action.
- Replacement batteries for existing fleets may become difficult or impossible to import.
- Major opportunity for Packet Digital & Badlands Batteries to fill the gap.



NDAA – Implications for National Security & U.S. Manufacturing

The NDAA Bill prohibits purchase of UAS originating from country deemed a national security risk such as China.

The US Department of War will begin limiting purchases of UAS battery packs and cells from China for U.S. governmental entities. Requirements for domestically sourced packs and cells will scale over time.

China has begun blacklisting entities that supply UAS and critical components to the DoD in response.

Geopolitical factors in Southeast Asia put the current supply chain at significant risk.

"From seabed to space, warfighters need power they can trust. Packet Digital's Badland Battery cell plant will put high-performance, U.S. built lithium-ion cells into our supply chain - cells engineered for extreme environments, smarter battery management, and zero foreign dependencies."
— Devin Beckwith, LTC USAFSOCOM

PacketDigital

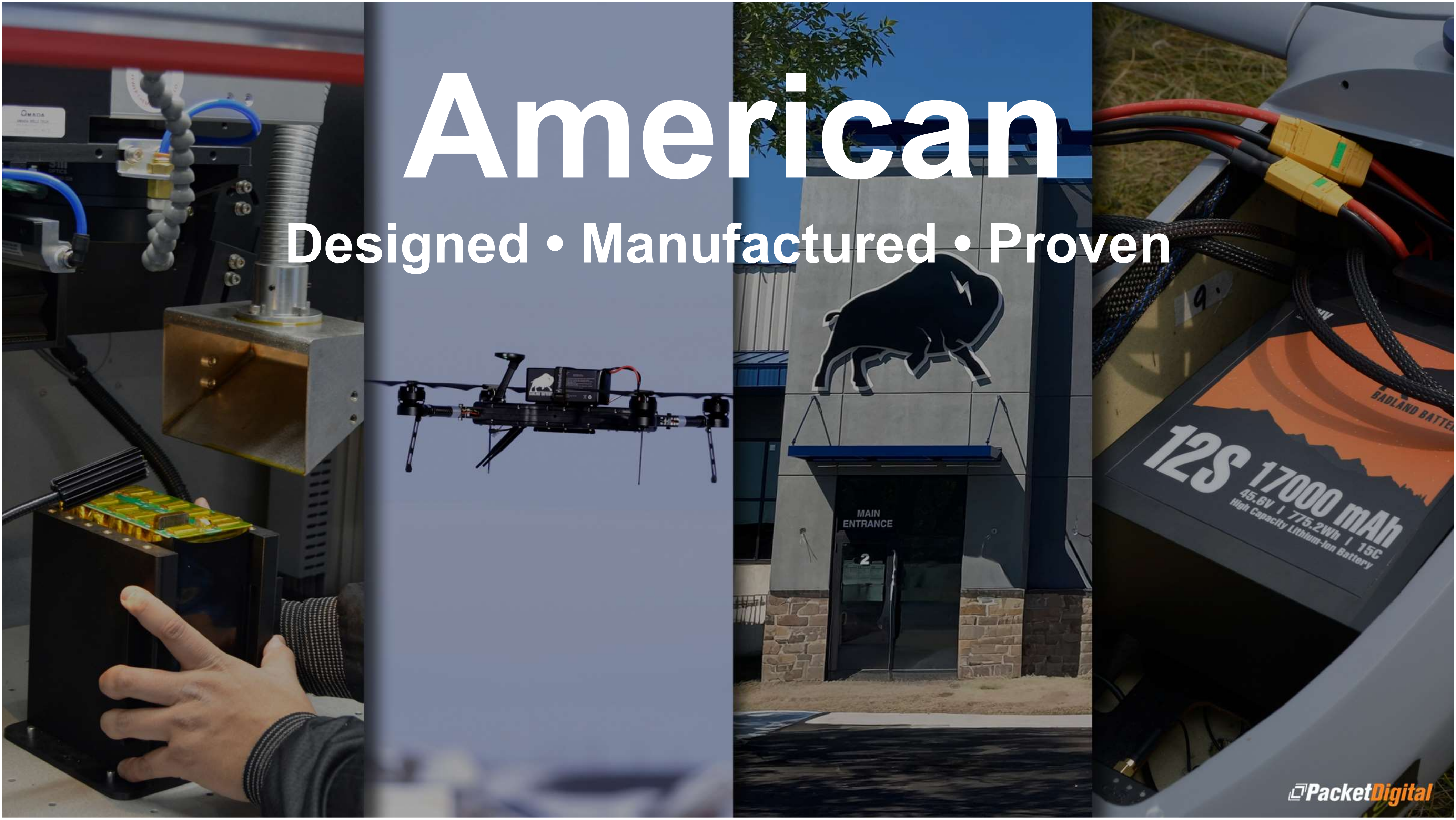
Strategic Importance of our Mission

Domestic Energy Solutions
Developing advanced battery technologies that reduce reliance on foreign supply chains enhances U.S. energy independence from adversaries.

National Security Impact
Secure, high-performance power systems ensure uninterrupted defense and aerospace operations vital for mission success.

Strategic Initiatives Support
Contracts like Navy, Air Force and APFIT and SHIELD IDIQ, focusing on energy solutions for missiles, satellites, and drones.

Strengthening U.S. and North Dakota Manufacturing
Commitment to U.S.-based manufacturing boosts the industrial base, creating high skilled jobs, a new workforce and fostering innovation.


American
Designed • Manufactured • Proven
MAIN
ENTRANCE
2
12S 17000 mAh
45.6V | 775.2Wh | 15C
High Capacity Lithium-Ion Battery
PacketDigital


POWER TO THE (DRONES)
THAT'S OUR BATTERY
PacketDigital

Back-up

Badland Batteries - Construction update

Packet Digital's Cell Performance - Competitive Analysis

F FEATURES

1. 260 - 500Wh/kg Energy density
2. 1C-12C Continuous Discharge Rate
3. > 300 cycle life
4. -40°C to 60°C Discharge
5. ~ 3mΩ Low Impedance
6. 100% domestic supply chain

A ADVANTAGES

1. Highest combination of Energy Density & Rate Capability
2. Long cycle life
3. Wide temperature adaptability
4. Reduced temperature rise
5. No reliance on foreign supply chain

B BENEFITS

1. Extended flight time
2. Long Endurance
3. All-terrain Application (from Arctic to Tropical Island)
4. Strengthen domestic critical mineral development

PacketDigital

Packet Digital Technical Capabilities

Packet Digital, with subsidiaries Botlink and Badland Batteries, combine capabilities in engineering, battery cell manufacturing and software development that together create world-class products and innovative solutions for power electronics industries.

PacketDigital

BADLAND BATTERIES

- Battery Cell Manufacturing
- Electrode Manufacturing
- Battery Cell Assembly
- Battery Cell Finishing
- Off-The-Shelf UAS Battery Packs
- Research & Development
- Raw Material Procurement
- Software Design

PacketDigital

- Custom Battery Design
- Mechanical Design
- Printed Circuit Board Design
- Battery Pack Assembly
- Battery Fleet Management
- Power Management Services
- Solar Power Integration
- Testing & Prototyping
- Data Scripting & Processing

Botlink

- UAS Operation Software
- UAS Traffic Management
- BVLOS Operation
- Remote Command & Control
- Mobile App Development
- Web Development
- Database Design
- Cross-Platform UX Expertise

Badland Batteries Cell Plant – APFIT Adward

USD(R&E)

Accelerate the Procurement & Fielding of Innovative Technologies (APFIT)

FY26 Submission Briefing

Name of Briefer: Bill Macchione
Title: Domestic High-Performance UAS Smart Batteries
Submitting Organization: US Navy
Date: August 29, 2025

Controlled by: OUSD(R&E)
Controlled by: MDJO/APFIT
Category: Controlled Technical Information (CTI)
Distribution: FEDCON
POC: Devin Bohanan,
devin.l.bohanan.civ@mail.mil, (703) 697-3570

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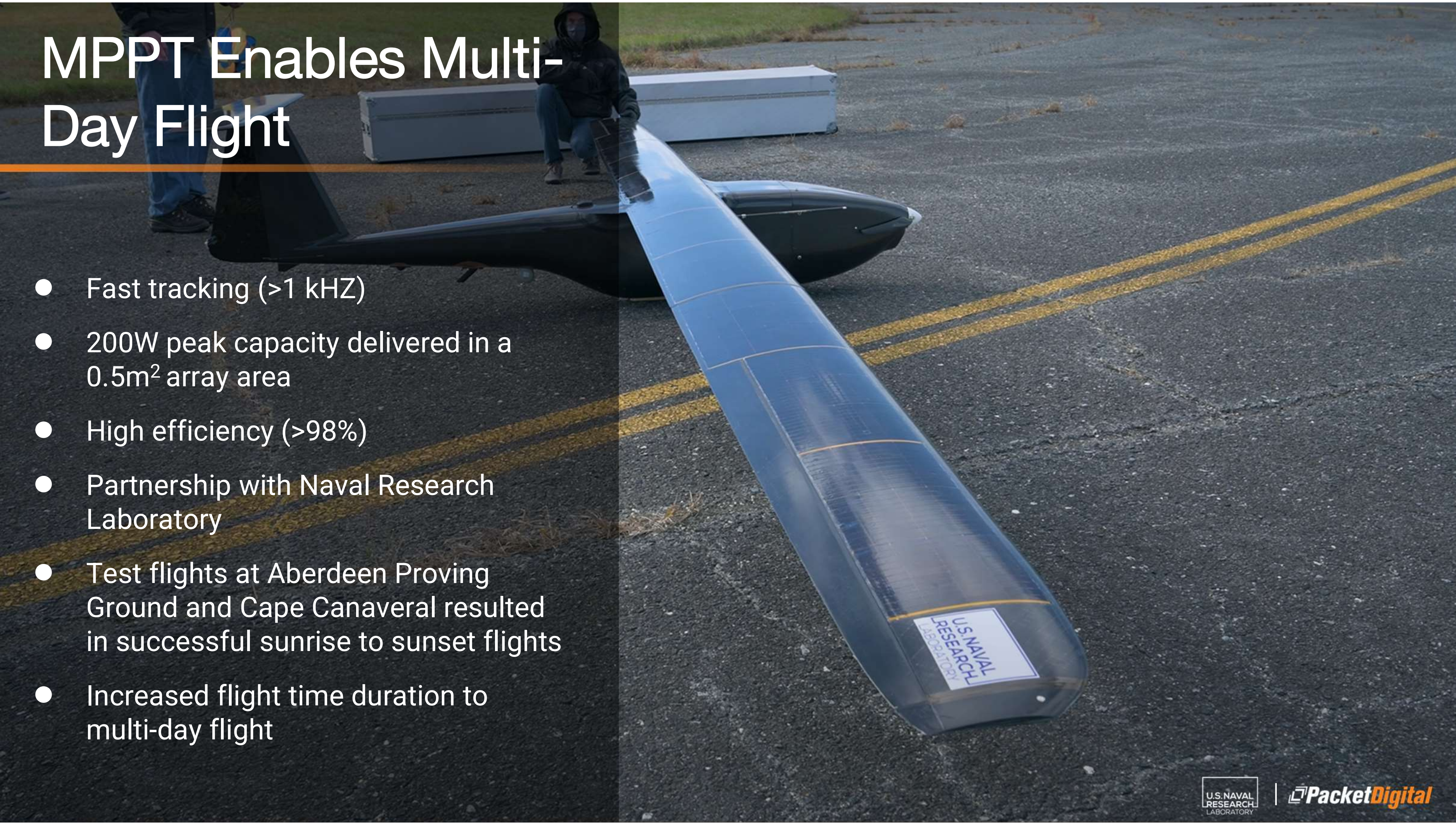
MPPT Improves Flight Endurance

- Fast tracking (>1 kHZ)
- 200W peak capacity delivered in a $0.5m^2$ array area
- High efficiency (>98%)
- Partnership with Naval Research Laboratory
- Test flights at Aberdeen Proving Ground and Cape Canaveral resulted in successful sunrise to sunset flights
- Increased flight time duration from 1.5 to 18 hours

MPPT Enables Multi-Day Flight

- Fast tracking (>1 kHZ)
- 200W peak capacity delivered in a $0.5m^2$ array area
- High efficiency (>98%)
- Partnership with Naval Research Laboratory
- Test flights at Aberdeen Proving Ground and Cape Canaveral resulted in successful sunrise to sunset flights
- Increased flight time duration to multi-day flight



Smart Battery & Charger for Lockheed Martin

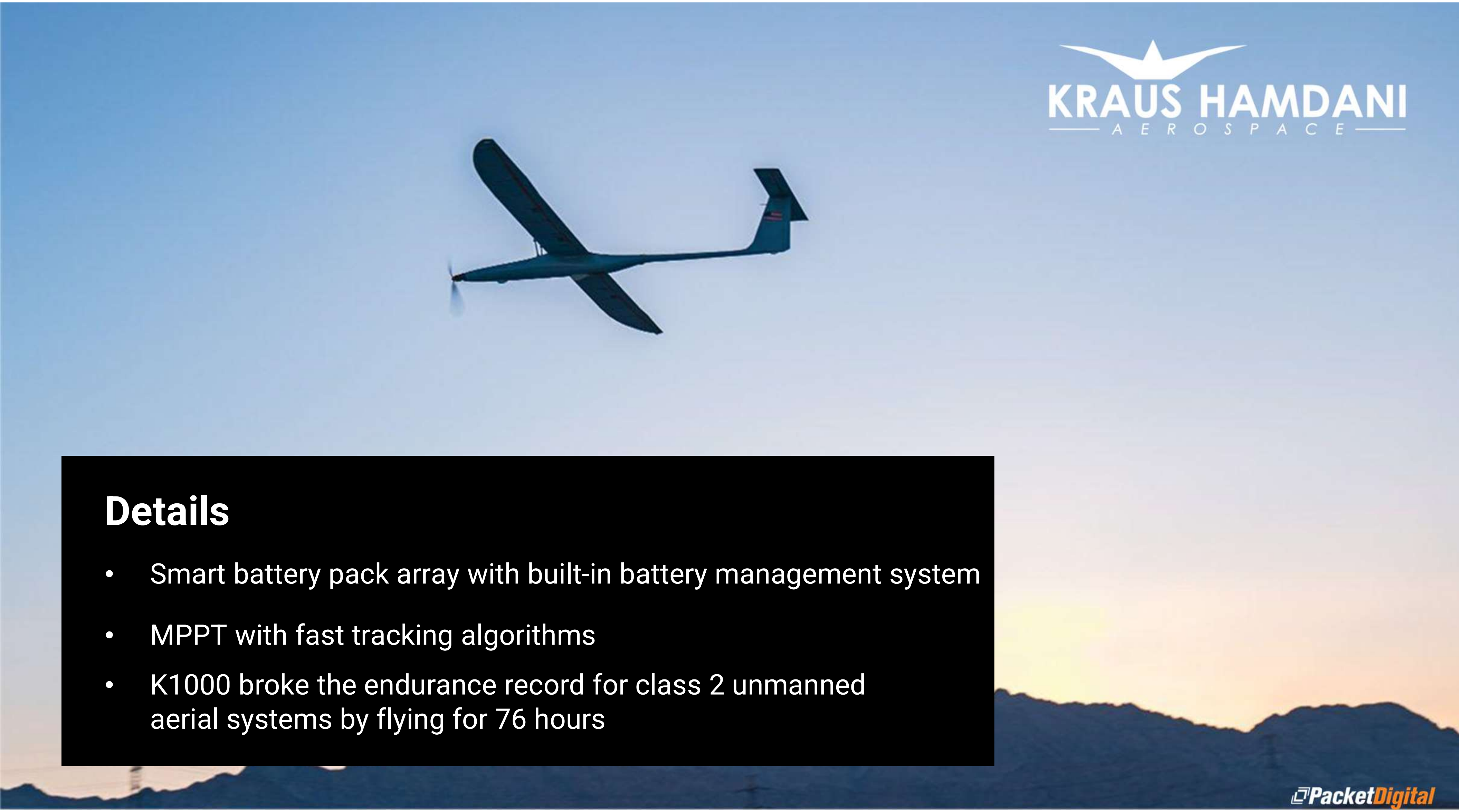
"We have been cycling Packet Digital's battery for 6 months. It is now at 1,000 cycles that's 10X better than anything we have ever seen, and it only shows 11% degradation."

— Lockheed Martin Chief Engineer

LOCKHEED MARTIN | PacketDigital

High Energy Density Batteries Power Anduril Drones

- Batteries for Anduril border patrol and DoD drones – Mutiple platforms – Bolt, Ghost, Dive LD and Roadrunner
- Manufacturing high-energy density battery packs
  - Enables increased range and payload capacity
- Advanced automated micro tig welding increases build quality and durability and decreases assembly time
- Quickly resolved critical supply chain issues through collaboration and experience with top component providers



Details

- Smart battery pack array with built-in battery management system
- MPPT with fast tracking algorithms
- K1000 broke the endurance record for class 2 unmanned aerial systems by flying for 76 hours

Details

Designed, tested and manufacturing a 16S1P 5Ah battery pack for their Valiant airframe, which uses six battery packs wired in series to power high-voltage VTOL propulsion and avionics.

Details

Designed an entire battery system for Sierra Nevada's Voly airframe consisting of multiple high discharge rate VTOL packs and a battery pack for starting the fuel engine along with docks for connecting to their electrical system and handling charging from the onboard generator.

Badland Batteries Cell Plant – APFIT Adward

APFIT Alignment

- *Packet Digital development backstory*
  - In 2014, Packet Digital partnered with the U.S. Marine Corps under an SBIR award to develop its first advanced battery and power system - delivering a tenfold increase in endurance. Building on that success and funded by OECIF in collaboration with the Naval Research Laboratory (NRL), Packet Digital and NRL then engineered a follow-on power system that sustained multiple days of continuous flight. These breakthroughs captured the attention of the UAS community and attracted leading commercial clients, including Lockheed Martin, Bell Helicopter, and Anduril. In 2023, Packet Digital won a Navy contract to design and produce safe, standardized batteries for unmanned naval platforms that meet NAVSEA S9310 & MIL-PRF-2959B. Today, we are actively manufacturing battery packs and constructing a dedicated lithium-ion cell production facility. To complete our vertical onshoring strategy and meet growing demand, we seek additional investment to scale cell production capabilities.
- *Interest from all acquisition transition organizations*
  - Primary Transition Office: PMA-263
  - Other Potential Transition Interest: USSOCOM, U.S. Army, U.S. Air Force
- *Describe the out-year funding situation of those all-acquisition transition organizations*
  - High volume production to meet the needs of the DoD for procurement of U.S.-made solution
  - NAWCAD WOLF will work with transition organizations to align out-year funding requests in the future POM cycle
- APFIT will procure 40,000-50,000 high-performance Li-ion cells to build and deliver 5,000 battery packs for 8 UAS and 1 AUV produced by 7 manufacturers. The total anticipated need is 560,000 cells for 70,000 packs, outfitting 4,000 UAS/AUV systems across all user groups.
  - Breakout of quantities in Backup Slides

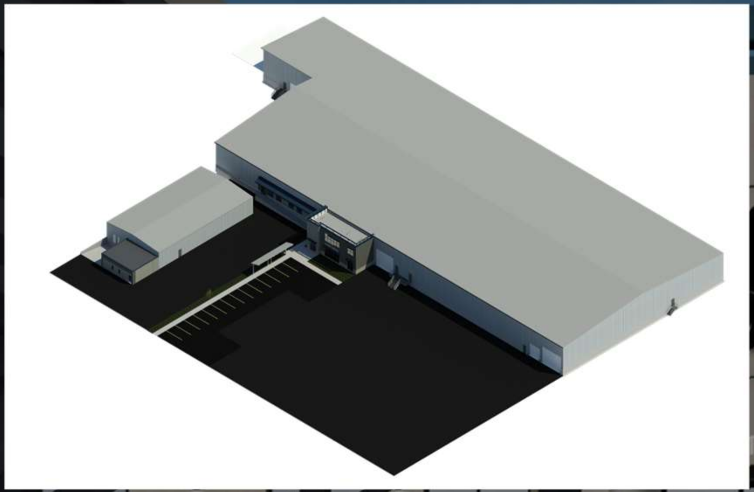
Funding Organization	Funding Type	FY23	FY24	FY25	FY26	FY27	FY28	FY29
OUSD(R&E) APFIT	PROC				$38M			
Navy Logistics UAS Family of Advanced Batteries	RDT&E	$9M	$9.8M	$5M				
DoD industry stakeholder customers	PROC/O&M				$4M	$8M	$15M	$25M

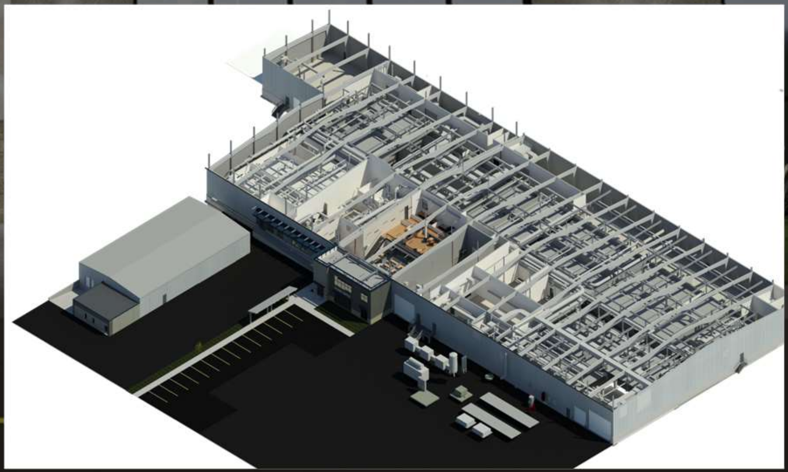
Badland Batteries – Manufacturing Equipment

Production Equipment plan for 2,000pcs/ 8hrs			
#	Work procedure	Equipment name	Number of machines 2,000 pcs/ 8hrs
1	Mixing	Mixer	5
2	Coating	Coating Machine	2
3	Calendaring/Splitting	Calendaring/Splitting Machine	2
4	Hardware cutting	Hardware Cutting Machine	4
5	Stacking	Stacking Machine	3
6	Soldering	Soldering Machine	1
7	Sealing	Sealing Machine	1
8	X-RAY	X-RAY machine	1
9	Baking	Oven	2
10	Electrolyte filling	Injection Machine	1
11	Pre-formation	Preformation Cabinet	5
12	Second Sealing	Second Sealing Machine	1
13	Capacity Grading	Capacity Grading Cabinet	8
14	OCV	OCV Machine	1
Annual capacity (1 shift/day, 5 days/ week)			**24 MWh**

PacketDigital

Badland Batteries – 3D design rendering





PacketDigital

Flying Sea Glider & Submarine

- Developed multiple components including the battery management system, MPPT, and PMAD
- One hour flight in the air to location
- Active several months underwater
- Underwater solar charging adjusts for water clarity and depth as needed
- Super low power sleep option enables power conservation at depth

U.S. NAVAL RESEARCH LABORATORY | PacketDigital

The Problem (The Opportunity)

10147

Executive Order mandates electronic batteries be USA made

100%

Of US Government Agencies have Country of Origin Requirements for drones

95+%

Drone Batteries today are manufactured in CHINA

PacketDigital

CSEA Grant Round 6 Technical Review Summary

C-06-D The Forge Project, AmeriCarbon Forge, LLC

Grant Request: $0

Loan Request: $40,000,000

Total Project Costs: $100,000,000

Average Technical Review Score: **268.5/315 (Good)**

Selected Technical Reviewer Comments:

The Forge project presents clearly articulated objectives that are well aligned with the Clean Sustainable Energy Authority's goals, primarily via diversification within the broader lignite industry (sustainable energy) and a >90% emissions reduction (clean) compared to conventional coal tar pitch production. Co-production of rare earth elements or other critical minerals, if successful, would further align the project as these commodities are essential components in many clean energy technologies.

The project as proposed would immediately produce 250–300 construction jobs and flows of $25-$30 million annually during startup. Once in service, 50 full-time operating positions and sales of approximately 30,000 tons of pitch and carbon by-products annually would be significant additions to North Dakota's economy.

The construction and operation of a functional pilot-scale coal liquefaction pitch production unit in West Virgina supports AmeriCarbon's expertise in the materials and equipment required for a successful scale-up in North Dakota in concert with the Worley Group.

The project would utilize novel technologies to create an entirely new sub-industry in the state utilizing traditional energy resources (lignite) to create products which, although non-energy (coal tar pitch and carbon by-products), would serve to diversify and strengthen the overall lignite energy ecosystem.

A three-page section of the proposal describes managerial approach and oversight, breaks-down responsibilities, and lists evaluation points (stage-gates & milestones). It would be nice to see the evaluation points identified more clearly on the timeline.

The project management plan is clearly structured and well defined. Budgeting projections are as reasonable as can be expected, while strong partner connections and a coherent milestone chart supports effective project execution.

I found the proposal to be well written and comprehensive. Previous research & pilot-testing at the demonstration facility in Morgantown, WV has validated technical feasibility, is providing data to inform the scale-up process, and has allowed technical challenges to be identified and addressed. A key engineering partner has offices in Bismarck and near the demonstration facility in West Virginia.

Another result of the proposal could be the development of a repeatable commercial design model to be used at other sites.

The proposal was well-constructed, and the project looks to be technically sound, leveraging technology proven at the pilot scale and large, diverse market for potential lignite-derived products. The final product mix/identified buyers were somewhat ambiguous, but the adaptability of the process to make a variety of end products would surely be an asset in a swiftly changing marketplace.

AmeriCarbon and its partners seem to have the technical expertise in place to continue to scale its process into a commercial-scale facility, thus I would recommend funding the project.

October 15, 2025

State of North Dakota
The Industrial Commission
Clean Sustainable Energy Authority Program
State Capitol – Fourteenth Floor
600 East Boulevard Avenue
Bismarck, ND 58505

Re: The Forge Project – Application for Loan Funding

Dear Members of the North Dakota Industrial Commission and the Clean Sustainable Energy Authority:

AmeriCarbon Forge, LLC ("AmeriCarbon Forge") is pleased to submit this application for grant and loan funding under the Clean Sustainable Energy Authority (CSEA) program for The Forge Project, a first-of-its-kind commercial manufacturing facility to produce Eco-Pitch™ — a patented and proprietary engineered coal tar pitch derived from North Dakota lignite coal.

The Forge Project will establish a new value-added industry in North Dakota, transforming a locally abundant natural resource into high-performance carbon materials used across industrial, infrastructure, and defense applications. The facility will be located near the Falkirk Mine and Coal Creek Station, leveraging regional energy and mining infrastructure to maximize efficiency and economic impact.

AmeriCarbon's proprietary Liquid Carbon Process converts lignite into Eco-Pitch™, a clean, carbon-rich material that can be further refined for applications ranging from EV battery anode binders to asphalt binders and specialty defense carbon products. When operational, The Forge Project will:

- Establish North Dakota as a national hub for advanced carbon manufacturing.

- Create dozens of high-value jobs in McLean County and generate long-term economic benefits across the regional supply chain.

- Provide a foundation for integration with rare earth element (REE) recovery operations led by AmeriCarbon's affiliate, Ore Spring Materials, LLC, strengthening domestic critical-materials supply chains.

AmeriCarbon Forge will be a joint development effort between AmeriCarbon Enterprises, LLC and NACCO Industries, Inc., combining advanced technology leadership with deep North Dakota operating experience. The total project cost is estimated at $80–100 million, with approximately 20% equity and 80% debt anticipated.

This transmittal letter sets forth a binding commitment on behalf of AmeriCarbon Forge, LLC to complete the project as described in the accompanying application if the North Dakota Industrial Commission approves the requested funding under the CSEA program.

We appreciate the Commission's continued support for innovation in lignite-based energy and manufacturing and look forward to the opportunity to bring this transformational project to life in North Dakota.

Sincerely,

AmeriCarbon Forge, LLC
By AmeriCarbon Enterprises, LLC, its Manager

Greg Henthorn
Chief Business Officer

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 (Appendix)
☒	Loan/Loan Guarantee Application (if Applicable, Appendix)
☒	Other Appendices (If Applicable)

When the package is completed, send an electronic version to ndicgrants@nd.gov

For more information on the application process please visit:
https://www.ndic.nd.gov/grant-programs/csea/clean-sustainable-energy-authority-applicant-information

Questions can be addressed to the Industrial Commission at 701-328-3722.

Clean Sustainable Energy Authority

North Dakota Industrial Commission

Application

Project Title:

The Forge Project

Applicant:

AmeriCarbon Forge, LLC

Date of Application:

October 15, 2025

Amount of Request

Grant: N/A

Loan: $40,000,000

Total Amount of Proposed Project:

$100,000,000

Duration of Project:

2 years

Point of Contact (POC):

Greg Henthorn, Chief Business Officer

POC Telephone:

304-685-6017

POC Email:

greg.henthorn@americarbon.com

POC Address:

3001 Cityview Drive
Morgantown, WV 26508

TABLE OF CONTENTS

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ABSTRACT

Objective:

AmeriCarbon Forge, LLC requests a $40 million CSEA loan to fund the construction, commissioning, and startup of the first U.S. commercial-scale facility producing Eco-Pitch™—an engineered coal-tar-pitch manufactured directly from North Dakota lignite using AmeriCarbon's patented Liquid Carbon Process (LCP). Located near Underwood in McLean County, the facility will deliver a domestic, lower-carbon supply of binder and impregnating pitch for infrastructure, industrial/defense, and advanced-materials markets while reducing greenhouse-gas emissions by more than 90% versus conventional supply chains. The project advances from completed FEL-3 into full execution with Worley as engineering/EPC-M partner and leverages data from AmeriCarbon's operating pilot plant to de-risk scale-up.

Expected Results:

- ✓ Commercial operation of a ~100 TPD plant (~30,000 tons/year total output: ~15,000 tons Eco-Pitch™ and ~15,000 tons carbon by-products).
- ✓ Verified >90% GHG reduction versus conventional coal-tar-pitch production; compliance with ND DEQ permitting.
- ✓ Product qualification of binder and impregnating grades across infrastructure (e.g., asphalt), industrial/defense, and specialty markets.
- ✓ Execution of MOUs/LOIs covering a majority of initial Year-1 Eco-Pitch™ volumes; staged customer validation continues.
- ✓ Job creation: ~250–300 construction jobs and ~50 full-time operating positions in McLean County.
- ✓ Bankable execution: 90-day performance demonstration at nameplate throughput; modular scope enables phased specialty add-ons.

Duration:

Two years (engineering completion to construction, commissioning, and startup), but may extend to three years.

Total Project Cost:

Planning basis of $100 million TIC (application), structured as a modular program in the range of $80–$100 million to accommodate customer-driven specialty units and prudent contingency.

Participants:

Applicant: AmeriCarbon Forge, LLC (JV of AmeriCarbon Enterprises, NACCO Industries, and other investors). Engineering/EPC-M: Worley. Key partners and validators include University of North Dakota (feedstock integration), market validation collaborators (e.g., SDSU, VertX), and site collaborators (e.g., North American Coal, Rainbow Energy).

PROJECT DESCRIPTION

Objectives:

AmeriCarbon Forge, LLC has been formed as a joint venture among AmeriCarbon Enterprises, LLC, NACCO Industries, Inc., and other investors and stakeholders to implement the **Forge Project**: to construct, commission, and operate our nation's first commercial scale facility to manufacture coal tar pitch, a critical carbon feedstock for industrial, infrastructure, and defense applications, directly from coal using AmeriCarbon's proprietary Liquid Carbon Process. The commercialization of this strategic innovation has been supported over the past 5+ years by private investment, federal funding, and R&D efforts, as well as four projects funded in part by the North Dakota Industrial Commission under the Lignite Research Council program.

AmeriCarbon's Liquid Carbon Process converts lignite coal into its proprietary carbon pitch product, Eco-Pitch™, a 100% domestically sourced coal tar pitch. Eco-Pitch is a critical material for manufacturing advanced carbon products. AmeriCarbon operates our nation's only pilot-scale manufacturing facility using a continuous, non-combustible process. This approach reduces greenhouse gas emissions by more than 92% compared to traditional methods, contributing to a sustainable manufacturing pathway consistent with the objectives of the Clean & Sustainable Energy Authority (CSEA).

This proposal seeks $40 million from the CSEA loan program to fund the design, construction, and operation of its commercial-scale facility ("Facility") in McLean County, North Dakota that will process 30,000 tons per year of lignite coal into Eco-Pitch various by-products. The Facility will scale up production of Eco-Pitch to address applications in industry, infrastructure, and defense.

Product Description

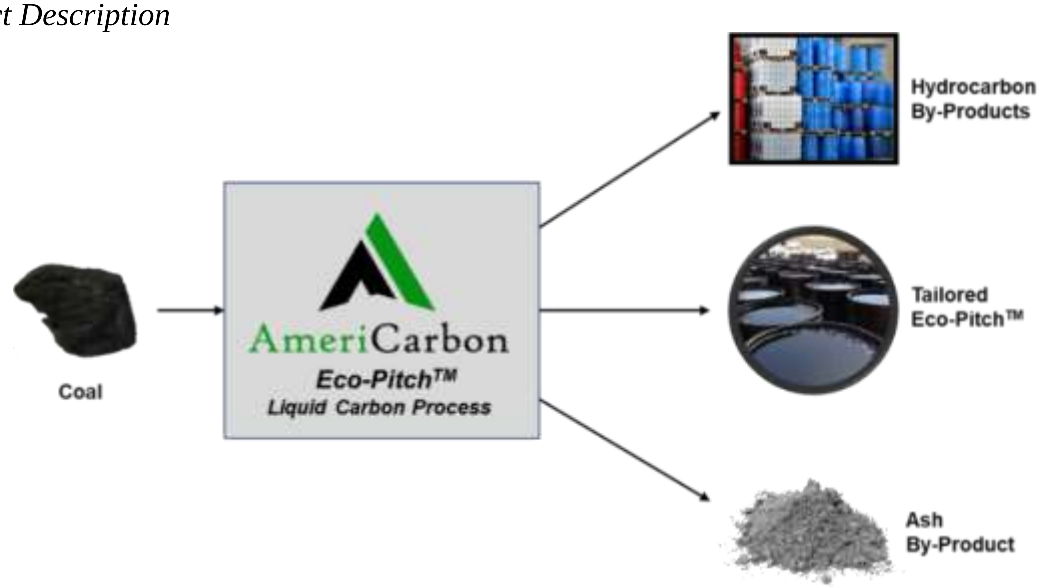


Figure 1. Simplified Diagram of AmeriCarbon's patented and proprietary Eco-Pitch Liquid Carbon Process.

Eco-Pitch, AmeriCarbon's patented and proprietary carbon pitch product, is a 100% domestically sourced alternative to traditional coal tar pitch. Eco-Pitch plays a vital role in both the binder pitch and impregnating pitch functions required in the manufacture of various carbon products. AmeriCarbon's process has multiple unit operations that produce a tailored carbon pitch that has several advantages over current industrial supplies:

- ✓ Enables the United States to develop a domestic supply chain while reducing industrial reliance on China and other Asian countries
- ✓ Reduces greenhouse gas emissions by more than 92% compared to existing supplies
- ✓ Tailorability allows for attaining superior properties such as high strength-to-weight, radar absorbency, electrical conductivity, and/or thermal conduction
- ✓ Efficiency of process allows AmeriCarbon to compete on price
- ✓ The ash by-product is a source of concentrated rare earth elements (REEs)

Tailored Eco-Pitch Products

Eco-Pitch is a family of engineered coal-tar-pitch materials whose rheology and composition can be tuned for multiple end use applications across infrastructure, industrial/defense, and advanced-materials markets. Eco-Pitch serves broadly as (i) binder pitch for asphalt pavements, carbon electrodes, carbon fiber composites, and graphite anodes; and (ii) impregnating pitch to densify and strengthen pre-formed carbon/graphite parts used in refractories, electrodes, blocks, aerospace components, and high-temperature equipment. The two primary commercial forms highlighted below—binder and impregnating grades—reflect current market pull and ongoing customer validation, while the same tunability supports specialty variants (e.g., mesophase grades for premium carbon foams and composites) as demand evolves.

Binder Pitch: Eco-Pitch is engineered as a high-performance binder pitch used across a range of advanced carbon and infrastructure applications. In addition to its role in synthetic and natural graphite anode production for energy storage applications, Eco-Pitch serves as a key binder in the manufacture of carbon electrodes, carbon fiber composites, and asphalt and pavement materials. As a binder, Eco-Pitch provides the critical adhesive and structural functions that hold particulate or fibrous materials together, delivering the required strength, stability, and durability for demanding industrial and construction environments. Its formulation can be tailored to achieve specific viscosity, softening point, and flow characteristics, ensuring optimal performance whether used in high-temperature industrial processes or long-life infrastructure applications such as asphalt paving and roofing.

Impregnating Pitch: In its impregnating form, Eco-Pitch is used to fill the pores and voids of pre-formed carbon or graphite structures, significantly enhancing their density, strength, thermal conductivity, and durability. This capability is essential not only for electric-vehicle battery anodes, but also for graphite electrodes, carbon blocks, refractories, and advanced carbon composites used in aerospace, metallurgy, and infrastructure applications. By optimizing penetration and flow characteristics, Eco-Pitch enables uniform impregnation and superior material performance under high-temperature and high-stress conditions. Its formulation can be tailored to meet a wide range of industrial specifications, supporting both emerging energy technologies and established carbon-intensive manufacturing sectors.

Both forms of Eco-Pitch offer significant environmental advantages over traditional coal tar pitch, including a greater than 92% reduction in greenhouse gas emissions. This makes Eco-Pitch a key material for decarbonizing materials supply chains while contributing to the development of a fully domestic, sustainable production process for advanced carbon products.

By-Products

In addition to producing Eco-Pitch at an approximate yield of 50%, AmeriCarbon's manufacturing process also produces various by-products that add considerable value to the overall product output streams. It can be generally stated that the Eco-Pitch process produces product and by-product revenue 10-100 times greater than its combined feedstock and waste disposal costs. The following is a brief description of the by-products produced in the Eco-Pitch process:

- **Creosote**. This complex mixture of hydrocarbon oils can be derived from three sources: coal, wood, and creosote bush. It is used to produce a variety of products including treated wood, carbon black, and various medicines. Creosote produced from coal (traditionally, via distillation of coal tar) is the primary source of wood preservatives and carbon black production.

- **Naphthalene**. A valuable aromatic hydrocarbon, naphthalene is widely used in the production of plastics, resins, and insecticides, and serves as a key intermediate in the synthesis of other industrial chemicals such as phthalic anhydride. Naphthalene is also employed in the manufacture of mothballs and as a solvent in various applications. Its production as a by-product of the Eco-Pitch process adds significant value by supporting diverse industrial uses, while contributing to the overall efficiency of AmeriCarbon's carbon conversion technology.

- **Anthracene Oil.** Anthracene oil is a complex mixture of polycyclic aromatic hydrocarbons, with anthracene as a key component. It is commonly produced as a by-product during the distillation of coal tar. Anthracene oil is used in the manufacture of carbon black, dyes, and certain types of resins, and is also a precursor for anthraquinone, an important intermediate in the production of dyes and pigments. In addition, anthracene itself can be further processed for use in the production of high-performance carbon materials.

- **Concentrated Ash with Rare Earth Elements (REEs)**. Depending on the composition, coals can hold an appreciable amount of REEs, many of which are on the U.S. government's list of critical materials. As industry develops financially viable solutions for extracting REEs from coal, this presents potential future upside from the ash produced in the Eco-Pitch process.

The Eco-Pitch process is highly adaptable; it should be noted that different configurations of the process may have different by-products; final selection of by-products will depend on a number of factors, including processing conditions and type of pitch made. By-products can also be adjusted based on market conditions for the various by-products and their derivatives. This aspect of the AmeriCarbon process is analogous to commercial coal tar distillers that separate and provide a variety of hydrocarbon products depending on various factors. The ability of the Eco-Pitch process to control a number of chosen parameters enables AmeriCarbon to modify both primary product and downstream by-product distribution to maximize profits and/or adjust to market forces. This inherent flexibility provides an economic robustness that greatly enhances the competitiveness of the Eco-Pitch process and AmeriCarbon's market positioning.

Project Impact

The proposed facility will have a manufacturing capacity of 30,000 tons of carbon products annually, split into 15,000 tons of Eco-Pitch (for both binder and impregnating pitch applications) and 15,000 tons of carbon byproducts. The facility will provide product optionality, enabling flexibility in production outputs to meet market demands. AmeriCarbon's Liquid Carbon Pitch (LCP) Process is proprietary and patented.

The Forge Project will achieve the following objectives, offering significant advantages over traditional coal tar pitch production:

- Uses lignite coal as a primary feedstock, avoiding reliance on coking oven by-products from steelmaking.
- Reduces greenhouse gas emissions by over 92% compared to conventional methods.
- Low-temperature, non-combustible process minimizes harmful emissions and reduces environmental impact.
- Supports a diverse range of carbon applications, including synthetic graphite, battery electrodes, carbon fiber, and asphalt binders.
- Supports economic growth in McLean County by creating high-wage manufacturing and engineering jobs.

Figure 2 is a schematic diagram of the LCP process, illustrating the main unit operations and material flows.

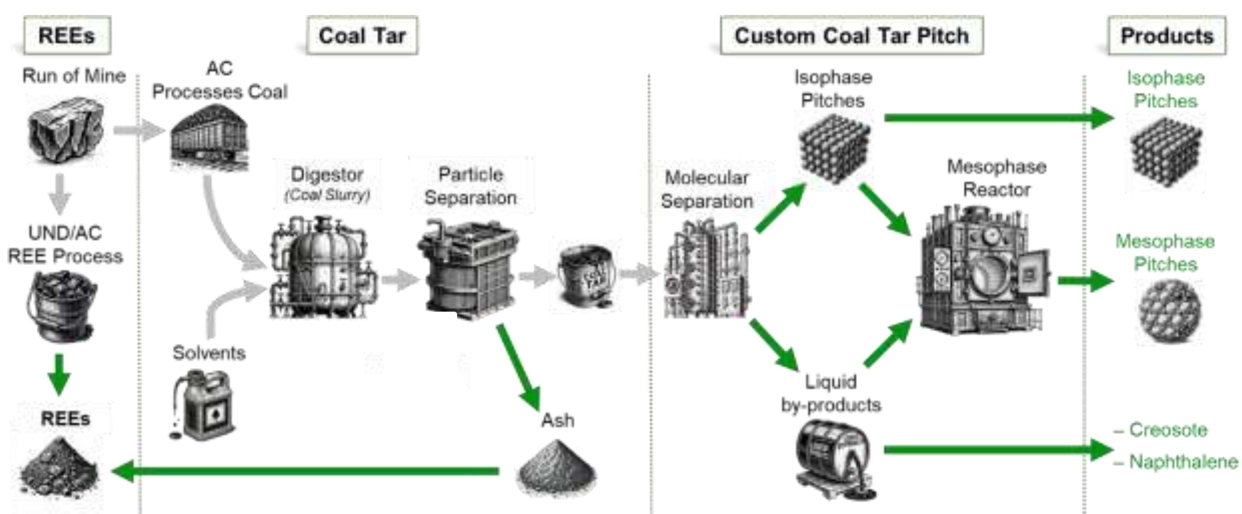


Figure 2. Schematic diagram of AmeriCarbon's patented and proprietary LCP process.

Possible Integration with Rare Earth Element and Critical Mineral Technologies

Separate from the currently proposed project, AmeriCarbon is collaborating with the University of North Dakota's College of Engineering and Mines (UND-CEM) to strengthen the value chain between lignite utilization and advanced carbon manufacturing. UND's REE pilot plant produces carbon-rich feedstocks through its pre-combustion processes developed for rare earth element (REE) and critical mineral (CM) extraction. These carbon materials—derived from leached lignite and humic acid residues—can be processed directly in AmeriCarbon's Liquid Carbon Process (LCP) to create high-value carbon pitches and graphitic materials. In turn, AmeriCarbon's process supports UND's mission by creating a downstream use pathway for its REE-extraction residues, ensuring full valorization of lignite resources. UND and AmeriCarbon are also collaborating on premium carbon and graphite development, including bench-scale graphitization and electrochemical testing of high-purity carbon materials for battery and defense applications. Together, these efforts form a closed-loop system that transforms lignite into both carbon products and purified mineral streams while anchoring innovation within North Dakota's research and industrial ecosystem.

In addition, AmeriCarbon's LCP process produces an ash by-product that can serve as a feedstock for Microbeam Technologies, Inc., whose proprietary separation systems can extract and concentrate REEs and critical minerals from carbon-rich residues. While REE recovery is not part of the Forge Project's base case, this compatibility positions AmeriCarbon's operations to integrate seamlessly with Microbeam's technology as those systems commercialize.

Although AmeriCarbon's core technology and financial model do not depend on REE or CM revenues, the company's partnerships with UND and Microbeam demonstrate how North Dakota's lignite resource base can support a vertically integrated, zero-waste manufacturing ecosystem—producing critical carbon materials, recoverable REEs, and value-added co-products within the state.

Methodology:

The design, development, and financing of The Forge Project follow a standard, stage-gate industrial development process for large-scale chemical and materials manufacturing facilities. Having completed FEL-0, FEL-1, and FEL-2, AmeriCarbon is now finalizing FEL-3 under contract with Worley Group, funded in part by the North Dakota Industrial Commission's Lignite Research Council. Upon completion of FEL-3, AmeriCarbon will have achieved Front-End Engineering Design (FEED) maturity, positioning the project to advance into execution, construction, and startup under the proposed CSEA loan.

FEL-3 and Design Basis. The FEL-3 study being executed by Worley provides an AACE Class-3 estimate of total installed cost (±15% accuracy) and includes full process flow diagrams (PFDs), piping and instrumentation diagrams (P&IDs), detailed equipment lists and specifications, a 3D model, and a Level-2 project schedule. The engineering package also establishes the design basis for key process units, long-lead equipment identification, constructability reviews, HAZOP and risk assessments, and preliminary procurement strategies. Worley's team brings both global project-execution experience and a local North Dakota presence (Bismarck office), supported by specialized engineering resources from its Charleston, West Virginia office near AmeriCarbon's pilot plant.

Transition to Execution and Construction. Upon completion of FEL-3 and Authorization for Expenditure (AFE) approval, AmeriCarbon will move directly into detailed design, procurement, and construction. Worley is anticipated to continue in a detailed engineering and EPC-M role, managing design finalization, procurement of long-lead equipment, and field engineering support. The construction phase will be managed under AmeriCarbon's Project Management Office (PMO) using proven work-package control systems and milestone tracking consistent with AACE Class-2 standards at the time of award. Key activities will include:

- ✓ **Site preparation and civil works** at the Underwood, ND location near the Falkirk Mine and Rainbow Energy's Coal Creek Station;
- ✓ **Equipment fabrication and delivery**, with long-lead items such as reactor trains, distillation columns, and condensers ordered immediately upon funding;
- ✓ **Modular assembly and installation** of process trains to shorten field schedules and minimize winter downtime;
- ✓ **Utility integration** leveraging adjacent industrial infrastructure for power, water, and logistics; and
- ✓ **Pre-commissioning and commissioning**, including dry-out, functional testing, and performance verification.

Commissioning and Startup. Startup and performance testing will be led by AmeriCarbon's technical operations team with direct participation from Worley commissioning engineers. AmeriCarbon will implement a structured Start-Up Readiness Review (SRR) and 90-day performance demonstration to validate throughput, product specifications, and emissions performance. This process ensures a safe and efficient transition to steady-state operations and early delivery of commercial product.

Integration of Pilot Data. AmeriCarbon's Morgantown pilot plant, capable of processing multi-ton quantities of lignite per day, provides the engineering data underpinning scale-up. The pilot's instrumentation and control data are directly informing Worley's design basis, reducing process uncertainty and ensuring scalability. Ongoing pilot enhancements are aligning operating parameters with commercial design, providing verified kinetic and thermodynamic data to support process guarantees and emissions validation.

Execution Oversight and Risk Mitigation. AmeriCarbon will maintain overall project control through its PMO, supported by Worley's project controls, cost management, and construction-management systems. Formal stage-gate reviews—Design Readiness Review (DRR), Procurement Readiness Review (PRR), and Startup Readiness Review (SRR)—will be used to verify deliverables before progressing to each phase. Risk management will include continuous HAZOP and QRA updates, contingency tracking, and schedule assurance reviews to maintain execution discipline and budget fidelity.

Outcome. This methodology ensures a seamless transition from engineering design through construction, commissioning, and startup—delivering a fully operational 100-tons-per-day commercial facility capable of producing 30,000 tons of carbon products annually. The process integrates proven engineering practices with validated pilot data and a world-class execution partner, providing CSEA reviewers with clear confidence in both technical feasibility and deliverability.

Anticipated Results:

The Forge Project will result in the successful construction, commissioning, and operation of the United States' first commercial-scale facility producing Eco-Pitch™, an engineered coal tar pitch manufactured directly from North Dakota lignite using AmeriCarbon's patented Liquid Carbon Process (LCP). Upon completion, the facility will achieve a throughput capacity of 100 tons per day—equivalent to approximately 30,000 tons of carbon products per year—and will demonstrate full-scale commercialization of a technology previously proven at AmeriCarbon's pilot facility.

Technical and Environmental Results

- ✓ **Demonstrated process performance**. Successful scale-up of the LCP technology by a factor of ten, validating design parameters and confirming reliability under continuous operation.
- ✓ **Emission reduction**. Verification of a >90% reduction in greenhouse gas emissions compared to conventional coal tar pitch production derived from coking by-products.
- ✓ **Product qualification**. Commercial-scale production of both binder and impregnating grades of Eco-Pitch™, meeting customer specifications across infrastructure, industrial, and defense markets.
- ✓ **Process adaptability**. Demonstration of flexible operation enabling product mix adjustments in response to market demand and customer specifications.

Economic and Commercial Results

- ✓ **Domestic supply chain creation**. Establishment of a fully domestic source of coal tar pitch, eliminating dependence on imported materials (primarily from China) and enhancing national energy and materials security.
- ✓ **Market penetration**. Execution of multiple offtake MOUs and LOIs covering a majority of initial production volumes, enabling revenue generation within the first year of operation.
- ✓ **Private investment leverage**. Activation of over $40–50 million in private capital alongside CSEA's loan participation, reinforcing the project's commercial readiness and scalability.

- ✓ **Scalability and replication**. Development of a repeatable commercial design and execution model capable of deployment at other lignite or sub-bituminous coal sites in North Dakota and across the U.S.

Regional and Workforce Results

- **Job creation**. Approximately 250–300 construction jobs during the build phase and 50 full-time operating positions once in service, including high-wage roles in process operations, maintenance, and engineering.

- **Workforce development partnerships**. Continued collaboration with the University of North Dakota to develop training programs in process operations, instrumentation, and materials science.

- **Economic impact**. Significant payroll and in-state spend during operations, with substantial secondary economic activity across suppliers and service providers in McLean County.

Integration and Innovation Results

- ✓ **Resource efficiency**. Utilization of lignite and potential integration with UND's pre-combustion carbon-feedstock program, supporting full resource valorization.

- ✓ **Circular economy opportunity**. Production of ash by-products suitable for Microbeam Technologies' REE extraction platform, creating future value-add pathways for rare earth and critical mineral recovery.

- ✓ **Technology demonstration**. Development of a reference facility that positions North Dakota as a national hub for advanced carbon materials manufacturing and associated research partnerships.

Long-Term Impact

By establishing this first-of-its-kind manufacturing facility, the Forge Project will demonstrate how lignite—long valued for power generation—can anchor a new generation of low-carbon materials industries. The anticipated results include not only a successful commercial plant, but also a replicable industrial template for integrating carbon products, critical minerals, and sustainable process technologies within North Dakota's evolving energy economy.

Facilities:

Proposed Commercial Plant Site

AmeriCarbon and its partners have identified a strategic location for the Forge Project near Underwood, North Dakota (Figure 4).

Figure 4. Planned location of the Forge Project near Underwood, North Dakota, outlined in blue.

The proposed site is situated near the following:

- Falkirk Mine, a significant lignite coal mining operation, and in proximity to key industrial infrastructures;
- *Rainbow Energy Center's Coal Creek Station*. This is North Dakota's largest power plant, known for its efficiency and substantial electricity generation capacity; and
- *Blue Flint Ethanol Plant*. Located just east of the Coal Creek Station, this facility has been operational for over a decade, producing ethanol and contributing to the region's biofuel industry.

The proximity to these facilities offers potential synergies, such as shared infrastructure and services, which can enhance operational efficiency and sustainability.

Pilot Plant: Foundation for Commercial Design

The design and operational strategies for the commercial facility are based on AmeriCarbon's operating pilot plant, located in Morgantown, West Virginia. This pilot plant stands as the only facility in the United States capable of demonstrating the complete coal liquefaction process for producing advanced carbon materials, including Eco-Pitch.

Figure 5. AmeriCarbon's Research and Pilot Demonstration Facility in Morgantown, West Virginia.

AmeriCarbon's pilot plant is significant for the following reasons:

- *Process Validation*. The pilot plant has been instrumental in validating the technical feasibility of the Eco-Pitch production process, ensuring that each stage operates seamlessly and efficiently.

- *Data Collection for Scale-Up***.** Comprehensive data gathered from pilot operations have been pivotal in informing the scale-up process, facilitating a tenfold increase in production capacity for the commercial plant.

- *Risk Mitigation*. Operating the pilot plant has allowed AmeriCarbon to identify and address potential challenges in a controlled environment, significantly reducing risks associated with scaling up to commercial production.

Figure 6. AmeriCarbon's pilot scale unit operations that underpin the LCP process.

AmeriCarbon’s equipment includes: coal liquefaction & coker trains capable of processing 10 tons per day; capable of producing custom coal pitch, needle coke, and advanced carbon products; product separation and collection train; both trains are fully automated and managed by an industry standard computer / software system; six commercial hood laboratory with flame suppression and exhaust system; fully equipped for benchtop lab research and development. The facility is heavily instrumented and managed by a PLC control system with continuous monitoring.

Figure 7. AmeriCarbon’s pilot scale and research equipment.

Worley Group Facilities

To ensure the successful translation of pilot-scale operations to a full-scale commercial facility, AmeriCarbon is collaborating with Worley Group, a globally recognized engineering firm. Worley maintains offices in Bismarck, North Dakota, and Charleston, West Virginia. While the Bismarck office provides valuable local insights and support, the Charleston office, given its proximity to the pilot plant, will play a crucial role in the engineering design process. Key activities include:

- *Pilot Plant Enhancements*. AmeriCarbon is investing capital into upgrading the pilot plant to align its operations more closely with the anticipated commercial design parameters. This harmonization is essential for accurate data collection and process optimization.

- *Integrated Design Approach*. Leveraging Worley's extensive experience and the empirical data from the pilot plant, the team will develop a robust engineering design that ensures scalability, efficiency, and reliability for the commercial facility.

Through strategic site selection, leveraging pilot plant insights, and collaborative engineering efforts, AmeriCarbon is well-positioned to establish a state-of-the-art Eco-Pitch manufacturing facility that meets the growing demand for advanced carbon materials while supporting regional economic development.

Resources:

The successful execution of the Forge Project to design, construct, and operate the commercial-scale Eco-Pitch manufacturing facility will require a comprehensive array of resources, including financial investments, technical expertise, workforce capabilities, and strategic partnerships. This section outlines the key resources that will be utilized to complete the project.

Financial Resources

AmeriCarbon has secured significant financial commitments to support the project, contingent upon various factors:

- ✓ **NACCO Industries, Inc.**, parent company of The North American Coal Corporation, has made a contingent commitment to this project to be a joint venture partner in the commercial plant, providing a possible equity investment of $6 million.

- ✓ **Hartz Capital, Inc.**, a New York based multibillion dollar private investment group with substantial holdings in energy and real estate, and longstanding relations with one of AmeriCarbon's founding investors, has made a contingent capital commitment of up to $10 million in equity investment.

- ✓ **Dickinson Group**, an investment group with substantial holdings in land, timber, and coal, and one of AmeriCarbon's earliest and largest investors, has expressed an interest to add to its previous seven-figure investment in AmeriCarbon to support the Forge Project.

- ✓ **AmeriCarbon Enterprises, LLC** is prepared to contribute additional equity capital to the Forge Project as may be required to move the Forge Project forward, subject to board approval.

AmeriCarbon and NACCO have existing banking relationships that can be leveraged to secure commercial financing to provide required matching for the CSEA loan program. Our current planned capital stack for the $80-100 million project is as follows:

Source	Commitment	% of Total
Equity (20%)	$16 – $20 million	20%
NACCO Industries	Up to $6 million	
Hartz Capital	Up to $10 million	
Dickinson Group & AmeriCarbon Investors	Up to $4 million	
Debt (80%)	$64 – $80 million	80%
CSEA	$32-40 million	
Commercial debt	$32-40 million	

Technical Expertise and Engineering Support

AmeriCarbon will engage Worley Group, a global engineering, procurement, and construction (EPC) leader, to execute the FEL3 design and ensure that the commercial-scale plant is technically robust and commercially viable. Key engineering resources include:

- ***Worley Group's North Dakota Office.*** Provides local coordination and insights to support regulatory compliance and stakeholder engagement.

- ***Worley Group's West Virginia Office.*** Conducts the majority of detailed engineering and design activities, leveraging proximity to the pilot plant and extensive EPC experience.

- ***AmeriCarbon's Pilot Plant Team*:** Provides critical technical expertise and operational insights to guide scale-up and design harmonization.

These combined resources will ensure that the project benefits from both local knowledge and cutting-edge engineering capabilities.

Data and Intellectual Property Resources

AmeriCarbon holds proprietary intellectual property related to its Eco-Pitch production technology. The data from its pilot plant operations provide invaluable insights into the performance, efficiency, and scalability of the process. This proprietary data will be used to inform the commercial design and ensure that all process parameters are optimized for large-scale production. Further, AmeriCarbon holds five patents in the United States and Canada: US# 11667852, 10301549, 9845431, 9534176; and CA# 3120884.

Techniques to Be Used, Their Availability and Capability:

The execution of The Forge Project—transitioning AmeriCarbon's technology from the completion of front-end engineering design (FEL-3) prior to project launch, through construction, commissioning, and startup—will employ a suite of advanced engineering, modeling, quality, and project-execution techniques proven in large-scale industrial manufacturing. The objective is to ensure that the commercial facility operates efficiently, safely, and economically while achieving full environmental and technical compliance. Both AmeriCarbon and Worley Group have dedicated personnel and established systems in place to complete this work within the project timeline and performance objectives.

Process Modeling and Simulation

AmeriCarbon and Worley will continue to apply Aspen Plus® and Aspen HYSYS® simulations to refine process design and operating envelopes for the commercial facility. These tools—validated through pilot-scale operations—will be used to:

- ✓ Model integrated material and energy balances across all process units.
- ✓ Predict system performance and optimize reaction and separation conditions.
- ✓ Evaluate feedstock variability and its influence on product yield and quality.
- ✓ Develop dynamic models to support control-system tuning during commissioning.

This modeling work ensures data-driven design optimization and provides predictive tools to support startup and future expansion. Worley's senior process engineers, with decades of experience in chemical and refining facilities, are already assigned to these tasks.

Engineering Design and Digital Delivery

During detailed engineering, Worley will employ 3D CAD and Building Information Modeling (BIM) to finalize plant layout, utilities, and access routes. The digital twin environment will integrate civil, structural, mechanical, electrical, and control disciplines, allowing clash detection, maintenance accessibility verification, and early constructability reviews.

Key design techniques include:

- ✓ 3D plant and piping models with equipment access and maintenance envelopes.
- ✓ Finite Element Modeling (FEM) for critical vessels and structural supports.
- ✓ Heat-integration optimization to minimize energy consumption.

The design output will culminate in an AACE Class-3/2 cost estimate and Level-2 schedule, enabling accurate procurement and construction planning.

Construction and Modularization

To shorten field schedules and mitigate weather and labor risks, the Forge Project will implement modularization and Advanced Work Packaging (AWP) best practices:

- ✓ Prefabricated skid-mounted process units and pipe racks fabricated off-site under controlled conditions.
- ✓ Preassembled utility modules and electrical buildings for rapid site installation.
- ✓ AWP methodology to define Construction Work Packages (CWPs) aligned with engineering and procurement deliverables.

Worley's construction management team—experienced in modular execution across petrochemical and power sectors—will lead these efforts from planning through field execution.

Risk Assessment and Safety Management

Safety and reliability will be embedded through industry-standard risk management frameworks:

- ✓ Hazard and Operability Studies (HAZOP) at 60% and 90% design.
- ✓ Quantitative Risk Assessment (QRA) to evaluate potential environmental and personnel hazards.
- ✓ Failure Modes and Effects Analysis (FMEA) for key process and mechanical systems.
- ✓ Startup Readiness Reviews (SRR) and Safe-Work permitting integrated into commissioning.

Worley's global Process Safety team and AmeriCarbon's Environmental, Health & Safety (EHS) group will jointly implement these reviews to ensure safe commissioning and sustainable operations.

Pilot Plant Data Utilization and Validation

AmeriCarbon's Morgantown pilot facility (10 TPD) provides the empirical foundation for process design and startup calibration. Techniques applied include:

- ✓ Continuous data logging and analysis of operational variables.
- ✓ Empirical scaling correlations for heat and mass transfer coefficients.
- ✓ Real-time comparison between pilot and commercial model predictions during commissioning.

This live data feedback will guide operating envelope definition and facilitate rapid troubleshooting during plant startup.

Quality Assurance and Control

Comprehensive QA/QC systems will ensure design integrity and construction quality:

- ✓ Vendor qualification and material certification for all pressure-boundary and rotating equipment.
- ✓ Factory Acceptance Testing (FAT) and Site Acceptance Testing (SAT) of critical instruments and control systems.
- ✓ Documented inspection and test plans (ITPs) aligned with Worley's ISO 9001 and AWP standards.

AmeriCarbon's project management team will maintain direct oversight of Worley's QA/QC program through stage-gate reviews and performance audits.

Commissioning, Startup, and Performance Testing

Commissioning will follow a system-by-system turnover approach, supported by detailed checklists and readiness reviews. Activities will include mechanical completion verification, loop-checking, equipment calibration, and phased energization. AmeriCarbon's operations personnel—trained at the pilot plant—will work alongside Worley's commissioning engineers to execute the 90-day performance demonstration to verify capacity, product quality, and emissions targets.

Personnel and Resource Availability

Worley will formally allocate multidisciplinary teams from its Charleston, WV and Bismarck, ND offices, ensuring continuity from FEL-3 through detailed design and construction. AmeriCarbon's technical staff, project management team, and pilot-plant operators will provide continuous support and data validation throughout commissioning and startup.

In combination, these techniques provide a robust, industry-standard execution framework—supported by proven modeling tools, disciplined risk management, and modularized construction methods—that ensure the Forge Project can be delivered safely, on time, and within budget while meeting all technical and environmental objectives.

Environmental and Economic Impacts while Project is Underway:

The Forge Project will advance from engineering into full execution, construction, and commissioning of the commercial-scale Eco-Pitch™ manufacturing facility. During this period, AmeriCarbon will implement rigorous environmental management and community engagement practices while generating significant economic activity across North Dakota.

Environmental Impacts

The construction and commissioning phase will be conducted in accordance with all applicable state and federal environmental regulations, including those administered by the North Dakota Department of Environmental Quality (DEQ). Primary environmental considerations during this stage include site preparation, material handling, construction emissions, and waste management.

- ✓ **Construction footprint and controls:** The selected site near Underwood, ND, has existing industrial infrastructure and access roads, minimizing new land disturbance. Standard erosion-control and stormwater-management measures will be in place under an approved SWPPP (Stormwater Pollution Prevention Plan).

- ✓ **Air quality management:** Temporary construction-related emissions (dust, vehicle traffic, and equipment exhaust) will be controlled through dust suppression, low-emission construction equipment, and strict idling limits. Once operational, the facility will comply with air-permitting requirements and employ a non-combustible, low-temperature process that achieves a >90% reduction in GHG emissions compared with conventional coal-tar-pitch production.

- ✓ **Waste and water management:** Construction waste will be minimized through modular fabrication and off-site prefabrication. During operations, the process will use closed-loop water and heat-recovery systems, limiting both water withdrawal and discharge.

- ✓ **Sustainability by design:** The commercial facility will incorporate energy-efficient equipment, waste-heat recovery, and automation systems to reduce energy intensity per ton of product. AmeriCarbon and Worley are embedding sustainability and lifecycle considerations into the engineering and procurement process, ensuring environmental performance is verified before startup.

Through these measures, temporary construction impacts will remain localized and manageable, while long-term operation will contribute to measurable emissions reduction and cleaner industrial production.

Economic Impacts

The Forge Project will generate significant direct and indirect economic benefits throughout its three-year execution period:

- ✓ **Construction employment:** An estimated 250–300 skilled tradespeople and craft workers will be employed during peak construction, with additional demand for engineering, logistics, and field-support services.

- ✓ **Permanent workforce:** Approximately 50 full-time operating and maintenance positions will be created in McLean County once the facility is in service, representing high-wage, technical employment in manufacturing, engineering, and quality assurance.

- ✓ **Local and regional spending:** Construction and startup activities are projected to inject $25–30 million annually into the local economy through wages, materials, housing, transportation, and contracted services.

- ✓ **Private investment leverage:** The project will deploy $80–$100 million in total capital investment—approximately half from private sources—supporting long-term economic diversification in North Dakota's lignite region.

These economic impacts extend beyond direct employment, strengthening local supply chains, tax revenues, and regional workforce capabilities that will support future advanced-manufacturing projects.

Community Engagement and Planning

AmeriCarbon is maintaining open communication with local governments, labor organizations, educational institutions, and community stakeholders to ensure the project aligns with regional priorities and workforce development goals. Regular updates and information sessions will continue throughout construction and startup, promoting transparency and responsiveness to community feedback. AmeriCarbon's approach emphasizes safe operations, environmental stewardship, and tangible economic opportunity for residents of McLean County and the surrounding region.

In summary, environmental impacts during project execution will be temporary and well-managed under established mitigation plans, while economic impacts will be substantial and lasting. The Forge Project will not only meet rigorous environmental standards but also serve as a catalyst for North Dakota's transition toward a cleaner, diversified, and innovation-driven industrial economy.

Ultimate Technological and Economic Impacts:

The successful completion of the FEL3 engineering design for the commercial-scale Eco-Pitch manufacturing facility will have significant technological and economic impacts, both regionally and nationally. The project will demonstrate the ability to convert lignite coal—a resource abundant in North Dakota—into high-value carbon products using AmeriCarbon's patented Eco-Pitch technology.

Technological Impacts

The commercial-scale facility will serve as a groundbreaking demonstration of how lignite coal can be transformed into advanced carbon products, including Eco-Pitch and valuable by-products. Traditionally, carbon pitch production has relied on by-products from coking ovens associated with steelmaking, which has made the United States heavily dependent on foreign imports, primarily from China. By establishing a commercial-scale facility using domestic lignite, this project will prove that the United States can independently produce high-quality carbon materials, thereby reducing reliance on foreign sources.

This project aligns with national priorities outlined in the March 20, 2025, Executive Order, *"Immediate Measures to Increase American Mineral Production"*, which emphasizes accelerating domestic production of critical minerals and materials essential to U.S. economic and national security interests. By advancing the conversion of lignite into high-value carbon materials such as coal tar pitch and mesophase pitch, this project directly supports the development of key inputs for aerospace, defense, and energy storage technologies. These applications are dependent on secure and sustainable sources of advanced carbon materials, and the proposed work represents a strategic opportunity to establish a domestic supply chain that meets this urgent need.

AmeriCarbon's Eco-Pitch technology represents a paradigm shift in carbon product manufacturing. The process utilizes lignite coal as the primary feedstock, avoiding the need for coking coal and significantly reducing greenhouse gas (GHG) emissions by over 90% compared to conventional methods. This is achieved through a low-temperature, non-combustible process that minimizes harmful emissions and environmental impact.

The technology's ability to scale from a 10-ton-per-day pilot facility to a 100-ton-per-day commercial plant is an important demonstration of its scalability and robustness. This tenfold increase in capacity, while maintaining product quality and process efficiency, will showcase the practical viability of commercializing lignite-to-carbon production.

Furthermore, this facility will serve as a model for replicating similar projects across other lignite-producing regions, both within North Dakota and nationwide. By proving the technical and economic viability of this approach, AmeriCarbon will open the door for other domestic carbon product facilities, fostering innovation and technological leadership in carbon materials manufacturing.

Economic Impacts and Value to North Dakota

The long-term economic impacts of this project will be transformative for McLean County, the state of North Dakota, and the broader U.S. industrial base. Key economic impacts include:

- *Creation of a New Industry in North Dakota*. By converting lignite into carbon products, the project will lay the foundation for a new carbon materials industry centered in the region. This will support economic diversification beyond traditional coal mining and power generation.

- *Strengthening the Domestic Supply Chain*. The successful production of Eco-Pitch at a commercial scale will significantly reduce U.S. dependence on imported coal tar pitch, enhancing national security and economic resilience.

- *Job Creation and Workforce Development*. The construction and operation of the commercial facility will generate numerous high-wage jobs, including engineering, technical, and manufacturing roles. Workforce development initiatives will ensure that local residents have the skills needed to support ongoing operations.

- *Economic Multipliers*. By establishing a domestic supply chain for carbon products, the project will catalyze downstream industries such as defense, aerospace, and others. This will create opportunities for value-added manufacturing and attract investment into related industries.

The project will also leverage North Dakota's abundant lignite reserves to create high-value carbon products, thereby transforming a traditionally low-value resource into a cornerstone of advanced manufacturing. This will not only create economic opportunities within the state but will also position North Dakota as a leader in innovative carbon technology.

Overall, the successful completion of this project will mark a pivotal step in transitioning from reliance on foreign coal tar pitch to a domestic, sustainable, and economically viable production model. By doing so, AmeriCarbon will contribute to the long-term stability of the U.S. carbon materials supply chain and drive economic growth through technological innovation.

Why the Project is Needed:

The Forge Project represents the commercial execution phase of AmeriCarbon's initiative to establish the nation's first large-scale facility for producing Eco-Pitch™, an engineered coal-tar-pitch material derived directly from North Dakota lignite. This facility is the critical next step beyond research and engineering design—transitioning a proven pilot-scale process into a fully operational manufacturing plant capable of supplying strategic carbon materials for industrial, infrastructure, and defense markets.

For decades, the United States has relied almost entirely on foreign imports of coal-tar pitch, with China supplying the majority of global demand. This dependency creates a significant supply-chain vulnerability for critical materials used in graphite electrodes, carbon composites, and defense applications. Eco-Pitch™ provides a domestic, lower-carbon alternative, enabling the United States to onshore production of materials that are foundational to multiple advanced-manufacturing sectors.

The Forge Project directly addresses three national and state-level imperatives:

- **Energy and materials security**. Establishing a domestic source of carbon pitch eliminates exposure to foreign supply disruptions and strengthens the resilience of U.S. defense and industrial supply chains.

- **Environmental performance**. AmeriCarbon's patented Liquid Carbon Process (LCP) achieves a greater than 90 percent reduction in greenhouse-gas emissions compared to conventional processes based on steel-industry by-products, while also enabling efficient use of North Dakota's abundant lignite resources.

- **Economic diversification**. By siting this facility in McLean County near the Falkirk Mine and Coal Creek Station, the project converts a legacy energy resource into a platform for advanced materials manufacturing, supporting high-wage technical jobs and a new value chain centered in North Dakota.

With completion of the FEL-3 design and validated pilot-plant data in hand, the technology and engineering risk have been substantially reduced. The requested CSEA participation will fund the construction, commissioning, and startup of the commercial facility, moving the project from design readiness to revenue-generating operations. This transition is essential to:

- ✓ Demonstrate commercial viability of the process at full scale and deliver market-qualified products under long-term offtake agreements.

- ✓ Catalyze follow-on investment for additional production modules and downstream carbon-product facilities within North Dakota.

- ✓ Anchor a domestic ecosystem for advanced carbon materials, complementing regional initiatives in rare-earth extraction, critical-mineral recovery, and sustainable manufacturing.

Ultimately, The Forge Project is needed to transform a decade of research, pilot testing, and engineering design into a commercial reality that advances North Dakota's leadership in clean, sustainable energy and materials production. By doing so, it will strengthen national security, reduce emissions, and diversify the state's economy for decades to come.

STANDARDS OF SUCCESS

The project intends to bolster the domestic production of advanced carbon products, a strategic sector in the United States poised for substantial growth. Leveraging lignite coal as a primary raw material, AmeriCarbon and its collaborators seek to onshore the supply chain for advanced carbon material applications, enabling the creation of valuable finished products while dramatically reducing greenhouse gas emissions compared to existing industrial processes.

This project and the McLean Plant will play a pivotal role in establishing the foundation for the emergence of commercial-scale manufacturing facilities in North Dakota, aimed at seizing the economic potential presented by the onshoring of advanced carbon product production. Serving as a cornerstone, the production of carbon pitch from lignite coal will unlock additional manufacturing prospects, where lignite-derived carbon pitch serves as the basis for further refinement into high-value carbon materials and products. Over time, this endeavor has the potential to attract substantial capital investment, generate thousands of sustainable jobs, and contribute to the reduction of greenhouse gas emissions within the U.S. manufacturing sector.

The long-term success of this project, therefore, will be measured by the following:

- *Commercial pitch production facilities*. How many commercial scale pitch production facilities will be located in North Dakota and in what time frame? Our hope is to invest additional capital and resources into expanding the capacity of the Forge facility.

- *Downstream manufacturing facilities*. How many additional advanced carbon products manufacturing facilities will be located in North Dakota that use carbon pitch as a feedstock, and what will be their economic impact? Our hope is that in the next decade, there could be a network of manufacturers locating in North Dakota, leading to hundreds of jobs during construction and facility operations.

In order to evaluate the success of the proposed project, specific criteria need to be completed:

- *Technical Milestones*. Completion of FEL3 engineering design in accordance with industry standards and norms, including the following
    - Updated site layout and plot plan.
    - Additional granularity regarding engineering and process design, specifying equipment sizes, configurations, and materials of construction.
    - Refined capital cost estimates, including equipment, installation, and commissioning costs.
    - Refined operating cost projections and financial analysis to validate project economics.
    - Refinement of construction and operational plans, including logistics and supply chain integration.
    - Updated comprehensive risk assessments and mitigation strategies.
    - Identification of critical equipment and long-lead items.
    - Updated process flow diagrams (PFDs), piping and instrumentation diagrams (P&IDs), and mass and energy balance calculations.
    - Safety and environmental compliance reviews, ensuring adherence to local, state, and federal regulations.

By meeting these standards of success, the project will not only advance the domestic production of advanced carbon products but also contribute to job creation, economic growth, and environmental sustainability in North Dakota and beyond.

BACKGROUND/QUALIFICATIONS

AmeriCarbon's pioneering work in the development of advanced carbon products from lignite coal has been driven by a series of innovative projects that have progressively matured the technology from concept to commercial viability. The proposed project to complete the FEL3 engineering design for a commercial-scale Eco-Pitch manufacturing facility builds directly on the successes of prior projects and represents the next crucial step in transitioning from pilot-scale demonstrations to full-scale commercial production.

Origins of the Liquid Carbon Process and Early Developments
(Funded by AmeriCarbon)

The roots of AmeriCarbon's proprietary and patented Liquid Carbon Process (LCP) date back to 2009, when a predecessor organization built a pilot-scale unit aimed at broad coal liquefaction applications. Recognizing the potential for carbon pitch production, AmeriCarbon re-engineered the facility to create the Liquid Carbon Process specifically for producing tailored isophase and mesophase coal pitch intermediates and needle cokes. Since then, the facility has successfully produced pitch from lignite, bituminous, and sub-bituminous coals and has also demonstrated the production of needle coke.

AmeriCarbon's pilot facility, located in Morgantown, West Virginia, remains the only known coal liquefaction-based pitch production facility in the world. It comprises approximately 12,000 square feet and is equipped to support laboratory through pilot-scale research and development. This unique facility allows for the generation of directly scalable engineering data from applied research, enabling accurate translation to commercial-scale plant designs.

The Initial NDIC Project: Technical and Economic Feasibility Assessment
(Funded by NDIC, AmeriCarbon, and NACCO)

From January 2022 through June 2023, AmeriCarbon executed a project titled *North Dakota Lignite Coal-Based Pitch for Production of High-Value Carbon Products via AmeriCarbon Liquid Carbon Pitch (LCP) Process*, funded in part by the North Dakota Industrial Commission (NDIC). At the onset of that project, AmeriCarbon and its collaborators hypothesized that it would be technically feasible to convert North Dakota lignite coal into a coal tar pitch product. The project successfully demonstrated:

- Identification and quantification of specific market applications.
- Understanding of desired product specifications.
- Chemical formulation and process evaluation studies.
- Production of carbon products from lignite coal meeting market and customer specifications.
- Evaluation of by-products contributing to the commercial viability of the Liquid Carbon Process.
- Development of a technoeconomic model that meets investor return thresholds.

This initial project validated the technical feasibility of producing carbon pitch from North Dakota lignite coal and laid the groundwork for subsequent engineering studies to advance the technology toward commercial scale.

Engineering Design of the Base Module
(Funded by AmeriCarbon)

Building on the successful demonstration of the Liquid Carbon Process, AmeriCarbon engaged an engineering design contractor in October 2022 to develop an optimized base module design for the production of Eco-Pitch, hydrocarbon by-products, and ash by-product. This engineering effort, funded exclusively by AmeriCarbon, included the development of preliminary engineering designs for the base module, including equipment sizing and capital expense estimates. The effort also produced critical process flow diagrams (PFDs), piping and instrumentation diagrams (P&IDs), and mass and energy balance calculations.

This work culminated in the completion of the FEL2 engineering phase, conducted by Worley Parsons, which verified the technical and economic viability of the base module. These engineering studies established one of the key critical requisites for developing the commercial-scale McLean Plant.

Second NDIC Project: Engineering Design of Asphalt and Graphite Modules
(Funded by NDIC, AmeriCarbon, and NACCO)

In 2023, NDIC contributed funding support to a second project with AmeriCarbon, titled *Engineering Design and Feasibility Analysis for Commercial Graphite and Asphalt Manufacturing from Lignite-Derived Carbon Pitch*. This project initiated the engineering design and validated the economic viability of the asphalt and battery modules of the McLean Plant. Building on the earlier NDIC-funded effort, this project sought to advance the development of asphalt and battery-grade graphite derived from lignite coal using the patented/proprietary LCP process. These engineering advancements reinforced the technical potential of utilizing lignite-derived pitch for applications in both asphalt and graphite manufacturing, further supporting the commercial rationale for the McLean Plant.

Third NDIC Project: Reactor Optimization Project: Enhancing Lignite Conversion Efficiency
(Funded by NDIC, AmeriCarbon, and NACCO)

In 2024, AmeriCarbon was awarded funding from the North Dakota Industrial Commission (NDIC) for a targeted project aimed at optimizing the reactor design specifically for lignite coal conversion. This project was initiated in response to lessons learned from prior pilot-scale operations and early engineering studies, which identified the reactor as a critical component requiring enhanced performance to maximize yield and operational efficiency when processing lignite.
The primary objectives of the NDIC-funded reactor optimization project include:

- Conducting a comprehensive evaluation of the current reactor configuration to identify limitations and opportunities for improvement.
- Developing an optimized reactor design that maximizes lignite throughput while minimizing energy consumption and waste generation.
- Validating the new reactor design through prototype testing, ensuring it meets performance standards necessary for commercial-scale production.
- Generating high-quality lignite-derived pitch samples to validate product quality and consistency.
- Demonstrating the reactor’s ability to achieve consistent and reliable operation under commercial conditions.

This optimization project is essential to the successful commercialization of the Eco-Pitch process, as it directly addresses technical challenges related to the scale-up from pilot operations to full-scale production. By refining the reactor design and enhancing its capability to process lignite efficiently, AmeriCarbon is positioning the McLean Plant to achieve high operational reliability and economic viability.

Historical Background of Coal Liquefaction and Carbon Pitch Production

Coal liquefaction technology has a long and storied history, dating back to the early 20th century when Friedrich Bergius developed direct coal liquefaction to convert lignite into fuel. Subsequent advancements included the Fischer-Tropsch process, which converted syngas from coal into liquid hydrocarbons. While these technologies were initially developed for fuel production, they also laid the foundation for producing coal tar, a key precursor to carbon pitch.

In the United States, significant coking oven capacity once supported steelmaking and provided coal tar pitch as a by-product. However, with the decline of domestic steel production and the closure of many coking ovens, the supply of U.S.-produced coal tar pitch has dwindled. Simultaneously, the rapid growth of advanced carbon materials has created unprecedented demand for high-quality carbon pitch.

AmeriCarbon recognized the opportunity to adapt coal liquefaction technology for intentional pitch production, addressing the supply chain vulnerabilities created by the decline of domestic coking capacity and the increased reliance on imports, primarily from China. Through innovative engineering and process optimization, AmeriCarbon has pioneered the conversion of lignite into high-quality carbon pitch, positioning the company to meet the burgeoning demand for advanced carbon products.

The Current Project: Completing FEL3 and Preparing for Commercialization

The current project will complete the FEL3 engineering design for the commercial-scale McLean Plant in McLean County, North Dakota. This phase will Front End Engineering Design (FEED) package required to advance to the Execution phase, including definitive process and equipment specifications, refined cost estimates, risk assessments, and operational plans. This FEL3 effort builds directly on the achievements of prior projects, further validating the technical and economic feasibility of converting lignite to carbon pitch at a commercial scale.

Qualifications

<u>AmeriCarbon Team Members</u>

AmeriCarbon has assembled a credentialed project team and has developed a portfolio of strategic alliances with innovative developers, research institutions, and industry partners. Its executives bring expertise in the technical subject matter of hydrocarbon conversion, advanced coal products, technology scaleup and commercialization, and business and project finance.

Our team contributes the following to the proposed project:

- Technical Expertise. The AmeriCarbon team is led by **David Berry**, who is serving as principal investigator for the project. Dave has numerous patents and patents pending through more than three decades of institutional research experience with the U.S. Department of Energy and U.S. Department of Defense that are focused on hydrocarbon conversion technologies. Dave has extensive experience from the laboratory through the pilot-scale and has surrounded himself with world class researchers and innovative thinkers which have contributed to AmeriCarbon's unique technology. **Dr. Chetan Tambe** will serve as a senior researcher during the project. Dr. Tambe has a decade of experience in process design and development with a focus on hydrocarbon liquid processing. **Steven Mascaro, PMP** is a senior process engineer and project manager with more than three decades of experience, principally with the U.S. Department of Energy.

- Scale Up Capability. AmeriCarbon's business executives have spent the majority of their decades-long careers working in the realm between laboratory scale research and industrial development. The skills required to commercialize technology through the pilot demonstration phase are invaluable and contribute to AmeriCarbon's special capabilities in technical innovation and application.

- Commercial Track Record. Implementing innovation at pilot and industrial scale requires experience in large commercial transactions and the ability to manage capital with discipline. These qualities are the hallmark of AmeriCarbon's financial and commercial team members, who have raised and managed several hundred million dollars in the energy and materials sectors. **Greg Henthorn** formally serves as AmeriCarbon's vice president of business development and will continue to lead these activities in addition to providing project management and business operations support for the project.

Worley Parsons Team Members

Art Lucas has built a record of engineering accomplishments within various engineering disciplines, with experience at MATRIC, Marathon Ashland Petroleum, Akzo Nobel, Sunoco Chemicals, and DuPont Chemicals. He has provided engineering support for propylene purification and polymerization, polymer extrusion technology, process debottlenecking, solid handling and material transfer operations. He also has experience in simulating chemical processes with engineering software to develop a complete understanding of system dynamics. Art has been heavily involved in the design and detailed engineering for a biodiesel plant based on novel continuous technology. Art has a BS in Chemical Engineering from West Virginia University Institute of Technology.

Note: Detailed resumes from AmeriCarbon and Worley Parsons are included in the Appendix.

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.*

Management approach and oversight

AmeriCarbon will manage The Forge Project through an Owner-led Project Management Office (PMO) with Worley as the targeted engineering / EPC partner for execution, subject to final contracting at the conclusion of FEL-3. Governance will be provided by the AmeriCarbon Forge steering committee (JV principals) with decision rights at stage gates; day-to-day authority resides with the Project Director and PMO. Worley's role is anchored by its Charleston, WV chemicals center (with Bismarck, ND support) and is anticipated to continue from FEL-3 into detailed engineering, procurement support, construction management, and commissioning support per Worley's proposal and letter of support.

Organization and responsibilities

Owner (AmeriCarbon Forge PMO). Owns scope, budget, and schedule; approves stage-gates; manages financing and stakeholder engagement; leads EHS policy; integrates pilot-plant learnings; and accepts systems at Mechanical Completion (MC) and Provisional Acceptance (PA). The PMO issues the Project Execution Plan (PEP), Cost & Schedule Baselines, and Change Control (MOC) procedures.

Worley (anticipated EPC-M). Leads detailed design and interdisciplinary integration; provides project controls (Level-2 master schedule, cost reporting), procurement planning/expediting, constructability reviews, and commissioning support; delivers the **AACE Class-3** estimate and basis at FEL-3 handoff.

Operations (AmeriCarbon). Readies O&M procedures, staffing, and training (leveraging pilot operations) and leads commissioning & performance testing alongside Worley's commissioning team.

Execution controls and cadence. The PMO will implement an integrated control system aligned to the CSEA scoring emphasis on Methodology and Project Management (weights ×9 and ×6, respectively). Monthly reporting will track CPI/SPI (earned-value), commitments, forecast at completion, risk registers, safety KPIs, quality metrics, and progress to milestones; baselines are updated only via formal MOC.

> Key management artifacts produced/maintained: Project Execution Plan; Project Basis of Design; Level-2 schedule; Class-3 estimate & Basis; Procurement Plan; Constructability Reviews; HAZOP/QRA/FMEA records; Commissioning Management Plan; and monthly status packages (engineering, procurement, construction, HSSE, and cost).

Design finalization and procurement management. At the FEL-3 to execution transition, Worley provides the FEL-3 deliverables (PFDs, preliminary P&IDs, equipment lists, requisition packages, discipline design criteria, early 3D model) and firm quotations for major long-lead equipment. During execution, procurement will issue purchase orders for long-lead items immediately after AFE, then progress through bid/award for bulk materials and construction subcontracts. Supplier expediting and FAT/SAT are embedded in the QA/QC plan.

Construction management and AWP. Field execution will use Advanced Work Packaging (AWP) with Construction Work Packages (CWPs) linked to engineering and procurement deliverables to open multiple work fronts and protect the critical path. Early works include site prep, utilities, and lay-down areas; construction focuses on modular installation, utility tie-ins, and system turnover by subsystem.

Safety, risk, and environmental management. The project adopts a zero-harm objective. Process safety is embedded through HAZOP, QRA, and FMEA at 60%/90% design and refreshed pre-start; SIMOPS, permit-to-work, LOTO, and override control are enforced during commissioning. Risk workshops are held at each gate; top risks, mitigations, and residuals are tracked in the risk register.

Commissioning, startup, and handover. A Commissioning Management Plan governs systemization, MC certificates, loop checks, energization, PSSR, Start-Up Readiness Review (SUR), and a 90-day performance demonstration at design throughput with product-quality verification and emissions confirmation. Handover includes asset registers, as-builts, O&M procedures, and spares.

Reporting and stakeholder engagement. AmeriCarbon will provide CSEA/NDIC with monthly progress reports (cost, schedule, technical, HSSE), milestone notices, and a close-out report at PA/FA, consistent with the Committee's emphasis on clarity of management and timeliness. Coordination with local stakeholders and workforce partners will be continuous through construction and startup.

Evaluation Points (Stage Gates & In-Process Milestones)

Gate / Milestone	**Primary Evidence / Deliverable**
G0 – FEL-3 Complete	FEL-3 package; AACE Class-3 estimate; Level-2 schedule; procurement plan; updated risk/HSE studies
G1 – AFE / Financial Close	Executed financing (incl. CSEA), updated baseline (cost/schedule), LOIs/MOUs status
M1 – Long-Lead Orders Placed	PO/expediting logs for critical equipment (reactor trains, columns, condensers, electrical rooms)

Gate / Milestone	Primary Evidence / Deliverable
M2 – Site Mobilization & Early Works	Mobilization plan; SWPPP; early-works completion package
M3 – Structural & Modular Installation 50%	AWP progress; CWP completions; QA/ITP stats
M4 – Mechanical Completion (MC)	MC certificates by subsystem; turnover dossiers
G2 – Pre-Start-Up Safety Review (PSSR)	PSSR package; SIMOPS plan; training records
M5 – Hot Commissioning & Ramp	Functional and performance tests; control-loop tuning
M6 – 90-Day Performance Test	Independent QA results for binder & impregnating grades; GHG verification; utilities balance
G3 – Provisional Acceptance (PA)	O&M handover, spares, as-builts, asset register
M7 – Market & Workforce KPIs (running)	Executed MOUs/LOIs; shipments; hiring/training records

TIMETABLE

BUDGET

Project Associated Expense	NDIC Grant	NDIC Loan	Applicant's Share (Cash)	Other Project Sponsor's Share	Total
Project CAPEX		$40,000,000	$20,000,000	$40,000,000	$100,000,000
Total		$40,000,000	$20,000,000	$40,000,000	$100,000,000

A detailed financial model and equipment listing will be provided upon request, and subject to confidentiality restrictions.

CONFIDENTIAL INFORMATION

AmeriCarbon Forge, LLC hereby requests confidentiality for certain materials submitted in connection with this application pursuant to N.D.C.C. § 54-63-02 and the Clean Sustainable Energy Authority (CSEA) confidentiality procedures.

The confidential materials are provided under separate cover in clearly marked appendices labeled "Confidential – Not for Public Disclosure." These materials include:

- The AmeriCarbon Forge, LLC business plan, including strategic, commercial, and customer information;
- Historical and projected financial statements and tax returns;
- The Bank of North Dakota (BND) loan application and supporting financial documents; and
- Other proprietary and financial data containing trade secrets, commercial information, or competitive business details.

These materials contain information that is commercially sensitive and proprietary to AmeriCarbon Forge, LLC and its affiliates. Public disclosure would likely cause competitive harm by revealing internal business strategies, financial terms, and trade-secret information.

A separate Request for Confidentiality form has been submitted concurrently with this application, identifying the nature of the information to be protected and the basis for the confidentiality designation.

PATENTS/RIGHTS TO TECHNICAL DATA

AmeriCarbon holds several patents related to its proprietary Liquid Carbon Process (LCP) and the production of advanced carbon materials, including Eco-Pitch. These patents form the foundational intellectual property underlying the commercial-scale pitch manufacturing technology and related processes. All intellectual property rights will be retained by AmeriCarbon, subject to applicable North Dakota laws governing research and development projects funded in part by the North Dakota Industrial Commission (NDIC).

AmeriCarbon holds five patents in the United States and Canada: US# 11667852, 10301549, 9845431, 9534176; and CA# 3120884. AmeriCarbon's intellectual property portfolio protects the core technologies necessary for converting lignite coal into high-value carbon materials. The patents encompass process innovations, reactor configurations, and methodologies for producing tailored pitch products and carbon intermediates.

Subject to existing law of the State of North Dakota, all intellectual property developed, utilized, or refined during this project will remain the exclusive property of AmeriCarbon. This includes any new methods, improvements, or technical advancements arising from the FEL3 engineering design work or related pilot plant activities.

STATE PROGRAMS AND INCENTIVES

AmeriCarbon's affiliate, AmeriCarbon Products, LLC, has been the recipient of the following contracts through the Lignite Research Council and funded by the North Dakota Industrial Commission:

NDIC Contract Number	Title	Term of Contract	NDIC Share
Contract No. FY22-XCVII-241	North Dakota Lignite Coal-Based Pitch for Production of High Value Carbon Product	January 2022 through June 2023	$550,000.00
Contract No. FY23-102-251	Engineering Design and Feasibility Analysis for Commercial Graphite and Asphalt Manufacturing from Lignite Derived Carbon Pitch	July 2023 through June 2025	$700,000.00
Contract No. FY24-104-258	Lignite Conversion Reactor Optimization for Commercial Carbon Pitch Manufacturing	July 2024 through January 2026	$743,800.00
Contract No. FY25-107-264	Commercial Plant Design Optimization: Lignite to Critical Carbon Materials	May 2025 through July 2026	$1,499,653

PUBLICATIONS - Selected

1. Ping Wang, Bret Howard, Nicholas Means, Dushyant Shekhawat, David Berry. "Coal chemical-looping with oxygen uncoupled (CLOU) using a Cu-based oxygen carrier derived from natural minerals". Energies 2019, 12, 1453, doi:10.3390/en12081453.
2. Daniel J Haynes, Dushyant Shekhawat, David A Berry, Amitava Roy, James J. Spivey, Effect of calcination temperature on the steam reforming activity of Ni substituted pyrochlore catalysts, Jun 2018 to Applied Catalysis: A: Gen.
3. Ping Wang, Nicholas Means, Bret Howard, Dushyant Shekhawat, and David Berry, The Reactivity of CuO Oxygen Carrier and Coal in Chemical-Looping with Oxygen Uncoupled (CLOU) and In-situ Gasification Chemical-Looping Combustion (iG-CLC), Fuel 217 (2018) 642-649).
4. M.W. Smith, D.A. Berry, D. Shekhawat, D.J. Haynes, J.J. Spivey, Partial oxidation of liquid hydrocarbons in the presence of oxygen-conducting supports: Effect of catalyst layer deposition, Fuel, 89 (2010) 1193-1201.
5. D.J. Haynes, A. Campos, M.W. Smith, D.A. Berry, D. Shekhawat, J.J. Spivey, Reducing the deactivation of Ni-metal during the catalytic partial oxidation of a surrogate diesel fuel mixture, Catal Today, 154 (2010) 210-216.
6. D. Shekhawat, D. A. Berry, H. W. Pennline, E. Granite, J. J. Spivey, Special Issue: Advanced Fossil Energy Utilization, Fuel, Volume 89, Issue 6, January 1, 2010.
7. Maria D. Salazar-Villalpando, D. A. Berry and A. Cugini, Role of Lattice Oxygen in the Partial Oxidation of Methane over Rh/Supported Ceria Catalysts. Isotopic Studies, Solid State Ionics, December 2009.
8. M. Salazar, D. A. Berry and T. H. Gardner, "Partial Oxidation of Methane over Rh/Supported-Ceria Catalysts: Effect of Catalyst Reducibility and Redox Cycles", Published, International Journal of Hydrogen Energy, 33/11, (2008), 2695-2703
9. Shadle, L.J., Berry, D.A., and Syamlal, M., "Coal Gasification", Encyclopedia of Chemical Technology, Concise, 5th Edition (ISBN 978-0-470-04748-4). , John Wiley & Sons, Inc., NY, NY, May 2007.
10. Turton, R.A., Berry, D.A., Gardner, T.G., and Miltz, A., "The Evaluation of Zinc Oxide Sorbents in a Pilot-Scale Reactor: Sulfidation Kinetics and Reactor Modeling", Industrial Engineering and Chemistry, Ind. Eng. Chem. Res. 2004, 43, 1235-1243

PATENTS - Selected

1. U.S. Patent # 9,935,318 SOFC Cathode with Oxygen Reducing Layer, (2018)
2. U.S. Patent 9,598,644 Method of CO and/or CO2 hydrogenation to higher hydrocarbons using doped mixed metal oxides, (2017).
3. U. S. Patent 9,562,203 Methane-rich syngas production from hydrocarbon fuels using multi-functional catalyst/capture agent, (2017).
4. U.S. Patent 9,126,833 Process for continuous synthesis of mixed oxide powders, (2015).
5. U.S. Patent 8,486,301 Method for designing a reforming and/or combustion catalysts system, (2013).
6. U.S. Patent # 7,442,353 "Heat Recirculating Reformer for Fluid Stream Pollutant Removal, (2008).

SYNERGISTIC ACTIVITIES

- Editorial Board Member, "Catalysis Today", January 2006-2009.
- Distinguished Visiting Scientist, Oak Ridge National Laboratory, April 2002.
- Research Management Board Member, Army Core Technology Program (CTP) for Power Systems, June 2005 / 2006.

GREGORY G. HENTHORN

EDUCATION

West Virginia University, Morgantown, WV, Executive MBA (2003);

West Virginia University, Morgantown, WV, J.D. (2000)

West Virginia University, Morgantown, WV, B.S., Chemical Engineering (1995)

RESEARCH AND PROFESSIONAL EXPERIENCE

AmeriCarbon Products, LLC; VP of Corporate Development; Morgantown, WV; 2020-present; Focuses on commercial transactions; investor relations, capital attraction and management; business development with customers and collaborators; administrative and financial oversight.

West Virginia University; Associate Professor (Adjunct); Morgantown, WV; 2019-present; Energy Production and Operations (ENLM 220)

Flat Rock Energy; EVP of Business Development; Morgantown, WV; 2010-2020; Flat Rock is a private equity funded oil and gas exploration and production company that develops, funds, and implements drilling programs in the Appalachian Basin. Founder of company, securing more than $100 million in private equity funding; Negotiated commercial transactions with investors and other oil and gas operators.

Kinetic Clean Energy; Managing Partner; Morgantown, WV; 2007-2010; The company coordinated the origination, development, and finance of several methane-based renewable energy projects. Financed more than $50 million in renewable electric power facility construction projects; Organized facility to convert fleet vehicles to compressed natural gas; Assisted in the formation of a team to commercialize ethane-to-plastics technology.

Fourth Venture Group; Vice President; Morgantown, WV; 2000-2007; Fourth Venture was an angel capital and early stage venture capital firm that served as a launching pad for technology commercialization and economic development. Served as Chief Operating Officer for a 500,000-

member online portal that integrated with hundreds of brick-and-mortar merchants; Worked with DOE laboratories and NGOs to commercialize technologies developed in former Soviet military research institutes; Explored development of a liquefaction facility to convert coal to liquid transportation fuels; Co-founded an enterprise-class business-to-business software company that was focused on the surveying and construction sectors, from establishment of the business to its divestiture; Held executive management positions in two specialized manufacturing companies.

SELECTED PUBLICATIONS & PRESENTATIONS

- "New Business Opportunities in TransTech Energy Technologies", West Virginia Senate Economic Development Committee Meeting, West Virginia State Capitol, January 18, 2011.
- "Opportunities for the Coal Industry to Create Revenue from Carbon Offsets", 36th Annual West Virginia Mining Symposium, West Virginia Coal Association, Civic Center, Charleston, WV, February 18, 2009.
- Bai, Xingji and Henthorn, Greg. "13 Per Day." *Capacity Magazine* Spring (2007): 77-79. Print.

SYNERGISTIC ACTIVITIES

1. **TechConnectWV**, Charleston, WV; Member, Board of Directors, 2004-present; Member, Executive Committee, 2010-present. TechConnectWV is a non-profit, 501(c)(3) organization dedicated to the advancement of science, technology, and the innovation economy in West Virginia.
2. **West Virginia University**, under contract with Kinetic, 2012-2016; *Feasibilities of a Coal-Biomass to Liquids Plant in Southern West Virginia* (Award DE-FE0009997).
3. National Research Center for Coal & Energy, West Virginia University, Morgantown, WV; Consultant, Energy Efficiency Division, under contract with Kinetic, 2010-2011; *Supported establishment of initial TransTech Energy Conference.*
4. **West Virginia High Technology Consortium Foundation**, Fairmont, WV; Consultant, INNOVA Commercialization Group, 2010-2011; *Identification of technology commercialization and investment opportunities at NETL and WVU*

Art Lucas

Senior Principal Process Engineer

Summary

Mr. Lucas has more than twenty-two years of process design and research experience in the Chemical and Polymer industries. Responsibilities have included process engineer, research engineer and other roles.

Education

2000 B.S. Chemical Engineer, West Virginia Institute of Technology, Montgomery, WV

Experience

2023-Present Senior Principal Process Engineer, Worley, Charleston, WV

- Air Permitting & Emissions for Blue Ammonia Technology
- Proposal and Scope Work OSBL Blue Ammonia Technology
- Plastics Recycling Technology
- UniSim Modeling with OLI Software
- Worley Education Passports in Low Carbon Hydrogen, Ambition, Sustainability, Energy

2006-2023 Senior Research Engineer, MATRIC, South Charleston, WV

Technology development and deployment of various technologies at both laboratory and pilot scale as listed below.

- Batch polymerizations with novel technologies
- Liquid-Liquid Extractions
- Membrane technology and filtrations
- High Molecular weight polymerization
- Pyrolysis Technology
- Agitated filter drying and precipitations
- Adsorption Technologies
- Renewable Energy Technology
- Recycle Technology for various consumer products
- Chlorination reactions with shock sensitive byproducts
- Algae processing to make nutraceuticals

- Wiped Film evaporation and azeotropic distillations
- Slurry handling of both miscible and immiscible solutions.
- Solids handling of pseudoplastics and high viscosity polymers

Responsibilities included the following:

- Technical liaison with customers technical staff to develop scope of work, project execution plans and testing protocols.
- Developed all documentation for pilot scale operations. This included but not limited to, P&IDs, mass and energy balances, operating procedures, EHS, Safety assessments, emergency response and daily operational plans.
- Managed customer projects from concept to completing. A Dual role as Senior Research Engineer and Project Manager. Managed average capital expenditures of $500K to as excess of $1.5MM.
- Technical documentation for patent filing for successful technology for both the customer and internal research projects.
- Trained the operation workforce on the new technology deployments. This includes sample methodology as well as operation know how.
- Developed technology packages for renewable energies as part of the Renewable Fuel Standard.
- Worked with customer to mitigate risk for large scale fermentation to acid technology hurdles. Solutions were adopted and customer deployment commercial scale implementation in excess of $300MM.
- Developed and patented technology in Pyrolysis and Reverse Osmosis Membranes.
- Lead engineer for design and implementation of patented continuous biodiesel facility. Overseen technology transfer, prepared design and bid packages and orchestrated project implantation in a cradle to grave role. This also included writing all Standard Operation procedures an defining the safety and compliance issues for the facility.

2006 – 2006 Process Engineer, DuPont Chemical Company, Belle, WV

- Debottlenecking process by redeveloping process conditions.

Solid Handling and Material Transfer

Vacuum Operations

Slurry Transfer

Batch Processing

Blending and Conveying

- Responsible for all activities surrounding production metrics of the unit.
- Provided 24hr coverage for area of unit responsibility to provide direction as require for all production problems.
- Organized a process workflow system that directed the human interfaces with the process for optimal performance.
- Educated/Trained operations on critical paths for success and very instrumental in fostering a higher standard ow work practices of operational employees.
- Developed and implemented new process guidelines and control limits.
- Responsible for operational instructions for evening and night shift employees.

2001 – 2005 Project/Process Engineer, Sunoco Chemical – Kenova, WV

Extrusion Process

- Implemented Rheology technologies for improved process control.
- Project engineer for de-bottlenecking extrusion line.

Capital $1.75 MM

Designed and implemented Master Batch Additive System

- Rotating equipment

Twin Screw Extruders

Gear pumps

Blenders

Conveyors

Rotary valves

Pelletizers

Bulk material transfer

Gravity and pneumatic conveying systems

- Decreased off spec product by improving raw additive blend methods.
- Fully utilized new and existing PLC components for decreasing labor efforts along additive system.
- Orchestrated work efforts with hourly group to obtain new process workflow and procedure for new equipment.
- Preventative maintenance routines and monitoring for new equipment.
- Daily engineering support to production. Organized and developed "Best Practices" along extrusion line using root cause analysis.

300% increase in reliability

Increased first pass prime material from 93% to 98.2%.

Polymerization Process:

- Improved first stage reaction control by installing a refrigerated water/glycol system.
    - Twin screw and reciprocating compressor technology
- Operating Discipline Rollout member
- Spheripol Catalyst Technologies
- Provided engineering support to operations for high activity catalyst trials.
- Combined reaction kinetics and catalyst technologies to minimize byproduct formation.
- Decreased off-spec product by 50% by developing and implementing IMR models for online Rheology measurement.

Propylene Purification:

- Catalyst technologies for feedstock purifications
- Installed and commissioned first Nickel catalyst bed within Chemicals division ($100K capital).

Industrial Commission

Tax Liability Statement

Applicant:

AmeriCarbon Forge, LLC
3001 Cityview Drive
Morgantown, WV 26501

Application Title:

The Forge Project

Program:

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

Certification:

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

Signature

Chief Business Officer
Title

10/15/2025
Date

North American COAL

October 14, 2025

AmeriCarbon Forge, LLC
c/o AmeriCarbon Enterprises, LLC
Attn: Mr. Greg Henthorn, Chief Business Officer
3001 Cityview Drive
Morgantown, WV 26501

Re: Support The Forge Project in North Dakota

Dear Mr. Henthorn:

North American Coal, LLC (NACoal) is pleased to express its support for the applications being submitted by AmeriCarbon Forge, LLC and Ore Spring Materials, LLC to the Clean Sustainable Energy Authority (CSEA) for The Forge Project and the associated Rare Earth and Critical Materials Integration Project. Both projects represent transformative opportunities to advance value-added lignite utilization and domestic manufacturing in North Dakota.

As the leading producer of lignite coal in North Dakota, NACoal remains committed to supporting innovation that utilizes North Dakota's lignite as a strategic resource for economic development and job creation. We recognize the importance of developing domestic sources of advanced carbon materials and critical minerals, particularly those essential to industrial, infrastructure, and defense applications.

Currently, NACoal is considering investing up to $6 million in the commercial facility to be constructed as part of The Forge Project. Any such capital investment will be contingent upon completion of due diligence, mutually satisfactory definitive agreements, final project financing structure, and approval by NACoal's Board of Directors.

In addition to our potential equity participation, NACoal expects to continue supporting the project through its affiliate The Falkirk Mining Company, which operates the Falkirk Mine in McLean County, North Dakota—the planned feedstock source for The Forge Project. We anticipate that the project will strengthen the long-term viability of lignite operations by expanding the economic uses of this resource beyond power generation.

NACoal also recognizes the strategic significance of the Rare Earth and Critical Materials Integration Project being advanced by Ore Spring Materials in collaboration with AmeriCarbon, the University of North Dakota, and Microbeam Technologies. The potential to recover rare earth elements and critical minerals from by-product ash streams produced by the Forge facility offers a compelling opportunity to establish an integrated value chain for critical materials within the state. NACoal views this integration as a valuable bolt-on to the Forge Project, enhancing North Dakota's leadership in critical mineral recovery and clean industrial innovation.

We are encouraged by AmeriCarbon's technical progress, the strength of its partnerships with the University of North Dakota and other institutions, and the alignment of these projects with the state's economic goals. NACoal looks forward to continuing its collaboration with AmeriCarbon and its affiliates as they move toward commercial implementation of these important initiatives in North Dakota.

Sincerely,

NORTH AMERICAN COAL, LLC

Carroll L Dewing

Carroll L. Dewing
Senior Vice President and Chief Operating Officer

RAINBOW
ENERGY CENTER

918 E Divide Ave
Bismarck, ND 58501
rainbowenergycenter.com

October 14, 2025

AmeriCarbon Forge, LLC
c/o AmeriCarbon Enterprises, LLC
Attn: Greg Henthorn, Chief Business Officer
3001 Cityview Drive
Morgantown, WV 26501

Subject: Support of The Forge Project

Dear Mr. Henthorn:

Rainbow Energy Center, LLC is pleased to convey its strong endorsement of **The Forge Project** being advanced by AmeriCarbon and NACCO Natural Resources. The project's proposed location, near our Coal Creek Station operations, presents a unique opportunity for local synergy, strategic partnership, and regional economic development.

Rainbow is proud to be part of the electrical generation system in North Dakota, owning Coal Creek Station and Nexus Line, LLC, to deliver reliable power across the region. As part of our core mission, we are committed to exploring and supporting innovative technologies and value-added industrial uses of regional resources.

We view The Forge Project as complementary to our operations and regional energy ecosystem. The facility's production of Eco-Pitch™ from North Dakota lignite coal — using AmeriCarbon's proprietary process — dovetails with the region's broader ambitions to harness natural resources, enhance domestic manufacturing capacity, and build resilience in strategic supply chains.

Rainbow is committed to working cooperatively with AmeriCarbon to explore beneficial collaborations, including possible coordinated infrastructure use (energy, utilities, transmission access). We believe The Forge Project offers meaningful benefit to the county and state through economic stimulus, job creation, and long-term strategic advantage in energy and materials sectors.

Rainbow also recognizes the alignment between The Forge Project and the complementary rare earth element (REE) integration initiatives being advanced by AmeriCarbon and its affiliates, as well as NACCO Natural Resources, the University of North Dakota, and Microbeam Technologies. These efforts reinforce one another and present a valuable opportunity to leverage shared infrastructure and regional expertise to support critical mineral recovery and high-value carbon production within North Dakota's energy corridor. Rainbow wishes AmeriCarbon success in securing the Clean Sustainable Energy Authority award and looks forward to being a constructive collaborator as the project progresses.

Sincerely,

Jessica K. Bell

Jessica K. Bell, Vice President External Affairs
Rainbow Energy Center, LLC

Cc: David Straley (NACCO Natural Resources)

A Family Of Companies - CHARLESTON, W.V. -

DICKINSON GROUP

October 14, 2025

Mr. Greg Henthorn
Chief Business Officer
AmeriCarbon Forge, LLC
3001 Cityview Drive
Morgantown, WV 26501

Dear Mr. Henthorn:

I am writing in support of your application to the North Dakota Clean Sustainable Energy Authority (CSEA) for **The Forge Project**, which proposes the construction of a commercial-scale manufacturing facility for Eco-Pitch™. The Forge Project represents a major step forward in establishing domestic manufacturing capacity for advanced carbon materials that will serve critical roles in industrial, infrastructure, and defense applications.

The Dickinson Group is a family-office private-equity investment firm based in Charleston, West Virginia. The Dickinson family has been part of the Kanawha Valley community for more than 200 years. We maintain substantial holdings in natural resources, real estate, and energy, and we draw upon our multi-generational experience and values to help capitalize and grow innovative and sustainable businesses that impact strategic domestic supply chains.

We share North Dakota's vision to create value-added industries that utilize lignite coal for high-technology applications. AmeriCarbon's Eco-Pitch™ process exemplifies this opportunity—transforming a regional natural resource into a high-value engineered carbon material through an innovative and environmentally responsible process. We also recognize the longer-term opportunity to integrate rare-earth-element (REE) recovery from by-product ash at the Forge facility, in coordination with AmeriCarbon's affiliate, Ore Spring Materials, LLC. This complementary effort could further strengthen the project's impact on U.S. supply-chain security and resource recovery.

The Dickinson Group believes we can support this project in a number of ways, including potential capital investment in AmeriCarbon Forge, LLC to support your cost-share commitment. Any capital investment will, of course, be subject to customary due diligence and approval by our investment board. As you know, our family of companies and partners have already demonstrated our commitment to AmeriCarbon's success, having made a seven-figure investment in AmeriCarbon and its affiliates to date.

We are encouraged by AmeriCarbon's progress and confident that The Forge Project in North Dakota will help establish a strong foundation for domestic critical materials production. We look forward to continuing our relationship with AmeriCarbon as you advance this transformative project.

Sincerely,

Steve Platz
President & CEO

CONSOL Innovations, LLC
275 Technology Drive, Suite 101
Canonsburg, PA 15317

October 1, 2025

Clean Sustainable Energy Authority (CSEA)
North Dakota Industrial Commission
State Capitol, 14th Floor
600 E. Boulevard Ave., Dept. 405
Bismarck, ND 58505-0840

Re: Letter of Support for AmeriCarbon's Proposal to CSEA

On behalf of CONSOL Innovations LLC, I am pleased to offer this letter of support for AmeriCarbon's application to the Clean Sustainable Energy Authority ("CSEA") in support of a proposed project in McLean County, North Dakota. AmeriCarbon's proposed project represents a critical advancement in advanced manufacturing and carbon materials innovation, and we believe it aligns well with the mission of CSEA to support sustainable, emissions-reducing energy and industrial technologies.

CONSOL Innovations is interested in purchasing from AmeriCarbon a tailored mesophase version of Eco-Pitch™—a carbon material derived from domestic coal using a low-emissions process. Our intent is to convert this material into high-performance graphite foam for use in both defense and commercial applications.

The proposed project in North Dakota, which will house a commercial-scale production facility, is essential to enabling broader deployment of this domestic, sustainable carbon material. We are supportive of AmeriCarbon's efforts to scale production and have been working with the company in recent years toward a supplier-customer relationship. The MOU provides a framework for ongoing collaboration, and we view their success as important for our ability to deliver next-generation materials for critical applications.

We respectfully urge the Clean Sustainable Energy Authority to approve funding for AmeriCarbon's proposal, and we look forward to a continued relationship in realizing the economic, environmental, and strategic benefits of this technology.

Sincerely,

Rudy Olson III, PhD
Director of New Technology
CONSOL Innovations LLC

rudolpholson@coreresources.com
(304) 907-2501

Worley Group, Inc.
500 Lee Street East, Suite 1300
Charleston, WV 25301

October 14, 2025

AmeriCarbon Forge, LLC
c/o AmeriCarbon Enterprises, LLC
Attn: Mr. David A. Berry, Chief Executive Officer
3001 Cityview Drive
Morgantown, WV 26501

Subject: Letter of Support – CSEA Application for The Forge Project

Dear Mr. Berry:

Worley is pleased to express its support for AmeriCarbon Forge, LLC's application to the North Dakota Clean Sustainable Energy Authority (CSEA) for funding of The Forge Project—a first-of-its-kind commercial manufacturing facility for Eco-Pitch™, AmeriCarbon's patented coal tar pitch derived from North Dakota lignite coal. The Forge Project represents a critical step toward the domestic production of advanced carbon materials that support industrial, infrastructure, and defense applications across the United States.

As Worley continues to provide engineering and design services for the Forge Project, we remain confident in AmeriCarbon's progress toward commercial scale production. Upon completion of the FEL-3 engineering design package, Worley anticipates the opportunity to submit a proposal to AmeriCarbon for Detailed Engineering Design services and potential participation in later project phases as an EPC contractor or EPC-M provider, subject to mutual agreement and commercial terms. While these discussions remain preliminary, Worley looks forward to continuing its close technical collaboration with AmeriCarbon through future phases of project execution.

Worley is proud to support AmeriCarbon's commitment to innovation and to North Dakota's leadership in developing value-added energy products from lignite coal resources. We believe that The Forge Project, located near the Falkirk Mine in McLean County, represents an important milestone in advancing domestic carbon manufacturing and expanding the state's role in sustainable industrial development.

Respectfully,

DocuSigned by:
Daniel Noel
E7C06C9BF0F44A3...

Daniel L. Noel, P.E.
Project Manager
Worley Group, Inc.

VERTX PARTNERS
602 Virginia Street East Suite 202
Charleston, WV 25301
vertxpartners.org

Mr. Greg Henthorn
Chief Business Officer
AmeriCarbon Forge, LLC
c/o AmeriCarbon Enterprises, LLC
3001 Cityview Drive
Morgantown, WV 26501

14 Oct 2025

Dear Mr. Henthorn:

It is my pleasure to provide this letter of support for AmeriCarbon and its proposal to the North Dakota Clean Sustainable Energy Authority (CSEA) for The Forge Project, which will establish a first-of-its-kind commercial-scale manufacturing facility for Eco-Pitch™. This project is directly aligned with critical Department of Defense (DoD) and defense-industrial base objectives to secure a domestic supply of high-performance carbon materials essential to the nation's infrastructure, energy, and defense sectors.

As a retired U.S. Air Force Colonel and former Program Director and System Program Manager for the $66 billion F-22 Raptor stealth fighter program, I spent much of my career ensuring that America's most advanced air-dominance weapon system maintained technological superiority through secure and resilient supply chains. At Wright-Patterson Air Force Base, I led a 2,200-person government–industry enterprise responsible for every aspect of the program's lifecycle — including management, technology development, programming, planning and budgeting, contracting, risk management, airworthiness, and 24/7 customer support and sustainment of the entire operational F-22 fleet. That experience gave me firsthand insight into the critical importance of secure defense supply chains — and why projects like this one, which return essential materials manufacturing to U.S. soil, are vital to our national security.

Through the firm I founded, Vertx Partners, I have collaborated with AmeriCarbon for several years, helping the company connect with defense contractors, DoD officials, and technology transition offices. During that time, I have seen AmeriCarbon secure initial DoD funding and receive letters of interest and support from defense contractors, all validating a serious and well-documented need for a secure domestic source of coal-tar-pitch and related advanced carbon products. AmeriCarbon is now actively engaged with potential customers in materials validation programs—an essential step toward full qualification and adoption in mission-critical systems.

I fully support AmeriCarbon's efforts to advance The Forge Project, which will not only expand domestic carbon manufacturing but also create an anchor platform for integration with rare-earth-element recovery operations being developed by its affiliate, Ore Spring Materials, LLC—further strengthening the national materials supply chain.

I am confident that AmeriCarbon has the leadership, technology, and partnerships required to deliver on this vision and to provide tangible benefits to U.S. defense readiness and industrial resilience.

Respectfully,

Sean M. Frisbee, Colonel, USAF (ret)
President
sean.frisbee@vertxpartners.org
304-276-8999

October 14, 2025

AmeriCarbon Forge, LLC
c/o AmeriCarbon Enterprises, LLC
3001 Cityview Drive
Morgantown, WV 26501

Subject: Letter of Support – Collaboration on Eco-Pitch™ and Asphalt Binder Development

Dear Mr. Berry,

It is our pleasure to express the support of the advanced pavement materials research team at South Dakota State University for AmeriCarbon's efforts to advance the development of Eco-Pitch™, a next-generation engineered carbon material, and its application in high-performance asphalt binder systems. Our collaboration with AmeriCarbon has been both productive and promising, and we look forward to continuing this important work as the company advances The Forge Project and related initiatives in North Dakota.

Through our research partnership, SDSU's advanced pavement materials research team has evaluated the mechanical performance of AmeriCarbon's engineered coal-tar-pitch-based materials (AC-127 and AC-128) as innovative binders or additives for asphalt pavements. The preliminary results demonstrated that these binders can achieve excellent stiffness and elasticity at high temperatures, favorable low-temperature cracking resistance, and adhesive bonding with common aggregates. These findings confirm that Eco-Pitch™-derived binders hold potential as alternatives to conventional petroleum-based asphalt, subject to further research, investigation, and optimization.

We are currently preparing for a Phase II program to expand this work, focusing on the formulation of a proprietary Eco-Pitch™ asphalt binder and its performance verification under industry-standard testing protocols. The next phase will build upon our previous laboratory studies, incorporating advanced rheological and mechanical evaluations, mix design development, and pilot-scale field validation.

Our advanced pavement materials research team at SDSU values its collaboration with AmeriCarbon and is committed to providing ongoing research and technical support as the company continues to scale its carbon technologies. We believe these innovations align strongly with regional and national objectives to enhance infrastructure durability of construction materials. We appreciate the opportunity to support AmeriCarbon's efforts and look forward to contributing to its success as the company advances The Forge Project and related programs.

Sincerely,

Rouzbeh Ghabchi

Rouzbeh Ghabchi, Ph.D., P.E.
Associate Professor
Department of Civil and Environmental Engineering
South Dakota State University
Rouzbeh.Ghabchi@sdstate.edu

UNIVERSITY OF NORTH DAKOTA

UND.edu

COLLEGE OF ENGINEERING & MINES

CEM Research Institute
CEC, Room 246
2844 Campus Rd. Stop 8153
Phone: 701.777.5745
Website: engineering.UND.edu

October 14, 2025

AmeriCarbon Forge, LLC
c/o AmeriCarbon Enterprises, LLC
Attn: Mr. Greg Henthorn, Chief Business Officer
3001 Cityview Drive
Morgantown, WV 26501

Subject: Letter of Support – The Forge Project

Dear Mr. Henthorn:

The University of North Dakota College of Engineering & Mines (UND-CEM) is pleased to express its support for The Forge Project being advanced by AmeriCarbon Forge, LLC. This important initiative represents a significant step forward in developing North Dakota's lignite resources into high-value carbon products that align with the state's broader goals for innovation and economic development.

UND and AmeriCarbon have worked together closely over the past several years through a series of collaborative research and development projects focused on lignite utilization, carbon product development, and rare earth element (REE) recovery. These joint efforts have strengthened North Dakota's position as a national leader in lignite innovation, and we consider our relationship with AmeriCarbon and its affiliate Ore Spring Materials, LLC to be a strategic partnership built on shared objectives and technical collaboration.

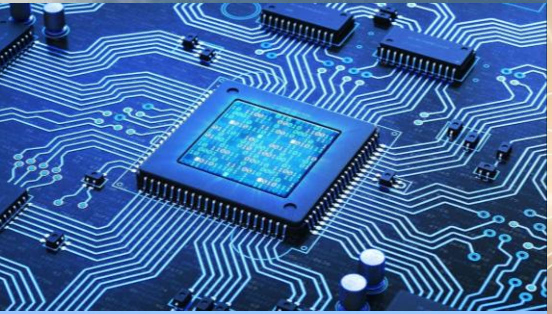
While The Forge Project is primarily a construction and commercialization effort, UND remains committed to supporting AmeriCarbon and Ore Spring as technical partners and collaborators as needs may arise. Our team at the College of Engineering & Mines stands ready to contribute expertise in areas such as feedstock evaluation, process optimization, and systems integration between carbon production and critical minerals recovery, consistent with our ongoing research mission.

We view The Forge Project as a model for how private industry and the state's research community can work together to drive economic growth and innovation within North Dakota's energy sector. UND looks forward to continuing to work with AmeriCarbon and its affiliates as you continue to advance this important initiative.

Sincerely,

DocuSigned by:
Daniel Laudal
9CFF8579D0B9464...

Daniel Laudal, Ph.D.
Executive Director
College of Engineering & Mines Research Institute
University of North Dakota
daniel.laudal@und.edu



AMERICARBON FORGE PROJECT

ENABLING A DOMESTIC SUPPLY CHAIN OF CRITICAL MATERIALS

JANUARY 29, 2026

AmeriCarbon

Forge Project

PLANNED AMERICARBON FORGE FACILITY

MCLEAN COUNTY, NORTH DAKOTA

AmeriCarbon Forge will design, build, own, and operate the **nation's first** commercial scale coal tar pitch manufacturing facility to address a supply crisis in critical materials.

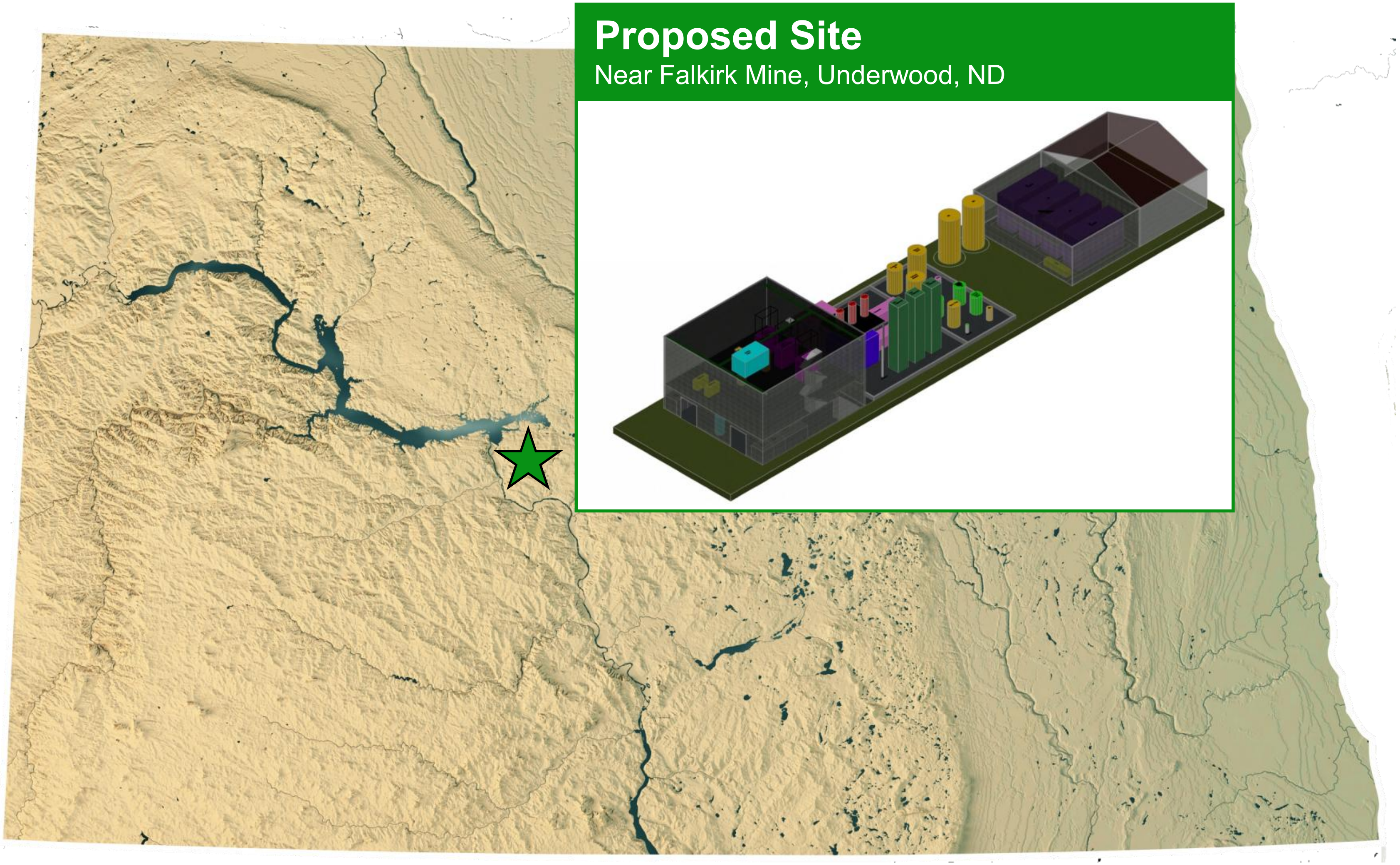
The facility will cost ~$100 million to construct, create 50 new, long term skilled jobs during its first production phase, with opportunity for significant expansion over time.

Project Partners & Collaborators:

- AmeriCarbon
- NACCO
- The North American Coal Corporation
- Rainbow Energy Center
- University of North Dakota
- Worley Group

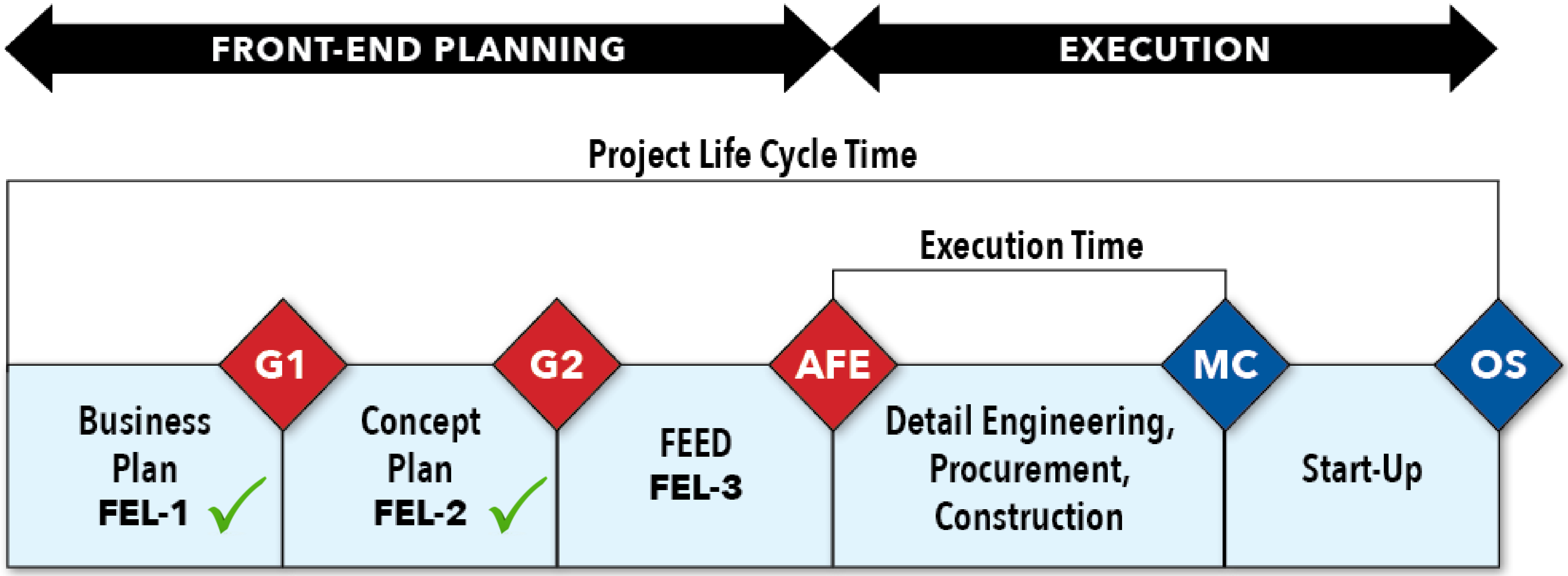
Status:

- FEL-3 Engineering being completed prior to project start
- Projected for operation in 4Q2027/1Q2028



AmeriCarbon

COMMERCIAL PLANT DESIGN STATUS: FEL-3



FEL: Front-End Loading
AFE: Authorization for Expenditure
MC: Mech. Completion
OS: On Stream
Gate
Milestone

AmeriCarbon is completing FEL-3 pursuant to a Lignite Research Council project, to be completed prior to initiation of the proposed project.

AmeriCarbon

AMERICARBON FORGE FACILITY

POSSIBLE CAPITAL STACK

CAPEX ESTIMATE

$100 MILLION

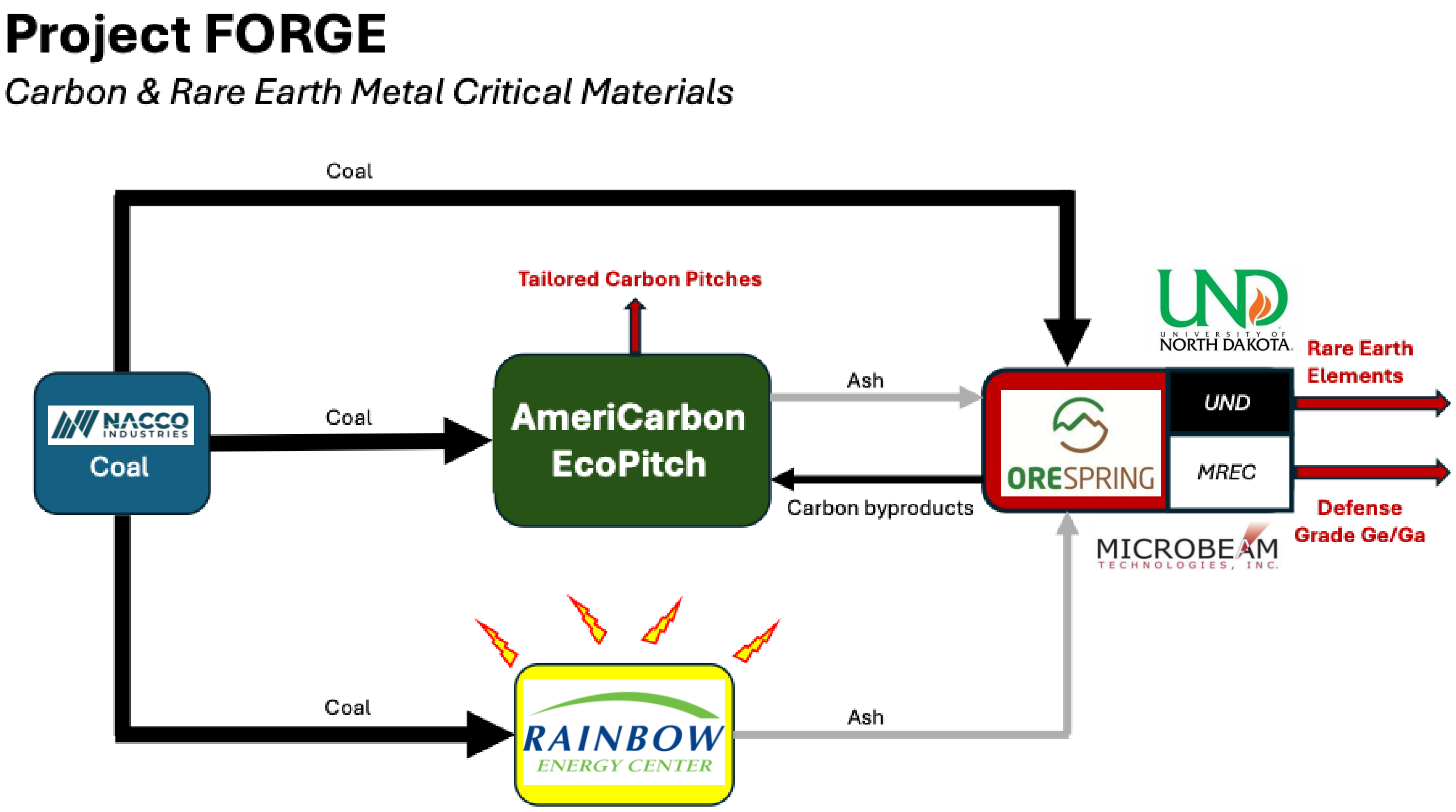
PLANNED CAPITAL STACK

CSEA loan	40%
Commercial debt	40%
Equity from AmeriCarbon Forge	20%

AmeriCarbon

FUTURE BOLT-ON

RARE EARTH ELEMENTS (REEs) EXTRACTION



Possible future expansion: Rare Earth Elements

Collaborators in the North Dakota materials ecosystem are organizing an SPV to commercialize a group of innovations and intellectual property involving the extraction of rare earth elements (REEs) from coal, ash, and other sources of industrial materials. The efforts have specific emphasis on germanium and gallium, two elements that have critical applications in defense, computing, and other strategic applications, and which have been subject to significant geopolitical pressure from China.

AmeriCarbon sees advantages in organizing the SPV to commercialize these technologies, many of which integrate with AmeriCarbon's process. AmeriCarbon's commercial success is not dependent upon these technologies, but the commercial success of these technologies can be significantly enhanced by integration with AmeriCarbon.

AmeriCarbon Background

AMERICARBON – LEADING DOMESTIC INNOVATOR IN PITCH

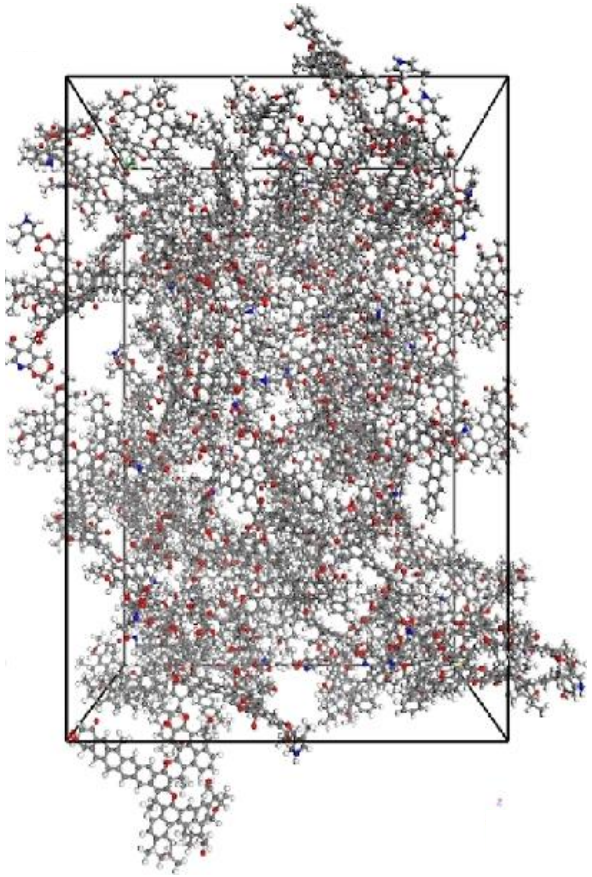
CREATING TAILORED COAL TAR PITCH DIRECTLY FROM U.S. COAL SINCE 2021

Operating a 10 ton-per-day (“tpd”) capacity pilot plant in Morgantown, WV since 2021

- Developing first 100 tpd plant in the US

Process is environmentally aware, IP-protected, and replicable

- Using chemistry to create coal tar pitch
- Process reduces greenhouse gas emissions by 92%+
- Patented and proprietary, with patents in US and Canada
- With each tailored pitch formulation, we add to our growing trade secrets and barriers-to-entry



AmeriCarbon has a multi-year head start in creating tailored CTP directly from U.S. coal

AMERICARBON AT A GLANCE

HIGH GROWTH MATERIALS AT INDUSTRIAL SCALE

Supply Crisis

Market demand for coal tar pitch is rapidly increasing at a **9.3% CAGR**[1] while **supply is dominated by China** due to current reliance on ~5% by-product from coking ovens.

Advantages

Operating the **nation's only facility** manufacturing coal tar pitch without reliance on coking oven by-products, AmeriCarbon can **tailor pitches** to customer spec while **reducing GHG emission by >92%**.[2]

Strategic

The United States government and industry are increasingly aware of the need for **critical materials** for defense, strategic industry, and infrastructure, and the importance of developing **domestic supply**.

Scalable

Modular design (10x scaleup factor from pilot plant) with estimated CAPEX of **$80-100 million per module**; could build **20+ modules** just to address near term incremental growth in U.S. demand (300+ modules for global increase).

Innovation

AmeriCarbon developed five families of **EcoPitch™** products, holds **five patents**, and has developed trade secrets that comprise a **proprietary chemical process and formulations** for several end use applications.

Ripe Timing

Building on **five years** of technology maturation, optimization, and alliance development, AmeriCarbon is at an inflection point, **approaching FID** for its first commercial plant, with operations targeted to begin in about **two years**.

AmeriCarbon

[1] Management estimates using data from Market Insights and Benchmark Week 2022
[2] Technical Summary: Estimated Greenhouse Gas Emissions for AmeriCarbon's Coal Tar Pitch Versus Coal Tar Pitch Produced in China, Downstream Strategies, January 3, 2025.

KEY ALLIANCES

Industry Partners

Technology Collaborators

Funding Sources

AmeriCarbon has built strong alliances across key aspects of the business (e.g., coal suppliers, customers, engineering, R&D, finance) toward a common vision of building AmeriCarbon into a scalable manufacturing company.

PILOT SCALE R&D FACILITY

CONTINUOUS PROCESS EQUIPMENT FOR RAPID SCALEUP

10,000 sq-ft research facility with offices and conference room

2,000 sq-ft coal & mineral prep building + 1.2 acre green space

Located in Morgantown, West Virginia

- AmeriCarbon operates the **only** known pilot-scale coal liquefaction pitch production unit in the United States
- The process has demonstrated unit operations with **continuous** pitch production on a variety of coals
- AmeriCarbon is interacting with both coal suppliers and advanced carbon product manufacturers to provide **tailored pitches** and serve as the bridge between feedstock supply and product manufacturing
- Provides major competitive advantage for scaling technology; would require **~$20 million** and **many years** for competitors to design, construct, and learn how to operate

AmeriCarbon

ENGINEERING, DESIGN, & CONSTRUCTION

DEEP INDUSTRIAL SCALEUP EXPERIENCE

Worley
energy | chemicals | resources

Helping you commercialize new process technologies, scaling up your facilities and delivering commercial-scale plants

Leader
Refineries and petrochemicals world leader in engineering, procurement and construction

900+
petrochemicals projects completed in more than 30 countries

50+
first-of-a-kind specialty chemicals development projects

65+
years of experience in process technology, licensor evaluation and selection

- Over 17,000 professional resources in the North America
- Current portfolio of ~25,000 current projects including 3,565 energy transition projects
- World leader in engineering, procurement, and construction in the petrochemical sector with over 900 projects

AmeriCarbon

AmeriCarbon has engaged Worley Group, a world-class EPC firm with a significant breadth of relevant knowledge and experience, to serve as its engineering firm for scaleup and construction oversight.

Coal Tar Pitch

COAL TAR PITCH

CRITICAL INTERMEDIATE CHEMICAL

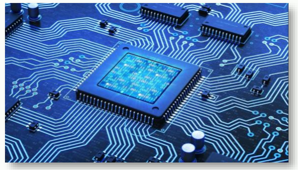
- Coal tar pitch is distilled from coal tar, a ~5% by-product of the coking process in steel production
- Coal tar pitch is a critical intermediate chemical used in the production of several important and growing applications, including graphite, fibers, foams, and other carbon products
- Supply chain is dominated by China and limited to production from metallurgical bituminous coal
- Industry's current process for producing coal tar pitch is energy intensive and not environmentally friendly
- Coal tar pitch is in high demand with markets growing rapidly
- **World supply made exclusively from metallurgical bituminous coal**
- **AmeriCarbon's process is an alternative chemical pathway that uses multiple coal types, enabling us to harness unique chemical properties of lignite**

AmeriCarbon

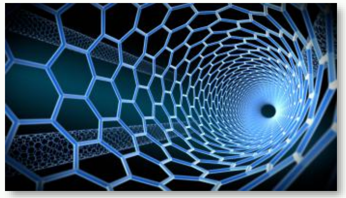
SELECT CARBON PRODUCT MARKETS

COMMERCIAL

Electric Arc Furnace Electrodes


Computer Chips


Carbon Fibers


Graphene Nano Tubes

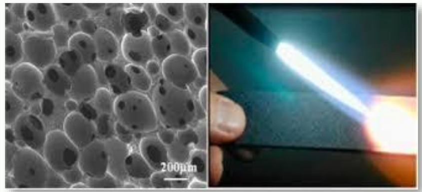

Carbon Foams


Automobiles


Batteries / Energy Storage

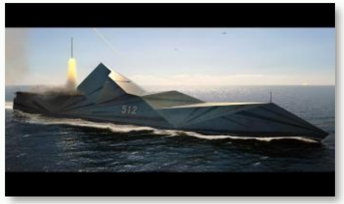
DEFENSE


Lightweight Personnel Armor


Conductive/Insulating Foams


Radar Absorbing Planes


Rocket Tiles


Tactical Battleships


Rocket Nozzle Throats

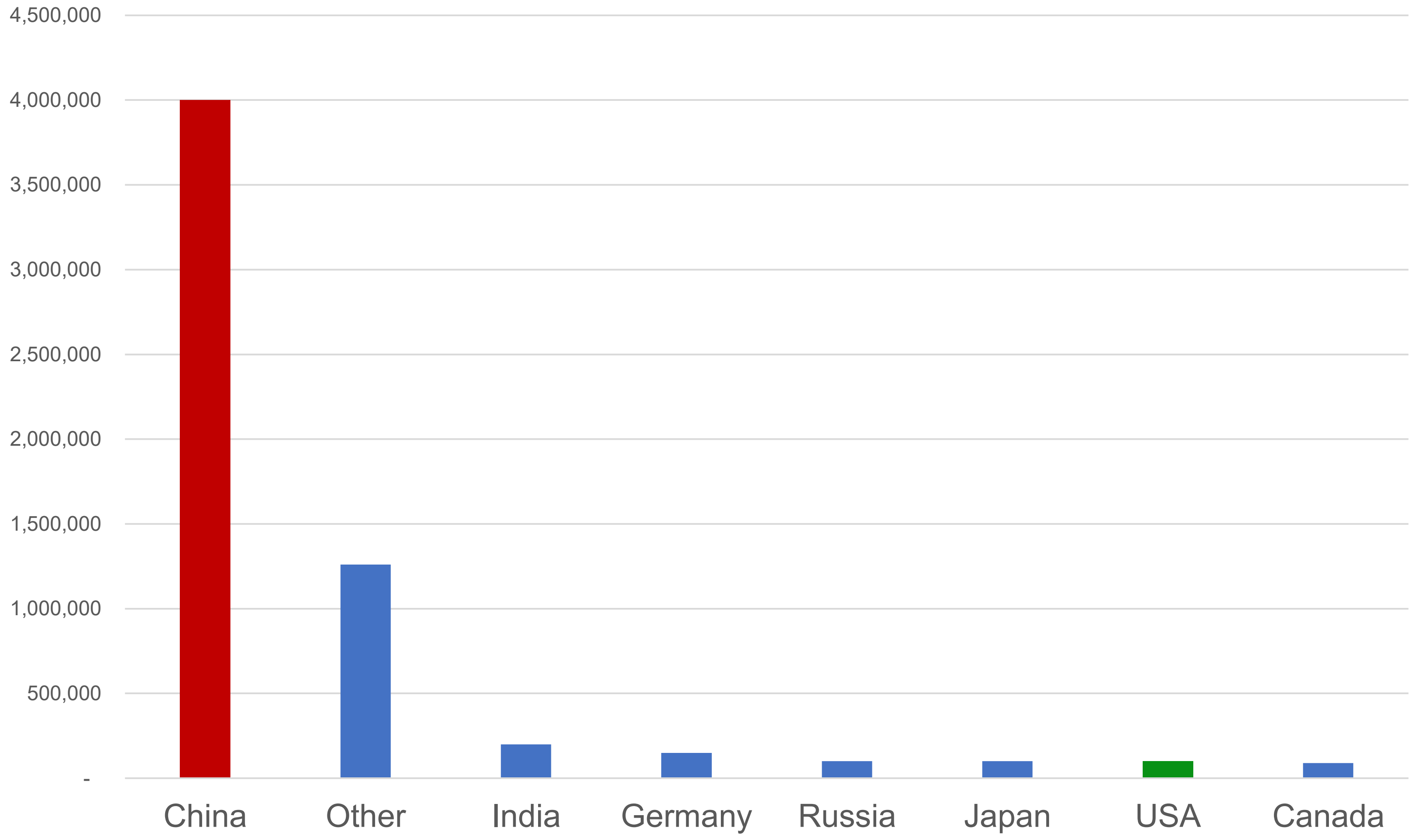

Advanced Tanks

Reliance on Chinese supply and lack of domestic production leaves the United States vulnerable to geopolitical and military pressure.

AmeriCarbon

Global Annual Coal Tar Pitch Production (tons/yr)

(based on source of coal tar)



China	**4,000,000**	**tons/yr**
Other	**1,260,000**	**tons/yr**
India	**200,000**	**tons/yr**
Germany	**150,000**	**tons/yr**
Russia	**100,000**	**tons/yr**
Japan	**100,000**	**tons/yr**
USA	**100,000**	**tons/yr**
Canada	**90,000**	**tons/yr**
	6,000,000	**tons/yr**

AmeriCarbon Module
15,000 tons/yr coal tar pitch
15,000 tons/yr byproducts

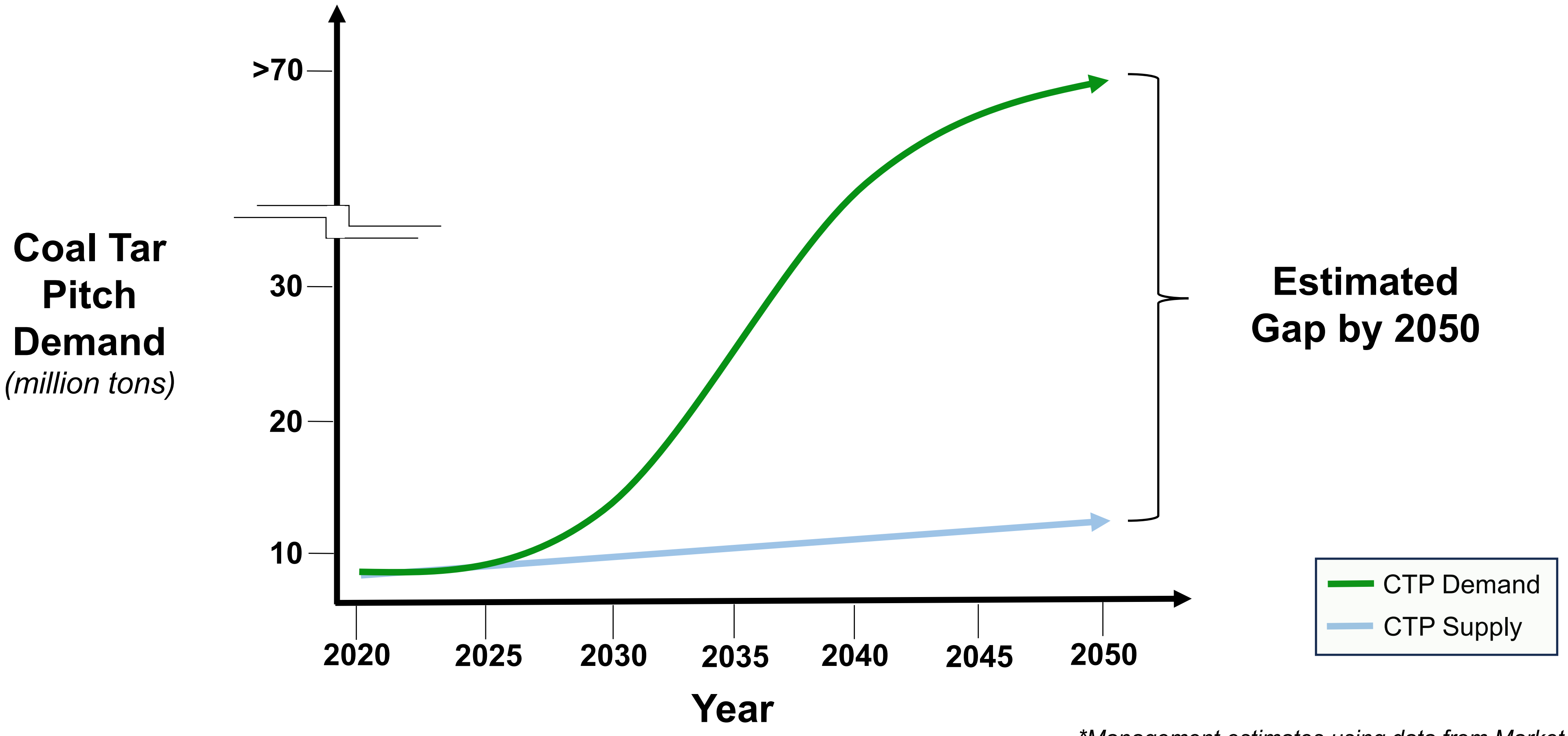
Note:
Most coal tar pitch production in the United States involves domestic distilleries that source foreign coal tar.

Data sources: Market Research Future, Mordor Intelligence, Technavio, Ken Research, Knowledge Sourcing Intelligence, HJ Research, Absolute Reports, SkyQuest Technology, IspatGuru, Research in China, Volza, OECD Coal Information, Benchmark Week

AmeriCarbon

CURRENT AND PROJECTED SUPPLY/DEMAND GAP

*CTP SUPPLY/DEMAND GAP EXPECTED TO EXCEED 50 MILLION TONS PER YEAR BY 2050**

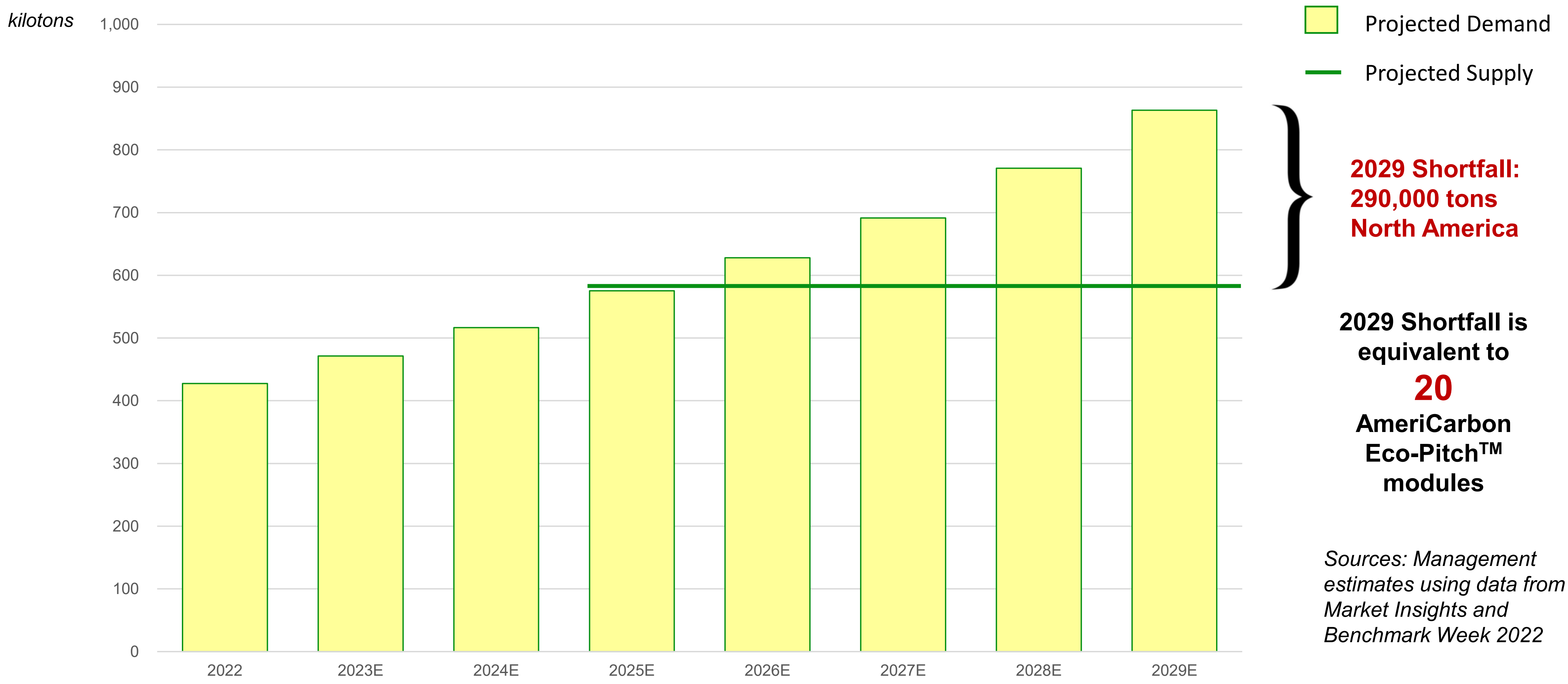


**Management estimates using data from Market Insights*

As demand for coal tar pitch accelerates, the supply of coal tar is projected to be almost flat*

SUPPLY / DEMAND CRUNCH

DEMAND IS RAPIDLY OUTPACING SUPPLY – ADDITIONAL PLANTS NEEDED



2029 Shortfall is equivalent to
20
AmeriCarbon Eco-Pitch™ modules

Sources: Management estimates using data from Market Insights and Benchmark Week 2022

AmeriCarbon

Global coal tar pitch demand is growing at an estimated 9.3% CAGR[1] while pitch supply is decreasing in the United States. These estimates exclude the opportunities in energy storage and asphalt binder.

AmeriCarbon Innovation

PROPRIETARY AMERICARBON MANUFACTURING PROCESS

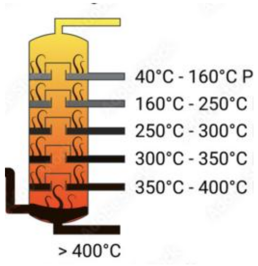
EFFICIENT AND DIRECT PRODUCTION OF COAL TAR PITCH

Eco-Pitch™
Liquid Carbon Process

Coal
(Carbon Ore)

Coal Tar Pitch
(liquefied Carbon)

Concentrated Ash
(Contains Rare Earth Elements "REE's")



Liquid By-Products
(High Value)

AmeriCarbon

Primary Focus

- BINDER PITCH
- IMPREGNATING PITCH
- MESOPHASE PITCH

Emerging Focus

- NEEDLE COKE
- SYNTHETIC GRAPHITE

Primary Carbon Products

- BATTERY ANODES
- ELECTRODES CARBON/GRAPHITE
- ISOMOLDED GRAPHITE
- CARBON FOAMS
- CARBON FIBERS & COMPOSITES
- ASPHALT BINDER

AmeriCarbon

AmeriCarbon's process reduces GHG emissions by more than 92% compared to current industry supply.

PRIMARY PRODUCTS

ECO-PITCH FAMILY OF CARBON PITCH MATERIALS

AMERICARBON
ECO-PITCH™

Advanced Pitch
for Carbon Products

www.americarbon.com

ECO-PITCH™

is a high-performance, environmentally advanced coal tar pitch produced using our innovative **Liquid Carbon Pitch (LCP)** process.

Our process converts coal into a versatile carbon pitch with significantly reduced greenhouse gas emissions compared to conventional methods, offering an optimal solution for various industrial applications such as **synthetic graphite, carbon composites, & other advanced materials.**

KEY FEATURES AND BENEFITS

Domestic Supply Chain

1 — AmeriCarbon uses **100% domestic** materials, reducing reliance on foreign sources and ensuring supply chain resilience. This is particularly critical in strategic sectors such as defense & energy storage.

Lower GHG Emissions

2 — The Eco-Pitch™ process reduces **Green House Gas (GHG) emissions by more than 92%** compared to traditional coal tar pitch production methods, contributing to sustainability goals & environmental compliance.

Engineered Pitch

3 — The LCP process allows for **tailored carbon pitches** with specific properties suited for **various applications**, including high softening points, enhanced adhesion, and electrical conductivity.

ENVIRONMENTAL IMPACT

In addition to reducing greenhouse gas emissions by more than 92% compared to other suppliers, Eco-Pitch™ is produced using a comparatively low-temperature process that **minimizes harmful chemical by-products** such as carcinogenic benzopyrenes, making it a **safer alternative to conventional coal tar pitch.**

AmeriCarbon
3001 Cityview Drive
Morgantown, WV 26501
(888) 367-1650
info@americarbon.com

PRODUCT APPLICATIONS

- Graphite Electrodes
- Synthetic Graphite
- Battery Anodes
- Asphalt Binders
- Carbon-Carbon Composites
- Radar Absorbent Materials
- Conductive Inks
- Wind Turbine Blades
- Tank & Vehicle Frames
- Lightweight Armor
- Space Shuttle Tiles
- Carbon-Based Filters
- Building Materials
- Electronics Materials
- Rocket Nozzles and Heat Shields
- Wear-Resistant Coatings
- Battery Packs for UAVs
- Carbon Foam for Insulation

PITCH SOFTENING POINTS	(°C) LO - HI
Asphalt Grade Binder Pitch	50 - 80
Impregnation Pitch	60 - 80
Binder Pitch	80 - 100
Battery Grade Synthetic Graphite	90 - 100
Lo-Hi Mesophase Pitch	120 - 300+

This table outlines the different types of Eco-Pitch™ produced by AmeriCarbon, along with their respective softening points. ***Each type is tailored to meet the needs of specific industrial applications****, ranging from binder and impregnation uses to synthetic graphite and mesophase pitches.*

Binder Pitch
for Carbon-Carbon Composites
- Adhesives for High-Temperature Applications

Eco-Pitch™ can be tailored as binder pitch, an adhesive material used in the production of carbon-carbon composites and various carbon products. It serves as a **critical binding agent**, holding together carbon particles or fibers to form a cohesive material. Binder pitch is essential in high-temperature applications, such as the manufacturing of **carbon electrodes and aerospace components**, where it provides structural integrity, thermal stability, and resistance to mechanical stress.

Mesophase Pitch
for Advanced Carbon Materials
- Graphite Fibers & Structural Composites

Mesophase type Eco-Pitch™ is used to produce **high-strength carbon fibers and composites.** These materials find applications in critical industries such as **aerospace, defense,** and **high-performance automotive manufacturing.** The mesophase pitch's unique structure enables the production of fibers with excellent mechanical properties, including high strength-to-weight ratios and superior thermal conductivity, making it indispensable for advanced composite materials.

Isomolded Graphite
for High Precision Components

Eco-Pitch™ serves as a key raw material for isomolded graphite, which is used to manufacture high-strength, precision components for industries such as **aerospace, semiconductors,** and **industrial machinery.** The tailored pitch offers consistent particle size and distribution, enabling superior mechanical properties, high thermal conductivity, and corrosion resistance. This makes it **ideal for demanding applications requiring tight tolerances and high performance.**

Synthetic Graphite
for EV Batteries & Stationary Grid Storage
- Battery-Grade Carbon Pitch

Eco-Pitch™ is a critical feedstock for the production of synthetic graphite used in **lithium-ion batteries** for both **electric vehicles (EVs)** and **stationary grid energy storage systems**. Its tailored properties enhance energy density, cycling stability, and charge-discharge efficiency, providing a sustainable and reliable domestic solution to meet the growing demand for energy storage. AmeriCarbon's Eco-Pitch™ reduces reliance on foreign sources, **addressing the critical need for a stable supply of battery-grade synthetic graphite in these rapidly expanding sectors.**

Impregnating Pitch
for Enhancing Strength, Density, & Conductivity
- Batteries & Carbon-Carbon Composites

Impregnating pitch supercharges carbon and graphite materials by infiltrating and filling their pores, dramatically **enhancing strength, density, and conductivity**. Used in critical applications like graphite anodes for **high performance batteries** and **carbon-carbon composites for aerospace**, it ensures components can meet the toughest demands.

PITCH SOFTENING POINTS	(°C) LO - HI
Asphalt Grade Binder Pitch	50 - 80
Impregnation Pitch	60 - 80
Binder Pitch	80 - 100
Battery Grade Synthetic Graphite	90 - 100
Lo-Hi Mesophase Pitch	120 - 300+

EXAMPLE APPLICATIONS

ECO-PITCH CAN BE TAILORED TO MEET VARIOUS MATERIAL PROPERTIES

CARBON/CARBON COMPOSITES

High Thermal Conductivity
Ideal for applications requiring high heat dissipation and minimal thermal deformation.
Defense Applications
Used in aircraft brake systems, hypersonic vehicles, rocket nozzles, and re-entry systems.
Strength-to-Weight Ratio
Lightweight yet extremely strong, contributing to fuel efficiency and enhanced performance in aerospace and military vehicles.
Versatility Across Defense Sectors
Applicable to various branches—aircraft, vehicles, tanks, and watercraft.

ISOMOLDED GRAPHITE

Thermal Stability & Erosion Resistance
Exceptional performance under extreme temperatures and erosive forces.
Missile & Rocket Applications
Ensures structural integrity and reliable heat dissipation in missile components and rocket nozzles.
Chemical & Dimensional Stability
Essential for high-performance seals, gaskets, and re-entry vehicle components.
Re-Entry Vehicles
Provides critical thermal protection and stability required for space missions and atmospheric re-entry.

BATTERY-GRADE GRAPHITE

Energy Storage
Key component in lithium-ion batteries for UAVs, tactical vehicles, and portable power systems.
High Charge Capacity & Cycle Life
Ensures reliable, long-lasting energy storage solutions for extended mission durations.
Domestically Sourced
Reduces reliance on foreign graphite, enhancing national security and supply chain resilience.
Critical for Next-Generation Technologies
Supports emerging technologies requiring high-density, stable energy storage.

ASPHALT

Asphalt Binder for Infrastructure
Eco-Pitch can serve as an asphalt binder, improving the performance and lifespan of asphalt in road construction. It enhances resistance to cracking and wear, contributing to more sustainable and long-lasting infrastructure projects.

AmeriCarbon

Team

COMPANY FOUNDERS

DAVE BERRY
Chief Executive Officer

Dave Berry is a highly accomplished scientist and manager with 40 years of expertise in both energy and defense related technology development. He served as Associate Director at the DOE National Energy Technology Laboratory, where he both conducted and oversaw research through pilot scale work in electric power generation systems, gas turbines, fuel cells, gasification, electromagnetic hydrocarbon conversion, catalysis and more. Berry managed NETL's fuel cell program and played a key role in technology transfer and patent licensing. He's authored numerous technical journal papers, book chapters, and has numerous patented inventions, several of which that have been commercially licensed. Dave holds B.S and M.S degrees in Chemical Engineering from West Virginia University.

GREG HENTHORN
Chief Business Officer

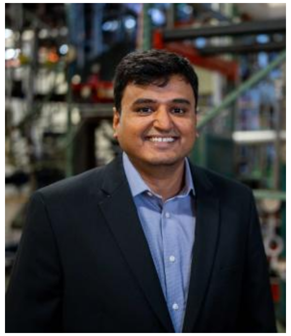
Greg Henthorn is a seasoned business executive specializing in corporate and project finance. With a strong focus on innovative companies in energy, chemical manufacturing, and environmental sustainability, he has secured over $100 million in debt and equity financing from various sources. Henthorn is a multifaceted professional skilled in commercial transactions and forming strategic alliances. He holds degrees in chemical engineering, business, and law from West Virginia University, where he also teaches as an adjunct professor in the Energy and Land Management program. Additionally, he actively supports regional economic development through his role on the Board of Directors of TechConnect West Virginia.

AmeriCarbon

ADDITIONAL KEY TEAM MEMBERS

STEVE MASCARO
Senior Process Engineer

Steve Mascaro serves as Senior Process Engineer at AmeriCarbon, focusing on pilot plant optimization. Over the past 25 years Steve worked at the U.S. Department of Energy's National Energy Technology Laboratory leading pilot plant research of coal-gas desulfurization, catalyst development for hydrocarbon conversion, managing extramural research projects, and conducting engineering reviews. Steve began his career at Aristech Chemical's polypropylene facility in LaPorte, Texas (now Braskem), where he held roles in process engineering, total quality management, and utilities supervision. His tenure culminated in a corporate engineering position, where he contributed to the Aristech expansion project with Jacobs Engineering, overseeing cost estimation, construction, commissioning, and the startup of a new process adding 550-million-pounds-per-year of new polypropylene capacity. He earned his BS in Chemical Engineering from West Virginia University.

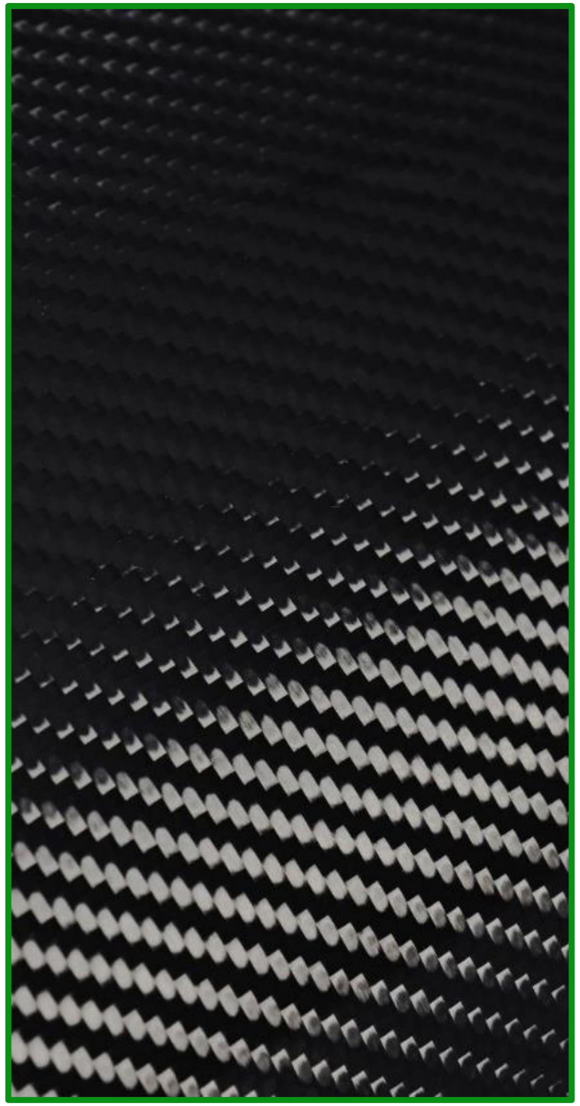


CHETAN TAMBE, PH.D
Senior Engineer

Dr. Chetan Tambe is a Senior Engineer at AmeriCarbon, specializing in energy-efficient carbon product manufacturing from coal. Prior to this, he spent 5 years as a Research Scientist at Cardolite Corporation (PA), where he developed innovative hydrogenation technology, leading to the expansion of the company's product lines. He also managed the pilot-plant scale-up of these technologies and fostered research collaborations with academic institutions. Dr. Tambe holds a Ph.D. from Michigan State University, focusing on sustainable biobased materials. During his Ph.D. program, he undertook internships at Coca-Cola and Sherwin Williams, contributing to polymerization process optimization and next-gen packaging materials. His academic work has resulted in numerous peer-reviewed publications, a book chapter, and five patents. He earned his BS in Chemical Engineering from the Institute of Chemical Technology (India).

ROBERT WENTZ
Venture Partner

Robert Wentz is the founder of PointSquared Ventures and Stonewall Capital, where he invests in the technology, energy, and data analytics sectors. He's also the founder of Stonewall Energy, an energy exploration and support holding company, encompassing American Energy Holdings and STE Energy. Previously, Mr. Wentz served as the Executive Chairman of Allegheny Science & Technology (AST), an engineering and technology firm supporting mission-critical R&D for government agencies. He co-founded AST in 2009 and led it to become a 6-time INC 500 fastest-growing company before his departure in 2020. Prior to AST, he founded Information Research Corporation (IRC), a software development and engineering company serving the Department of Defense and NASA. Mr. Wentz holds a degree in Computer and Electrical Engineering from West Virginia University and earned an MBA from the WVU School of Business & Economics.



CONTACT

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AmeriCarbon

CSEA Grant Round 6 Technical Review Summary

C-06-E The Forge Project: Rare Earths and Critical Materials Integration, Ore Spring Materials, LLC

Grant Request: $2,250,000

Loan Request: $0

Total Project Costs: $4,500,000

Average Technical Review Score: **252/315 (Good)**

Selected Technical Reviewer Comments:

The technologies have the potential to provide additional opportunities for North Dakota lignite, and the project should help optimize integration into an existing mine and power plant.

The necessary demonstration systems are available for the project and have all been proven in prior work.

The Ge/Ga & REE value proposition needs to be quantified to confirm the economic boost to the Americarbon process. Pending a successful project there should be great economic development potential.

Should the technical assessments preformed during this project produce data favorable for commercialization, the technologies deployed would represent a world first in recovery of several critical mineral commodities from coal or coal by-products. This would potentially improve clarity on the economics for recovery of these commodities in other lignite feedstocks around the state.

It is very likely the project will achieve its tasks as listed, which are technical studies and assessments to evaluate the viability of REE-CM co-production with lignite pitch, assuming the timely construction of the commercial lignite pitch plant itself.

In addition to the robust partnerships aligned in support of the pitch manufacturing facility, Ore Spring Materials/AmeriCarbon's partnership with the UND College of Engineering and Mines and Microbeam Technologies include the country's foremost experts in REE/CM extraction from lignite.

The project appears technically sound in large part based on the extensive experience of each participant. It proposes a relatively complex integration of coal tar pitch manufacturing and REE-CM extraction with no guarantee of realized REE-CM production, but it does aim to provide much-needed data on the economic feasibility of REE-CM extraction from lignite at scale.

The successful demonstration of REE and CM recovery integration with AmeriCarbon's Eco-Pitch carbon manufacturing process is unlikely to amount to significant economic impacts for ND in the immediate term. There is potential for more significant scaling in the medium term alongside REE/CM-extraction facilities or additional coal tar pitch facilities, and this project could in turn produce the additional data to support the economic feasibility of such facilities.

Successful REE-CM co-production alongside another viable economic product (tar pitch) is a potential gateway to standalone REE-CM production from other feedstocks in the state, and thus I recommend funding the proposal as a significant step toward commercialization for lignite-hosted rare earth elements and other critical minerals in North Dakota.

Good proposal targeting new value opportunities for utilizing North Dakota Lignite. The Americarbon technology has shown promise in previous projects and this work should move it toward commercialization while evaluating the potential for integration with REE recovery. This reviewer would recommend the presentation briefly include:

- A discussion on the potential amount/product value vs. cost for including the REE & Ge/Ga recovery from the ash resulting from the carbon manufacturing process.
- A discussion on the likelihood of commercial application pending a successful project.

ORESPRING

October 15, 2025

State of North Dakota
The Industrial Commission
Clean Sustainable Energy Authority Program
State Capitol – Fourteenth Floor
600 East Boulevard Avenue
Bismarck, ND 58505

Re: The Forge Project: Rare Earths and Critical Materials Integration – Application for Grant Funding

Dear Members of the North Dakota Industrial Commission and the Clean Sustainable Energy Authority:

Ore Spring Materials, LLC ("Ore Spring") is pleased to submit this application for grant and loan funding under the Clean Sustainable Energy Authority (CSEA) program for *The Forge Project: Rare Earths and Critical Materials Integration*. This project represents a unique opportunity to expand North Dakota's lignite innovation platform by integrating rare earth element (REE) recovery and critical mineral production with AmeriCarbon's advanced carbon manufacturing operations.

Ore Spring Materials is an affiliate of AmeriCarbon Enterprises, LLC, focused on developing new pathways for value-added utilization of lignite resources. Through this initiative, Ore Spring will collaborate with NACCO Industries, Inc., the University of North Dakota (UND), Microbeam Technologies, Inc., and AmeriCarbon Forge, LLC to demonstrate the recovery of REEs and other critical materials from concentrated ash and residue streams produced by AmeriCarbon's Eco-Pitch™ process. This innovative approach builds directly upon UND's ongoing lignite-based REE research and leverages AmeriCarbon's commercial technology platform to accelerate deployment at industrial scale.

When fully implemented, the REE Integration Project will:

- ✓ Establish a domestic source of rare earth elements and critical minerals derived from North Dakota lignite and associated byproducts;
- ✓ Complement The Forge Project by utilizing its ash and carbon residues as a feedstock for REE extraction, creating a closed-loop, zero-waste manufacturing ecosystem; and
- ✓ Strengthen North Dakota's leadership in the critical materials, clean energy, and advanced manufacturing sectors.

Ore Spring Materials, LLC is committed to advancing this initiative in close collaboration with UND, Microbeam, AmeriCarbon, and the State of North Dakota. The total program is expected to operate on a timeline that is in coordination with The Forge Project and represents a vital step toward establishing a vertically integrated supply chain for both carbon and critical materials within the state.

This transmittal letter sets forth a binding commitment on behalf of Ore Spring Materials, LLC to complete the project as described in the accompanying application if the North Dakota Industrial Commission approves the requested funding under the CSEA program.

We appreciate the Commission's consideration and continued leadership in fostering innovation in lignite-based energy, materials science, and sustainable industrial development.

Sincerely,

Ore Spring Materials, LLC
by AmeriCarbon Enterprises, LLC, its Manager

Greg Henthorn
Chief Business Officer

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 (Appendix)
☐	Loan/Loan Guarantee Application (if Applicable, Appendix)
☐	Other Appendices (If Applicable)

When the package is completed, send an electronic version to ndicgrants@nd.gov

For more information on the application process please visit:
https://www.ndic.nd.gov/grant-programs/csea/clean-sustainable-energy-authority-applicant-information

Questions can be addressed to the Industrial Commission at 701-328-3722.

Clean Sustainable Energy Authority

North Dakota Industrial Commission

Application

Project Title:

The Forge Project: Rare Earths and Critical Materials Integration

Applicant:

Ore Spring Materials, LLC

Date of Application:

October 15, 2025

Amount of Request
Grant: $2,250,000
Loan: N/A

Total Amount of Proposed Project:

$4,500,000

Duration of Project:

2 years

Point of Contact (POC):

Greg Henthorn, AmeriCarbon

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304-685-6017

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greg.henthorn@americarbon.com

POC Address:

3001 Cityview Drive
Morgantown, WV 26508

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ABSTRACT

Objective:

The objective of ***The Forge Project: Rare Earths and Critical Materials Integration*** is to demonstrate and advance the integration of AmeriCarbon's Eco-Pitch™ carbon manufacturing process with rare earth element (REE) and critical mineral (CM) recovery technologies developed by the University of North Dakota (UND) and Microbeam Technologies, Inc. (Microbeam). The project aims to establish a scalable, co-located platform in North Dakota that converts lignite-derived and related feedstocks into engineered carbon materials while simultaneously recovering REEs, germanium (Ge), gallium (Ga), and other critical minerals from process by-products.

This integration will (1) optimize AmeriCarbon's liquefaction process to utilize diverse feedstocks—including upgraded lignite, humins, and humic acid residues from UND's REE processing—tailoring pitch compositions to customer-specific performance requirements; (2) develop a pathway to use AmeriCarbon's carbon process ash as a high-value CM-bearing feedstock for Microbeam's Ge/Ga recovery system; and (3) define the engineering and economic framework for commercial-scale deployment at the Forge site in McLean County, ND.

Through this effort, the project will advance North Dakota's leadership in lignite-based innovation by demonstrating a fully integrated carbon-plus-critical-minerals manufacturing ecosystem—linking clean carbon production, REE-CM extraction, and high-purity metal refining. The outcome will be a validated process model, optimized feedstock strategy, and techno-economic foundation for an industrial complex that strengthens domestic supply chains for both advanced carbon materials and strategic minerals.

Expected Results:

The Forge Project will deliver a validated and integrated process framework that unites AmeriCarbon's Eco-Pitch™ manufacturing, UND's rare-earth extraction technologies, and Microbeam's germanium and gallium recovery system into a cohesive, North Dakota–based production platform.

The project is expected to:

- ✓ Demonstrate feedstock integration and optimization—confirming the technical viability of using upgraded lignite, humins, and humic-acid residues (individually and in blended configurations) as feedstocks for AmeriCarbon's carbon liquefaction process, yielding targeted pitch formulations for downstream customers in energy and materials sectors.
- ✓ Quantify and enhance by-product value recovery—producing empirical data on the concentration, separation, recovery, and refinement potential of REEs and critical minerals (Ge, Ga, and Sb) from AmeriCarbon's ash and residue streams using Microbeam's pyrometallurgical and hydrometallurgical processes.
- ✓ Validate carbon purity and product performance—through demineralization and purification studies conducted with UND to achieve premium carbon qualities suitable for graphite, anode, and advanced binder applications.

- ✓ Develop an integrated process and site design—including mass and energy balances, flow diagrams, and infrastructure layouts defining how REE-CM extraction, ash utilization, and carbon manufacturing can be co-located at AmeriCarbon's commercial plant in McLean County.
- ✓ Produce a techno-economic and commercialization analysis—quantifying capital and operating costs, product revenue streams, and economic multipliers for North Dakota, while identifying a practical path to commercial deployment.

Collectively, these outcomes will advance the technology readiness and economic feasibility of an industrial system that transforms lignite and its by-products into high-value carbon and critical mineral commodities. Successful execution will position North Dakota as a national model for clean-energy resource integration—linking carbon manufacturing, REE-CM recovery, and critical-materials supply-chain development within one regional industrial ecosystem.

Duration:

2 years.

Total Project Cost:

$4.5 million ($2.25 million from CSEA grant program, and $2.25 million in matching)

Participants:

The proposed project is being led by Ore Spring Materials, LLC, an AmeriCarbon affiliate formed to coordinate integration of advanced carbon and critical mineral technologies. AmeriCarbon Forge, LLC—a joint venture between AmeriCarbon Enterprises and NACCO Natural Resources—will serve as the commercial host entity and provide the process and infrastructure platform for pilot validation and future deployment at the Falkirk site in McLean County, North Dakota.

The University of North Dakota (UND) College of Engineering & Mines will participate in the project along with its demonstrated rare earth element (REE) extraction and beneficiation technology, leveraging pilot-scale systems developed under DOE- and NDIC-supported programs to supply upgraded lignite and humins as optimized feedstocks and to conduct purification and demineralization studies. Microbeam Technologies, Inc. (Microbeam) will apply its patented vaporization and selective condensation process to AmeriCarbon's ash residues and UND's mixed rare earth concentrates to recover germanium, gallium, and other critical minerals. As a subcontractor to AmeriCarbon, Worley Group will provide engineering and integration support, developing process flow diagrams and site-level integration studies for co-located operations.

These participants bring a strong combination of industrial capability, engineering depth, and technology readiness. Together, they form a comprehensive team capable of demonstrating a fully integrated carbon and critical materials production ecosystem that aligns with CSEA's mission to advance sustainable, value-added energy and materials manufacturing in North Dakota.

Objectives:

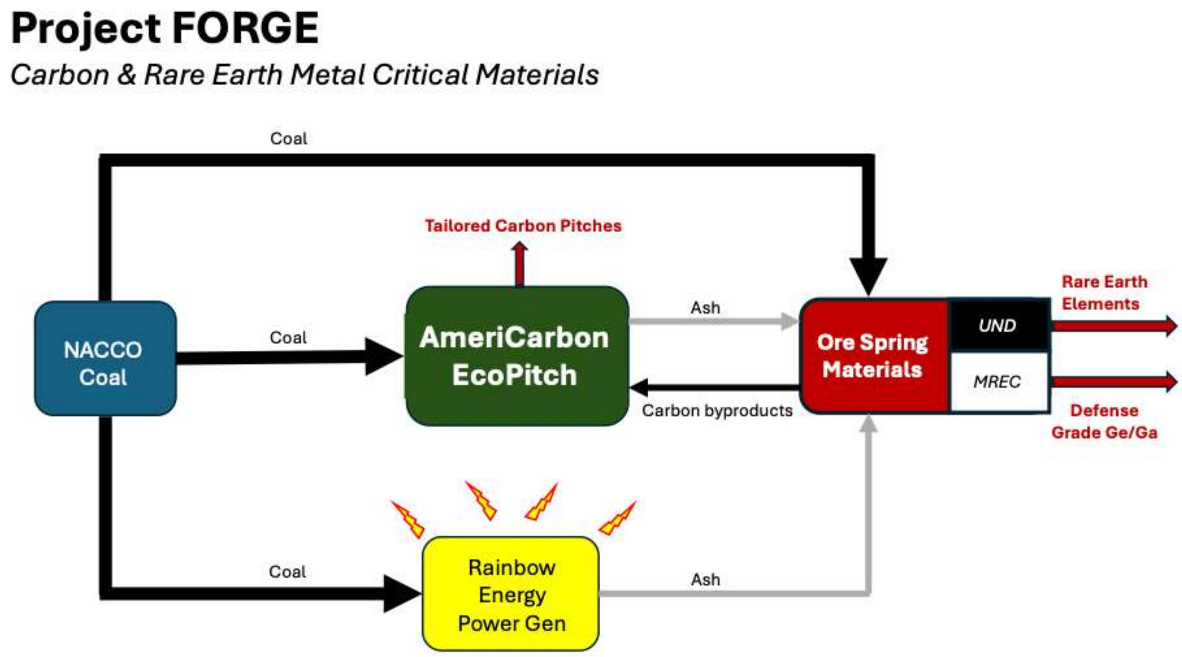

Figure 1. The Forge Project: Rare Earths and Critical Materials Integration.

The overarching objective of *The Forge Project: Rare Earths and Critical Materials Integration* is to develop, demonstrate, and engineer a fully integrated process that combines AmeriCarbon's carbon liquefaction and pitch manufacturing technology with the rare earth and critical mineral recovery systems pioneered by UND and Microbeam. This integrated system will establish the technical and economic basis for a new lignite-based manufacturing industry in North Dakota that simultaneously produces high-value carbon materials and rare earth/critical mineral products from regional resources and process by-products.

Specifically, the proposed project will:

- ✓ Integrate and optimize feedstock utilization — Demonstrate the use of upgraded lignite, humins, and humic-acid residues from UND's rare earth extraction process as alternative or blended feedstocks for AmeriCarbon's Eco-Pitch™ process. This effort will refine process parameters to tailor pitch compositions for distinct industrial applications while maximizing yield and carbon efficiency.

- ✓ Develop and evaluate by-product valorization pathways — Characterize and optimize AmeriCarbon's process residues and ashes for use as feedstock in Microbeam's Ge/Ga recovery technology, enabling recovery of high-purity germanium, gallium, and other strategic minerals.

- ✓ Advance purification and demineralization techniques — Conduct joint studies with UND, Worley Group, and prospective customers to enhance removal of ash, sulfur, and metallic impurities from carbon and feedstock streams to achieve ultra-high-purity carbon suitable for advanced materials markets.

- ✓ Perform process integration and engineering design — Engage Worley Group to develop process flow diagrams (PFDs), material and energy balances, and site-integration studies that define how the carbon manufacturing, REE extraction, and critical mineral recovery systems can be co-located and operated synergistically at AmeriCarbon's Forge site in McLean County, ND.

- ✓ Conduct techno-economic assessment and commercialization planning — Quantify the technical performance, cost structure, and economic impacts of the integrated system, including potential product revenues, co-product credits, and state-level economic multipliers.

The successful completion of these objectives will demonstrate a scalable, North Dakota–based model for the co-production of engineered carbon and critical materials—advancing national supply chain resilience while creating new markets and industrial opportunities within the state's lignite resource base.

Methodology:

The Forge Project will be executed through a structured series of technical and engineering tasks designed to integrate AmeriCarbon's Eco-Pitch™ manufacturing process with the rare earth and critical mineral recovery systems developed by UND and Microbeam Technologies. The following Statement of Work outlines the major work activities, responsible organizations, and corresponding budget allocations that collectively define the technical pathway for the project. This work structure provides the framework for coordination, data sharing, and process optimization across all participants.

The Forge Project will be an industrial manufacturing complex in North Dakota to produce critical materials such as carbon and REE-CM to address national and global vulnerabilities and shortfalls in the United States with severe economic and geopolitical strategic consequences caused by the current offshore supply of these materials. Central to the Forge Project is the planned joint venture (AmeriCarbon Forge, LLC) between AmeriCarbon and NACCO to build a lignite coal-to-carbon pitch/materials plant in McClean County, North Dakota. The establishment of this groundbreaking facility provides the basis for an integrated platform for critical materials manufacturing.

The REE manufacturing/production capability is being initiated by Ore Springs LLC, an AmeriCarbon and NACCO affiliate, to bring production of these critical elements derived from lignite coals and by-product streams from AmeriCarbon's proprietary carbon pitch technology. Integration of these capabilities provide a unique and optimized opportunity that is a key basis of the Forge Project.

Under this proposed work scope being submitted by Ore Spring Materials, LLC, process integration efforts will be undertaken by the key participants to define the necessary optimization between the feedstock inputs and product/by-product outputs of the pitch production (AmeriCarbon) and REE-CM production (Ore Spring / UND / Microbeam).

Project Tasks

Task 1: Project Management:

This task encompasses all project management activities necessary to ensure the successful execution of the project in compliance with CSEA's contractual, technical, and administrative requirements. The Project Management team will provide overall leadership, coordination, and integration of technical, financial, and reporting activities across all project tasks. Responsibilities include tracking schedule and budget performance, managing risk and deliverables, maintaining communication with CSEA program management, and ensuring that project milestones are met in accordance with the approved Work Scope.

The task will also include coordination of subcontractor and partner activities, preparation of project management documentation, and oversight of quality assurance and safety compliance as applicable to R&D operations.

Estimated budget: <u>$100,000</u>

Task 2: Preliminary Process and Site Integration Assessment

Based on the current design basis for each of the critical material technologies, a process integration and site layout study will be conducted. This will provide the starting point for the integration and optimization studies defined for the various technology efforts in Tasks 3-5. Critical parameters such as material mass and energy requirements will be conducted along with site utility, infrastructure process flow and acreage requirements will be defined. Outputs from Tasks 3-5 will be used to update final assessment study.

Estimated budget: <u>$100,000</u>

Task 3: Pitch Integration & Optimization Studies

AmeriCarbon's proprietary Eco-Pitch process produces a unique by-product ash that has favorable characteristics that make separation/purification of REEs and CMs simpler, lower energy and more environmentally friendly than power plant derived ash or other post combustion sources. AmeriCarbon will conduct optimization studies to produce tailored ash that will then be evaluated by both the UND REE technology and Microbeam technologies to determine the maximal integration opportunities. AmeriCarbon will also conduct an extensive matrix effort to process and evaluate both lignite coals and the by-product carbon streams from the UND REE process (upgraded lignite by-product ore/carbons, humins and humic acid). This work will be conducted in AmeriCarbon's multi-ton, multi-million-dollar pilot facility to ensure the results can be directly scaled to the commercial plant being built at the North Dakota Project Forge site. Various chemical and physical processing will be involved in the evaluation studies. This task will help ensure the process integration ties with the REE-CM recovery/production process are adequately defined to allow complete successful site process integration opportunities. The iterative and synergistic nature of process integration across tasks 3-5 are important to understand and optimizing for the successful overall integration of lignite coal, tailored carbon pitch (EcoPitch) and REE-CM production for Project Forge.

Estimated budget: $2,975,000

Task 4: REE Process Integration & Optimization Studies

The University of North Dakota (UND) has developed extensive intellectual property for the separation and recovery of REE's in North Dakota lignite coal and demonstrated both at the laboratory and pilot scale. This task will be focused on producing various by-product variants to be tested as potential feedstock for AmeriCarbon's Eco-Pitch manufacturing plant. The iterative approach will allow both REE and pitch process unit operations to be optimized for both product quality and by-product integration. Data will be generated at both the laboratory and pilot scale. Demonstration of carbon products (such as graphite, carbon anodes, batteries) made from the novel pitches will be conducted at the bench-scale to validate the process integration approach at Project Forge.

Estimated budget: $800,000

Task 5: Ge/Ga Process Integration & Optimization Studies

Microbeam's Ge/Ga pyrometallurgical process specifically focuses on concentration of gallium, germanium and antimony and is significant for important electronics and defense critical applications. Microbeam with test the various ash by-products from the AmeriCarbon Eco-Pitch process which will be uniquely produced in varying chemistries/specifications depending on the product/by-products being utilized (from lignite coal mines and by-product use from the UND REE process).

Estimated budget: $300,000

Task 6: Technoeconomic Assessment

A study will be conducted to evaluate the optimization impact of the REE-CM integration of Project Forge on the baseline economics of the planned AmeriCarbon Forge pitch manufacturing plant. Input will be based on existing AmeriCarbon techno-economics and results from Tasks 3-5. This will also contain preliminary markets and plant economics for the REE integrated process/plant integration at the site.

Estimated budget: $150,000

Task 7: Technology Development and Commercialization Path

Based on the deliverables of the preceding tasks, a gap analysis approach will be taken to identify a technology development and/or commercialization path leading to a complete integrated commercial lignite pitch and REE plant at the Project Forge site located in North Dakota.

$75,000

Total project budget:

Task 1: $100,000
Task 2: $100,000
Task 3: $2,975,000
Task 4: $800,000
Task 5: $300,000
Task 6: $150,000
Task 7: $75,000

Total: $4,500,000

Anticipated Results:

The Forge Project will generate both technical and strategic outcomes that validate the feasibility and economic potential of integrating AmeriCarbon's carbon liquefaction process with UND's and Microbeam's critical-materials recovery technologies. Completion of the project will result in a process integration framework, validated technical data packages, and an engineering and economic foundation to support commercial-scale implementation at the planned Forge manufacturing complex in McLean County, North Dakota.

Key anticipated results include:

1. Validated Feedstock and Process Integration
   - Demonstrated use of upgraded lignite, humins, and humic-acid residues as optimized or blended feedstocks for AmeriCarbon's Eco-Pitch™ process.
   - Quantitative data defining yield, composition, and carbon conversion efficiency for each feedstock scenario.
   - Confirmed compatibility of these materials with existing pilot operations and projected commercial-scale plant parameters.
2. Improved Product Quality and Purity
   - Demonstrated reduction of ash and mineral impurities through optimized demineralization and purification processes.

- Production of ultra-high-purity carbon materials suitable for advanced applications such as synthetic graphite, carbon anodes, and binder pitches.

3. By-Product Value Recovery

    - Characterization of REE, Ge, Ga, and Sb concentrations in AmeriCarbon's process residues and UND's by-product streams.
    - Bench-scale verification of Microbeam's vaporization and selective-condensation process using these materials, achieving target Ge/Ga purities above 90% oxide basis.
    - Data supporting downstream refining to 99.999%-purity metals for evaluation by industrial offtakers.

4. Engineering and Economic Integration Framework

    - Development of process flow diagrams, material and energy balances, and preliminary site layouts illustrating how carbon and critical-mineral systems can be co-located.
    - Definition of shared utilities, waste management, and by-product handling schemes to enable an integrated commercial facility.
    - Completion of a techno-economic assessment (TEA) quantifying capital and operating costs, product revenue potential, and overall economic contribution to North Dakota.

5. Technology Development and Commercialization Pathway

    - Identification of remaining technical gaps and a stepwise plan toward full commercialization, including pilot-to-plant scale-up milestones.
    - Defined roles for industrial, academic, and engineering partners in the next development phase.
    - Comprehensive dataset and engineering documentation suitable for inclusion in future CSEA and DOE funding applications supporting scale-up.

Collectively, these outcomes will establish a first-of-its-kind lignite-based carbon and critical-materials manufacturing model. The project will demonstrate how North Dakota's lignite resources can underpin a new clean-energy and strategic-materials industry—producing value-added carbon, recovering critical minerals, and enabling supply-chain resilience for the nation while diversifying the state's energy economy.

Facilities:

Proposed Commercial Plant Site

AmeriCarbon and its partners have identified a strategic location for the Forge Project site near Underwood, North Dakota (Figure 2).

Figure 2. Planned location of the Forge Project near Underwood, North Dakota, outlined in blue.

The proposed site is situated near the following:

- Falkirk Mine, a significant lignite coal mining operation, and in proximity to key industrial infrastructures;

- *Rainbow Energy Center's Coal Creek Station*. This is North Dakota's largest power plant, known for its efficiency and substantial electricity generation capacity; and

- *Blue Flint Ethanol Plant*. Located just east of the Coal Creek Station, this facility has been operational for over a decade, producing ethanol and contributing to the region's biofuel industry.

The proximity to these facilities offers potential synergies, such as shared infrastructure and services, which can enhance operational efficiency and sustainability.

Pilot Plant: Foundation for Commercial Design

AmeriCarbon operates the only known multi-ton-per-day coal liquefaction and pitch manufacturing pilot facility in the United States. The pilot plant incorporates AmeriCarbon's patented Liquid Carbon Process (Eco-Pitch™), which converts domestic coals—including lignite—into engineered coal tar pitch and advanced carbon materials.

Key systems include:

- A continuous liquefaction reactor train with precision temperature and residence-time control;
- Real-time analytical instrumentation for viscosity, softening point, and product composition;
- Integrated ash-handling and residue collection systems designed for by-product sampling and characterization; and
- Utilities and controls suitable for rapid parameter adjustments during feedstock blending trials.

This facility provides the platform for conducting feedstock and process optimization under Task 3 (Pitch Integration & Optimization Studies), enabling direct scale-up to AmeriCarbon Forge, LLC's planned commercial plant in McLean County, North Dakota.


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Figure 3. AmeriCarbon's Research and Pilot Demonstration Facility in Morgantown, West Virginia.

AmeriCarbon's pilot plant is significant for the following reasons:

- *Process Validation*. The pilot plant has been instrumental in validating the technical feasibility of the Eco-Pitch production process, ensuring that each stage operates seamlessly and efficiently.

- *Data Collection for Scale-Up***.** Comprehensive data gathered from pilot operations have been pivotal in informing the scale-up process, facilitating a tenfold increase in production capacity for the commercial plant.

- *Risk Mitigation*. Operating the pilot plant has allowed AmeriCarbon to identify and address potential challenges in a controlled environment, significantly reducing risks associated with scaling up to commercial production.

Figure 4. AmeriCarbon's pilot scale unit operations that underpin the LCP process.

Figure 5. AmeriCarbon's pilot scale and research equipment.

University of North Dakota – College of Engineering & Mines Research Facilities

UND's College of Engineering & Mines Research Institute houses extensive laboratory and pilot infrastructure dedicated to rare earth element (REE) and critical mineral recovery from lignite and associated materials. These include:

- ✓ A fully integrated pilot-scale REE extraction system capable of processing up to 500 kilograms per hour of lignite mine waste feedstock, producing mixed rare earth concentrates (MREC) and upgraded lignite co-products;

- ✓ The Advanced Materials Characterization Laboratory (AMCL), equipped with scanning electron microscopy (SEM-EDS), X-ray fluorescence (XRF), X-ray diffraction (XRD), inductively coupled plasma–mass spectrometry (ICP-MS), and thermal analysis instrumentation;

- ✓ A bench-scale purification and graphitization laboratory, supporting the development of ultra-high-purity carbons for anode and specialty applications; and

- ✓ Process modeling and engineering design software (Aspen Plus, COMSOL Multiphysics, MATLAB, and SimaPro) used for techno-economic and life-cycle analyses.

These facilities support Task 4 (REE Process Integration & Optimization Studies) and provide the test bed for refining demineralization, purification, and carbon-quality improvement studies.

Microbeam Technologies, Inc. – Grand Forks, ND and Minnetonka, MN

Microbeam operates analytical and pilot-scale systems focused on critical mineral recovery and advanced materials analysis. Its Grand Forks facility houses:

- ✓ Two automated scanning electron microscopes (CCSEM) with X-ray microanalysis for mineralogical and compositional mapping;

- ✓ Laboratory and bench-scale pyrometallurgical and hydrometallurgical reactors for germanium, gallium, and antimony vaporization, selective condensation, and refining; and

- ✓ A pilot bench system designed to process mixed rare earth concentrates (MREC) and produce Ge/Ga concentrates at rates of up to 5–10 kg/h.

- ✓ Thermochemical equilibrium modeling software (FactSage) to predict critical mineral vapor-liquid-solid transformations and interactions that is crucial in optimizing process conditions for pyrometallurgical applications.

Microbeam's Grand Forks and Minnetonka locations include computational modeling, analytical equipment, a metals recovery and high-temperature testing facility, as well as a 7,000-square-foot shop and laboratory area for constructing and operating process equipment. These facilities will support Task 5 (Ge/Ga Process Integration & Optimization Studies) and provide analytical support across all project activities.

Worley Group Facilities

Worley Group will provide engineering design, process integration, and site planning services under Task 2 (Preliminary Process and Site Integration Assessment). The firm's regional engineering offices and process modeling capabilities will be used to generate process flow diagrams (PFDs), mass and energy balances, and site layout studies defining how the integrated systems can be co-located and scaled at the Forge site.

Resources:

The successful execution of *The Forge Project: Rare Earths and Critical Materials Integration* will rely on a coordinated set of technical, analytical, and organizational resources contributed by AmeriCarbon, Ore Spring Materials, the University of North Dakota (UND), Microbeam Technologies, and Worley Group. These resources form the backbone of the project's ability to execute the technical scope and achieve the anticipated outcomes.

Technical and Engineering Resources

AmeriCarbon Enterprises, LLC / AmeriCarbon Forge, LLC. AmeriCarbon brings the nation's only multi-ton-per-day coal liquefaction pilot facility and a world-class technical team with experience in carbon product manufacturing, feedstock optimization, and process integration. The AmeriCarbon pilot facility will serve as the platform for Task 3 (Pitch Integration and Optimization Studies), providing real-world process data on temperature control, residence time, and yield performance across various feedstock configurations.

AmeriCarbon's engagement of Worley Group provides direct access to multidisciplinary engineering resources for process modeling, mass and energy balance development, and site integration design. Worley's engineering and construction teams have extensive experience in advanced materials, refining, and energy-infrastructure projects in North Dakota and globally.

Academic and Research Resources

University of North Dakota (UND) – College of Engineering & Mines Research Institute. UND contributes a fully operational pilot-scale rare earth element (REE) extraction facility capable of processing up to 500 kilograms per hour of lignite feedstock, producing upgraded lignite and mixed rare earth concentrates. The facility, coupled with UND's Advanced Materials Characterization Laboratory (AMCL), provides comprehensive analytical capabilities (SEM/EDS, XRF, XRD, ICP-MS, and thermal analysis).

UND's team has extensive experience in rare earth and critical mineral recovery, feedstock purification, and techno-economic modeling. Their existing DOE- and NDIC-supported programs provide validated process data and a mature platform for integration with AmeriCarbon's carbon liquefaction technology.

UND's REE extraction process produces several products, including a unique upgraded lignite carbon ore ("upgraded LCO"). REE/CM processing uses lignite that would be otherwise unsuitable for thermal applications (high ash and low heating value) and significantly upgrades it by 1) reducing mineral matter using physical separations and 2) removing the organically associated inorganic elements through dilute mineral acid extraction. UND's prior technology development has identified that our REE/CM process has promising economic potential; however, a major component (~50%) of projected revenues from a commercial facility is from the upgraded LCO, even under the low-value use as a combustion blending fuel. This highlights the magnitude of the potential economic benefit of, instead, manufacturing value-added carbon products.

Industrial Research and Critical Mineral Recovery Resources

Microbeam Technologies, Inc. Microbeam brings to the project a unique combination of analytical, metallurgical, and process-development capabilities. Its Grand Forks and Minnetonka facilities are equipped with equilibrium thermodynamics modeling, high-temperature furnaces, condensation systems, and metals-recovery benches designed to process mixed rare earth concentrates (MREC) and coal-derived ash into germanium (Ge) and gallium (Ga) products. These resources will be directly utilized under Task 5 (Ge/Ga Process Integration and Optimization Studies).

Microbeam's expertise in mineralogical analysis (SEM, XRF, and ICP-MS) and its patented vaporization and selective-condensation process will enable accurate assessment of REE and CM recovery from AmeriCarbon's by-product ash streams.

Data, Intellectual Property, and Prior Research Assets

The proposed project builds upon substantial intellectual property and data portfolios developed by the participants:

- ✓ **AmeriCarbon** AmeriCarbon holds proprietary intellectual property related to its Eco-Pitch production technology. The data from its pilot plant operations provide invaluable insights into the performance, efficiency, and scalability of the process. This proprietary data will be used to inform the commercial design and ensure that all process parameters are optimized for large-scale production. Further, AmeriCarbon holds five patents in the United States and Canada: US# 11667852, 10301549, 9845431, 9534176; and CA# 3120884.

- ✓ **UND** holds patents and pending applications covering the extraction of rare earths and critical minerals from lignite mine wastes and organically associated materials, and maintains several years of pilot-scale performance data validated under DOE projects.

- ✓ **Microbeam** holds patents and pending applications for its REE-predictive analysis algorithms (US# 11733184) and for the process of producing high-purity Ge and Ga from mixed rare earth concentrates and coal-derived ash (US# 12031195).

These collective IP and data resources form a strong foundation for the integrated process modeling and techno-economic evaluation that will be undertaken in this project.

Techniques to Be Used, Their Availability and Capability:

The Forge Project: Rare Earths and Critical Materials Integration will employ a suite of bench, pilot-, and engineering-scale techniques to validate the integrated process for carbon production and critical mineral recovery. All techniques are established and available within the existing facilities of AmeriCarbon, the University of North Dakota (UND), Microbeam Technologies, and Worley Group. Together, these techniques provide the ability to conduct process development, performance optimization, and economic evaluation at a level sufficient to inform commercial-scale design.

1. Feedstock Evaluation and Liquefaction (AmeriCarbon)

AmeriCarbon will utilize its Liquid Carbon Process (Eco-Pitch™) pilot plant and associated laboratory equipment to process and evaluate various feedstocks including run-of-mine lignite, upgraded lignite, humins, and humic acid residues supplied by UND. Techniques include:

- Controlled liquefaction testing. Continuous pilot-scale runs under variable residence time, temperature, and pressure conditions to determine yield and quality of resulting pitches.

- Analytical characterization. Viscosity, softening point, quinoline insolubles, toluene insolubles, elemental analysis, and ash content to assess performance and reproducibility.

- By-product handling and sampling. Automated collection and compositional mapping of ash and carbon residues for mineralogical and REE/CM content analysis.

- Blending and process-optimization matrix. Systematic blending of multiple feedstocks to identify optimal ratios for yield, purity, and pitch specification control.

All techniques are established within AmeriCarbon's operating pilot plant and have been used to generate validated process data for scale-up to commercial operations.

2. Rare Earth Element (REE) and Carbon Co-Product Processing (UND)

The UND College of Engineering & Mines Research Institute will apply a proven set of hydrometallurgical and beneficiation techniques used in its DOE- and NDIC-funded REE extraction programs. These include:

- Mild-acid leaching of lignite-based feedstocks to extract REEs and critical minerals from organically associated matrices while retaining the carbon structure for subsequent use by AmeriCarbon.
- Solid–liquid separation and washing to recover the upgraded carbon material with near-zero sodium and low-ash content.
- Two-stage oxalate precipitation and calcination to generate mixed rare earth concentrates (MREC) with ≥75 wt% REE purity on an oxide basis.
- Advanced purification and demineralization using bench-scale chemical treatment and filtration to produce high-purity carbon suitable for anode and binder applications.
- Bench-scale graphitization and electrochemical testing of resulting carbon materials (coin and 18650-cell evaluations).

All techniques are operational within UND's 500 kg/h pilot-scale REE extraction facility and Advanced Materials Characterization Laboratory (AMCL), which houses full analytical capabilities (SEM/EDS, XRF, XRD, ICP-MS, and TGA). These facilities have already achieved Technology Readiness Level (TRL) 6 for REE extraction from North Dakota lignite.

3. Critical Mineral (Ge/Ga/Sb) Recovery and Refining (Microbeam Technologies)

Microbeam will apply its patented vaporization and selective-condensation process to recover germanium (Ge), gallium (Ga), and antimony (Sb) from AmeriCarbon and UND by-product streams. The process combines pyrometallurgical techniques, including:

- High-temperature vaporization of MREC and ash feedstocks in controlled-atmosphere furnaces to release Ge and Ga vapors.
- Selective condensation and particulate capture to recover Ge- and Ga-rich oxides as discrete concentrates.
- Direct metallization and refining via chlorination, hydrolysis, and electrowinning steps to achieve high-purity (≥99.999%) Ge and Ga metals.
- Analytical validation using SEM/EDS, XRF, ICP-MS, and XRD to confirm product purity and recovery yield.

Microbeam's bench-scale system (5–10 kg/h feed rate) is supported through DOE-, DoD, and NDIC-supported projects. These techniques will be used to confirm recovery factors, product specifications, and by-product recycling potential.

4. Process Integration and Engineering (AmeriCarbon and Worley Group)

Worley Group will apply process modeling, simulation, and site-integration techniques to develop a unified design framework that combines carbon manufacturing and REE/CM recovery. Methods include:

- Process flow diagram (PFD) and piping & instrumentation diagram (P&ID) development using Aspen Plus and AutoCAD Plant 3D.
- Mass and energy balance modeling based on empirical data from Tasks 3–5.
- Utility and infrastructure integration modeling for power, water, and material handling systems.
- Plot-plan and layout design to support co-location at the Forge site, including environmental, utility, and logistics interfaces.

Worley has extensive experience delivering front-end engineering design (FEED) and techno-economic analysis (TEA) studies for lignite, refining, and advanced-materials facilities throughout North Dakota and other U.S. industrial regions.

5. Analytical and Data Management Techniques

Cross-partner data will be standardized and validated using the following techniques:

- Statistical design of experiments (DOE) and response-surface modeling for optimization across feedstock blends and process parameters.

- Standardized analytical protocols for REE/CM assays and carbon purity (using ICP-MS, XRF, and SEM-EDS) to ensure comparability between institutions.
- Digital data management and integration via shared cloud-based project folders, ensuring traceability of raw data, analytical results, and reports.

These methods ensure technical consistency, reproducibility, and defensible data quality across all project activities.

Collectively, these techniques span the full technology chain—from feedstock characterization through carbon and mineral production, to process modeling and techno-economic evaluation. Each is already established, available, and fully capable of achieving the project's technical objectives, providing a strong foundation for future scale-up and commercial implementation at the Forge site.

Environmental and Economic Impacts while Project is Underway:

The proposed project will be executed as a research, development, and engineering program, utilizing existing pilot and laboratory facilities at AmeriCarbon, the University of North Dakota (UND), and Microbeam Technologies. As such, environmental impacts during the project are expected to be minimal, localized, and fully manageable within standard institutional safety and environmental procedures.

Environmental Impacts

Limited Material and Energy Use. Pilot- and bench-scale testing will use small quantities of lignite, upgraded carbon feedstocks, and process residues. No large-scale excavation, construction, or waste disposal is planned. Energy and water use will remain within normal laboratory operations.

Waste and Effluent Management.

- Liquefaction residues, process ash, and small volumes of spent reagents generated at AmeriCarbon and UND will be managed under existing facility permits and standard operating procedures.
- Any acid or solvent streams from UND's REE extraction and purification work will be neutralized and disposed of through UND's hazardous waste program in compliance with state and federal regulations.
- Gaseous emissions from Microbeam's high-temperature testing will be captured through particulate control and ventilation systems; no uncontrolled emissions are expected.

Environmental Health and Safety (EHS) Compliance. All partner facilities maintain active EHS programs that include staff training, chemical hygiene plans, and hazardous waste management protocols. No new permitting actions or environmental assessments are anticipated during this phase of work.

No Adverse Community or Ecological Effects. Work will occur entirely within existing industrial or research facilities in Grand Forks, Morgantown, Minnetonka, and other controlled laboratory environments. No fieldwork or disturbance of natural land, water, or habitat will occur during the project.

Economic Impacts

Direct Employment and Workforce Development. The project will support a skilled multidisciplinary workforce of engineers, scientists, and technicians across AmeriCarbon, UND, and Microbeam. Temporary project-specific employment will include graduate and undergraduate researchers at UND, contract engineers, and technical support personnel.

Local and Regional Spending. Project expenditures will include laboratory supplies, analytical services, and engineering support procured within North Dakota and neighboring states. UND's research operations and the project's overall planned activities will direct a substantial portion of spending to local vendors, utilities, and service providers.

Capacity Building for Future Industry. Beyond the immediate project, this work expands North Dakota's industrial base in high-value carbon and critical-mineral technologies. It strengthens institutional and workforce capacity for future phases involving pilot expansion and commercial deployment at the Forge site.

In summary, during the project's execution period, environmental impacts will be negligible and confined to controlled laboratory activities, while economic impacts will be positive, centered on job creation, technical workforce training, and procurement within North Dakota's research and industrial ecosystem. The project thus aligns with CSEA's mission to support clean and sustainable energy innovation with responsible environmental stewardship.

Ultimate Technological and Economic Impacts:

The Forge Project: Rare Earths and Critical Materials Integration will demonstrate the technical and economic viability of an integrated system that transforms North Dakota lignite and process by-products into high-value carbon materials and critical minerals. The project will validate an entirely new model of resource utilization — one that combines advanced carbon manufacturing, rare earth element (REE) extraction, and critical mineral recovery within a single industrial ecosystem. The long-term impacts extend well beyond this research phase, establishing a foundation for new industries, jobs, and supply chains centered in North Dakota.

Technological Impacts

The project will advance a first-of-its-kind integration of carbon and critical-material technologies, combining three complementary innovations:

1. <u>AmeriCarbon's Eco-Pitch™ Liquefaction Process</u>, which converts lignite, upgraded lignite, and humic-based materials into tailored binder and impregnating pitches for high-value applications in synthetic graphite, battery anodes, and carbon composites;

2. UND's Rare Earth Extraction and Carbon Upgrading Process, which isolates REEs from lignite mine wastes and humic materials, producing upgraded carbon feedstocks with low ash and high purity suitable for conversion into premium carbon products; and

3. Microbeam's Germanium and Gallium Recovery Process, which separates and refines critical minerals from AmeriCarbon and UND process residues using proprietary vaporization and selective-condensation techniques.

Together, these systems create a closed-loop process chain that captures value from every portion of the lignite resource—carbon, rare earths, and trace metals—while minimizing waste. Technologically, the project will demonstrate:

- Integration at the process-engineering level, enabling simultaneous production of high-purity carbon materials and REE/CM concentrates within a single facility footprint;
- Improved environmental performance, including lower energy consumption and reduced waste generation compared with traditional REE and carbon manufacturing methods;
- Scalability and replicability, with data and designs directly transferable to commercial-scale deployment at AmeriCarbon Forge in McLean County, ND, and to future projects across other lignite-producing regions; and
- Alignment with national strategic goals, including the *2025 Executive Order on Increasing American Mineral Production*, which prioritizes domestic manufacturing of critical materials essential to defense, energy, and advanced manufacturing sectors.

By establishing the technical basis for co-locating carbon, REE, and critical-mineral production, the Forge Project will showcase a new generation of resource-integrated manufacturing capable of supporting the United States' long-term industrial and supply-chain resilience.

Economic Impacts and Value to North Dakota

The Forge Project's long-term economic impacts will be transformative for North Dakota, positioning the state as a center of excellence for critical-materials and advanced-carbon production.

Key economic impacts include:

- ✓ Creation of a New Industrial Platform**.** The integration of carbon manufacturing and REE/CM recovery represents the foundation of a new high-value industry in North Dakota—one that leverages the state's lignite resources not for combustion, but for advanced manufacturing and critical-materials production.
- ✓ Expansion of Domestic Supply Chains**.** By enabling U.S.-based production of coal-tar-pitch equivalents, synthetic graphite precursors, and REE/CM products such as germanium and gallium, the project supports national energy security, defense readiness, and industrial competitiveness.

- ✓ <u>Workforce Development and Technology Transfer</u>**.** The project will train a new generation of engineers, scientists, and technicians in advanced carbon and critical-material processing, creating transferable expertise for future commercial plants. UND's participation ensures educational integration, internships, and hands-on experience for students in chemical and materials engineering.
- ✓ <u>Regional Economic Growth</u>**.** The Forge Project will strengthen the economic base of McLean County and surrounding areas by anchoring future construction, operations, and supply-chain activities. The commercial facility enabled by this research will attract suppliers, create high-wage technical jobs, and generate significant secondary economic activity in logistics, maintenance, and services.
- ✓ <u>Diversification and Resource Valorization</u>**.** Transforming lignite into carbon and mineral products redefines the economic potential of North Dakota's coal reserves—converting a low-cost energy resource into a feedstock for the aerospace, energy storage, semiconductor, and defense industries.

In the long term, the Forge Project will catalyze a new materials manufacturing corridor within the state—anchored by the AmeriCarbon Forge commercial complex and sustained by ongoing partnerships with UND, Microbeam, and the North Dakota Industrial Commission. This vertically integrated system will advance national clean-energy and materials goals while providing durable, high-value employment and long-term economic diversification for North Dakota.

Why the Project is Needed:

The Forge Project: Rare Earths and Critical Materials Integration is needed to close a critical gap between research-stage technologies for rare earth element (REE) and critical mineral recovery and the commercial-scale carbon manufacturing system now being advanced in North Dakota through AmeriCarbon Forge, LLC. This project represents the essential integration phase—aligning the technical, engineering, and operational interfaces that will enable these complementary processes to function as one unified manufacturing platform.

For decades, the United States has been almost entirely dependent on foreign sources for two strategic material streams—coal-tar pitch (used for graphite, anodes, and carbon composites) and rare earth elements and critical minerals (used in electronics, defense, and clean-energy technologies). China currently dominates both supply chains. This dependence poses serious risks to national security, economic competitiveness, and the resilience of U.S. manufacturing.

The Forge Project directly addresses these vulnerabilities by creating a North Dakota–based integrated production system that converts lignite and process by-products into high-value carbon materials and co-recovered critical minerals such as germanium, gallium, and REEs. Through coordinated development by AmeriCarbon, UND, and Microbeam Technologies, the proposed project will establish the technical and engineering basis for co-locating these processes at the AmeriCarbon Forge site in McLean County.

Germanium (Ge) and Gallium (Ga) are essential materials for advancing energy efficiency and sustainability across a wide range of technologies, including quantum processors, photonic circuits, and high-speed electronic devices. Ge enables low-power, high-speed transistors, singlephoton detectors, and quantum dots for integrated sensing and computing, while Ga—especially in the form of gallium nitride (GaN)—powers efficient LEDs, RF amplifiers, and power electronics that reduce energy consumption in data centers, electric vehicles, and renewable energy systems. The lack of readily available Ge and Ga is limiting the US ability to produce high efficiency electronic products for infrared optics, thermal imaging systems, satellite solar panels, emerging quantum computing, and photonics platforms.

Addressing National and State Priorities

1. <u>Energy and Materials Security</u>. The project will strengthen domestic supply chains by enabling U.S. production of two categories of critical inputs: (i) advanced carbon materials and (ii) REEs and associated critical minerals. Integration of AmeriCarbon's Eco-Pitch™ process with UND's REE extraction and Microbeam's Ge/Ga recovery technologies directly supports the U.S. Department of Energy's Critical Materials Initiative and the *2025 Executive Order on Increasing American Mineral Production*.

2. <u>Environmental Performance and Resource Optimization</u>. The integration of these processes creates a closed-loop system that minimizes waste and maximizes value from North Dakota lignite. AmeriCarbon's low-temperature, non-combustion carbon process reduces greenhouse-gas emissions by more than 90% compared with conventional pitch manufacturing. UND's extraction process converts lignite mine waste into upgraded carbon feedstock, while Microbeam's technologies recover high-purity metals from process residues. Together, they form an environmentally responsible pathway to critical-materials production with minimal incremental footprint.

3. <u>Economic Diversification and Industrial Development in North Dakota</u>. The proposed project will accelerate North Dakota's transition from traditional coal utilization toward advanced materials manufacturing. It will position McLean County and the broader lignite region as a national hub for carbon, rare earth, and critical-mineral industries, supporting high-wage technical employment, new capital investment, and supply-chain growth in engineering, logistics, and materials processing.

Why This Project Is Needed Now

The underlying technologies—AmeriCarbon's Eco-Pitch™ process, UND's REE extraction platform, and Microbeam's Ge/Ga separation system—have each reached pilot or early demonstration scale. However, they have not yet been integrated into a shared industrial framework. Without this integration, opportunities for efficiency, by-product valorization, and shared infrastructure would remain unrealized, limiting both economic and environmental benefits.

This project provides the bridge between discrete technology readiness and industrial integration, delivering the data, engineering, and techno-economic foundation required for full-scale implementation at the Forge Project site.

Strategic Outcomes

The Forge Project: Rare Earths and Critical Materials Integration is needed to:

- ✓ Demonstrate process compatibility and optimized material flow among the three technology systems;
- ✓ Establish engineering, economic, and environmental parameters for integrated production;
- ✓ Enable CSEA and the State of North Dakota to evaluate a scalable model for carbon and critical-mineral manufacturing; and
- ✓ Position North Dakota as a national leader in clean, secure, and sustainable materials production.

In short, *The Forge Project* is the integration step that transforms years of parallel research into a unified, commercially viable system. It advances CSEA's mission by creating a model for clean energy and materials innovation that enhances national security, drives regional economic diversification, and redefines the role of lignite in a modern, low-carbon industrial economy.

STANDARDS OF SUCCESS

The success of *The Forge Project: Rare Earths and Critical Materials Integration* will be measured by its ability to demonstrate, document, and de-risk the technical, economic, and environmental viability of integrating AmeriCarbon's carbon manufacturing process with the rare earth and critical mineral recovery technologies developed by UND and Microbeam Technologies.

The project will define and validate the framework for a fully integrated carbon and critical-materials manufacturing platform in North Dakota—one that enhances the value of lignite, strengthens domestic supply chains, and positions the state as a leader in sustainable energy and materials innovation.

Key Metrics for Success

1. Technical Integration and Performance

- Successful completion of pilot- and bench-scale testing demonstrating compatibility among AmeriCarbon, UND, and Microbeam process streams.
- Verified ability to process multiple feedstocks—lignite, upgraded lignite, humins, and humic-acid residues—within AmeriCarbon's Eco-Pitch™ system to produce high-quality carbon pitches with defined customer specifications.

- Demonstrated recovery of germanium, gallium, and other critical minerals from AmeriCarbon and UND process residues, achieving purity levels suitable for downstream refining and potential commercial use.
- Delivery of a comprehensive **process integration model** including mass and energy balances, process flow diagrams (PFDs), and site-integration layouts validated by Worley Group.
- Completion of a **Techno-Economic Assessment (TEA)** showing clear economic potential for integrated production and co-location at the AmeriCarbon Forge site.

2. Environmental and Sustainability Outcomes

- Quantified reduction in process waste and greenhouse-gas intensity relative to conventional carbon and mineral processing.
- Documented lifecycle environmental benefits through data from the integrated process, emphasizing closed-loop material use and minimized waste generation.
- Establishment of an operational baseline to support future environmental permitting and sustainability certification for the commercial Forge facility.

3. Economic and Workforce Development Value

- Demonstrated economic viability and readiness for scale-up, providing the technical and economic foundation for subsequent CSEA and private-sector investment.
- Support of North Dakota-based engineering, research, and laboratory employment throughout the project period, including workforce participation by UND graduate and undergraduate students.
- Creation of an actionable roadmap for commercial deployment, enabling future job creation and local manufacturing investment in McLean County and across the state.

4. Advancement of Research, Development, and Technology Commercialization

- Advancement of three distinct technology families—carbon liquefaction, REE extraction, and Ge/Ga recovery—to a higher level of integration readiness.
- Development of a replicable model for industrial symbiosis that can be applied to other lignite regions or industrial sites in North Dakota.
- Generation of publishable, transferable technical data that can be leveraged by the public and private sectors to support future innovation and commercialization.

Alignment with CSEA Mission and Program Objectives

The Forge Project directly advances the mission of the Clean Sustainable Energy Authority by:

- ✓ Enhancing the **sustainability and value** of North Dakota's lignite resource through clean manufacturing technologies;

- ✓ Supporting **energy and materials security** by establishing the foundation for domestic production of critical materials;
- ✓ Promoting **environmental stewardship** through substantial reductions in greenhouse-gas and waste outputs; and
- ✓ Driving **economic diversification** through new industries, jobs, and technical capabilities based in the state.

Benchmarks for Long-Term Success

While the proposed project focuses on integration and optimization, its longer-term success will be measured by its ability to catalyze future developments, including:

- Commercial Deployment**.** Successful transition of the integrated process to full-scale operation at the AmeriCarbon Forge site by 2027.
- Expansion of Advanced Manufacturing**.** Attraction of additional carbon, rare earth, and critical-mineral manufacturing facilities within North Dakota over the next decade.
- Sustained Economic Impact**.** Creation of durable, high-wage employment in engineering, manufacturing, and materials processing, supported by a North Dakota–based supply chain.

By meeting these standards of success, *The Forge Project* will deliver measurable technical achievements, clear economic and environmental benefits, and a validated framework for commercial implementation. The results will strengthen North Dakota's leadership in clean, sustainable materials production and help establish a resilient, domestic supply chain for advanced carbon and critical-mineral industries.

BACKGROUND/QUALIFICATIONS

The Forge Project builds on more than a decade of development in lignite-based carbon manufacturing, rare earth element (REE) extraction, and critical mineral recovery technologies that have been pioneered independently by AmeriCarbon Enterprises, the University of North Dakota (UND), and Microbeam Technologies, Inc. This project represents the convergence of those technology paths into a unified industrial platform for the State of North Dakota.

Project Origins and Context

Ore Spring Materials, LLC was established to manage and coordinate the integration of AmeriCarbon's coal-to-carbon pitch manufacturing process with emerging REE and critical-mineral recovery technologies developed by UND and Microbeam. The combined system—referred to as *The Forge Project: Rare Earths and Critical Materials Integration*—advances a vision of full-resource utilization: converting lignite and related by-products into high-value carbon materials, rare earth elements, and critical minerals, while minimizing waste and environmental impact.

This integration builds on a series of NDIC- and DOE-funded projects that have demonstrated both the technical feasibility and economic promise of these constituent technologies. The current project, submitted to the Clean Sustainable Energy Authority (CSEA), focuses on the next step—process integration, optimization, and engineering design—to prepare for commercial-scale deployment at the AmeriCarbon Forge site in McLean County.

Background of Key Project Participants

AmeriCarbon Enterprises, LLC / AmeriCarbon Forge, LLC

AmeriCarbon has developed the patented Liquid Carbon Process (LCP), a proprietary technology that converts coal, including lignite, into high-performance binder and impregnating pitches (Eco-Pitch™). The process eliminates dependence on imported coal-tar pitch and reduces greenhouse-gas emissions by over 90% compared to conventional coking-oven processes.

AmeriCarbon operates a 12,000-square-foot pilot facility in Morgantown, West Virginia—the only known coal liquefaction–based pitch production facility in the world. Over multiple NDIC-supported projects, AmeriCarbon has:

- ✓ Demonstrated successful conversion of North Dakota lignite into coal tar pitch meeting industrial specifications;
- ✓ Completed FEL-2 engineering through Worley Parsons, verifying commercial feasibility;
- ✓ Advanced FEL-3 design for the McLean County plant through a series of NDIC- and AmeriCarbon-funded efforts; and
- ✓ Launched a reactor optimization project to maximize conversion efficiency and throughput of lignite feedstocks.

These projects collectively establish AmeriCarbon as the nation's leader in lignite-to-carbon process development. Its expertise in pilot-to-commercial scale-up, system engineering, and process integration underpins The Forge Project's carbon manufacturing and feedstock optimization components.

University of North Dakota (UND) – College of Engineering & Mines Research Institute

UND has spent the past decade pioneering rare earth and critical mineral recovery from lignite and related materials, with support from both the U.S. Department of Energy (DOE) and the North Dakota Industrial Commission (NDIC). The university's patented REE extraction process uses mild acid leaching and selective precipitation to produce Mixed Rare Earth Concentrates (MREC) while generating a valuable upgraded carbon by-product suitable for further conversion into high-value pitch products.

Key UND milestones include:

- ✓ Design, construction, and operation of a 500 kg/hr continuous pilot-scale REE extraction facility—the first of its kind using lignite mine waste feedstocks;

- ✓ Development of integrated purification, calcination, and ion-exchange processes capable of producing MREC with ≥ 75 wt% REE purity on an oxide basis;
- ✓ Partnership with DOE, Rare Earth Salts, Barr Engineering, and other industrial collaborators in completing a Front-End Engineering and Design (FEED) efforts for a demonstration facility; and
- ✓ Advancement of intellectual property protecting both the leaching process and organically associated critical-mineral recovery techniques.

UND's technologies form the front-end beneficiation and purification component of The Forge Project, providing high-purity carbon feedstocks and process data essential to optimizing AmeriCarbon's Eco-Pitch™ system.

<u>Microbeam Technologies, Inc.</u>

Microbeam Technologies, based in Grand Forks, North Dakota, and Minnetonka, Minnesota, is an applied research and development firm specializing in fuel characterization, ash behavior, and critical-mineral recovery from coal and carbonaceous feedstocks.

Microbeam's relevant experience includes:

- ✓ Development of a proprietary vaporization and selective-condensation process for germanium (Ge) and gallium (Ga) recovery from mixed REE concentrates (MREC) derived from UND's process;
- ✓ Successful bench-scale validation of this system under a DOE/NDIC-funded project (Award DE-FE0032522), achieving > 90 wt% purity of Ge/Ga concentrates;
- ✓ Operation of advanced analytical laboratories equipped with scanning electron microscopy, and X-ray fluorescence (XRF) for mineralogical and compositional mapping; and
- ✓ Longstanding collaboration with UND on REE characterization and process optimization.

Microbeam's role in The Forge Project is to lead the critical-mineral recovery and refinement tasks, evaluating AmeriCarbon's ash by-products as feedstocks for Ge/Ga separation and contributing process data to the integrated economic model.

<u>Worley Group</u>

Worley is a global engineering, procurement, and construction (EPC) firm with decades of experience in front-end engineering design (FEED) and industrial process integration. Through previous collaborations with AmeriCarbon and UND, Worley has developed process flow diagrams (PFDs), piping and instrumentation diagrams (P&IDs), and mass/energy balances for lignite-based carbon and REE facilities in North Dakota.

In The Forge Project, Worley will serve as the engineering integration lead, responsible for:

- Process modeling and mass/energy balance integration across the AmeriCarbon, UND, and Microbeam systems;
- Preliminary site layout and utility interface studies for the Forge site in McLean County; and
- Development of an engineering framework supporting future FEL-3 design and permitting.

Project Team Qualifications

The Forge Project team unites industrial operators, academic researchers, and engineering professionals with unmatched expertise in carbon manufacturing, REE extraction, and mineral recovery.

<u>Technical Leadership</u>

- **David Berry**, CEO of AmeriCarbon, brings more than three decades of DOE and DoD R&D experience in hydrocarbon conversion and advanced materials production, with multiple patents in carbon and liquid-phase processing.
- **Dr. Chetan Tambe**, Senior Engineer at AmeriCarbon, Dr. Tambe specializes in energy-efficient carbon product manufacturing from coal. Prior to joining AmeriCarbon, he worked as a Research Scientist at Cardolite Corporation (PA) on hydrogenation technology scale-up and research collaborations. He holds a Ph.D. from Michigan State University focused on sustainable biobased materials, and his academic work includes multiple peer-reviewed publications, a book chapter, and five patents.
- **Steve Mascaro,** Senior Process Engineer at AmeriCarbon, Steve brings over 25 years of process engineering experience, with a focus on pilot plant optimization. At AmeriCarbon, he leads efforts to optimize reactor performance and scale-up operations. Before joining AmeriCarbon, Steve worked at the U.S. Department of Energy's National Energy Technology Laboratory (NETL), leading pilot research in coal-gas desulfurization, catalyst development, and technical project reviews. He began his career at Aristech Chemical, where he held roles in process engineering, utilities, quality management, and oversaw the expansion of polypropylene capacity with Jacobs Engineering. He holds a B.S. in Chemical Engineering from West Virginia University.
- **Nolan Theaker**, Senior Research Manager with UND CPER, will be UND's principal investigator. Mr. Theaker has been the technical driver for UND's technology development and resource characterization efforts related to REE/CM since he joined UND in 2017. He is widely recognized within the DOE and the research community as a leading expert on REE/CM technologies. Mr. Theaker was the PI on UND's REE/CM pilot demonstration project (DE-FE0031835), as the technical lead on UND's recent FEED project (DE-FE0032295), holds two patents for UND's lignite-based extractive metallurgy process, and has been named as key personnel on two CORE-CM projects: Williston Basin and Gulf Coast.
- **Nic Dyrstad-Cincotta**, Research Operations Manager with UND CPER, is a mechanical and design engineer with over 10 years of experience in technology demonstration and scale-up. Nic was responsible for leading the design, construction and commissioning of

UND's existing REE/CM pilot facility and is one of its lead operations engineers. Nic is also an expert in process instrumentation and controls, having led the design, installation and programming of the REE/CM pilot's National Instruments LabVIEW PLC system and many of CPER's other R&D systems. Nic is also UND CPER's safety officer, responsible for maintaining the safety of our research spaces and operations.

- **Dr. Xiaodong Hou**, Research Associate Professor with UND CPER, is a material chemist with 16 years of experience synthesizing and characterizing advanced materials. He has over 45 peer-reviewed publications in chemistry materials and holds six patents. Dr. Hou has led multiple projects related to advanced carbon materials from lignite for LIBs, including DE-FE0031984 and DE-FE0032139. He will lead activities associated with proof-of-concept prototype product demonstrations for hard carbon anodes and collaborate with Vorbeck on demonstration of UPHA conversion into graphene products.
- **Dr. Dan Laudal**, Executive Director of the UND CEM Research Institute, is an expert on lignite coal, carbon products, and REE/CM technologies. His PhD research was the foundation for UND's technology development related to REE/CM from lignite. He was the Project Director on UND's FEED study project (DE-FE0032295) and in his nearly 20 years in the energy industry has been involved in a wide array of projects ranging from proof-of-concept to world-scale project development. He will support project management and serve as a technical advisor.
- **Dr. Steven Benson**, President of Microbeam Technologies, has over 45 years of experience in fuel chemistry, ash transformations, and critical-mineral recovery, with multiple issued patents and prior DOE project leadership.
- **Alex Benson**, Chief Operating Officer of Microbeam Technologies, leads Microbeam's projects related to the separation and recovery of Ge and Ga from coal-derived byproducts. He is the PI on DOE-NETL and DOD funded projects demonstrating and scaling this technology. He has also led multiple NDIC funded REE-CM resource evaluation efforts in ND (new and current resource developments). Mr. Benson also has experience in new product development, commercialization and operations management of greater than $300M production facilities.

- **Art Lucas**, Senior Process Engineer at Worley, leads engineering integration and techno-economic analyses, supported by Worley's global process modeling resources.

Summary of Capabilities

The team's combined resources and expertise uniquely position North Dakota to pioneer an integrated carbon-and-critical-materials manufacturing platform. Each participant contributes complementary capabilities:

- AmeriCarbon provides pilot-to-commercial scale process experience and proprietary carbon-conversion data.
- UND supplies validated REE extraction and purification technology and advanced analytical infrastructure.

- Microbeam contributes metallurgical and analytical expertise in Ge/Ga recovery and characterization.
- Worley integrates these systems into a cohesive engineering and economic framework ready for scale-up.

Together, these organizations represent a fully capable and field-proven team that has already demonstrated success in DOE and NDIC-funded programs. Their collective qualifications ensure that The Forge Project will deliver credible, data-driven results that advance North Dakota's leadership in sustainable, value-added energy and materials manufacturing.

MANAGEMENT

Management Approach and Oversight

The Forge Project will be managed through a collaborative project management framework led by Ore Spring Materials, LLC, with technical execution carried out by AmeriCarbon Enterprises, LLC, the University of North Dakota (UND), Microbeam Technologies, Inc., and Worley Group. Ore Spring will serve as the project integrator and administrative lead, responsible for coordination, schedule adherence, and reporting to the Clean Sustainable Energy Authority (CSEA). Governance will be provided by a Project Steering Committee comprising representatives from Ore Spring, AmeriCarbon, UND, Microbeam, and Worley. The Steering Committee will convene monthly to review progress, technical results, budget performance, and risk management. Day-to-day authority resides with the Project Director (Dave Berry, AmeriCarbon) and designated technical leads from each partner organization. Project management will follow established best practices for research program execution, including structured work breakdown, milestone tracking, and risk-based decision gating.

Organization and Responsibilities

<u>Ore Spring Materials, LLC (Project Lead)</u>

- Owns project scope, schedule, and budget.
- Manages partner coordination, reporting, and communications with CSEA and NDIC.
- Oversees compliance, risk management, and quality assurance.
- Maintains the Project Management Plan (PMP), change control procedures, and reporting cadence.

<u>AmeriCarbon (Carbon Manufacturing Lead)</u>

- Leads Task 3 (Pitch Integration & Optimization Studies) and contributes to overall integration design.
- Provides pilot plant operations, data collection, and process optimization for feedstock blending.

- Supplies process performance and material balance data to inform Worley's engineering integration models.

University of North Dakota (REE Integration Lead)

- Leads Task 4 (REE Process Integration & Optimization Studies) and contributes to feedstock and purification research.
- Provides upgraded lignite, humins, and humic-acid residues as test feedstocks.
- Conducts bench- and pilot-scale validation of demineralization, purification, and carbon-quality improvements.

Microbeam Technologies, Inc. (Critical Mineral Recovery Lead)

- Leads Task 5 (Ge/Ga Process Integration & Optimization Studies).
- Conducts bench-scale vaporization, condensation, and refining trials on AmeriCarbon and UND by-product streams.
- Provides mineralogical and compositional analysis to support the techno-economic assessment.

Worley Group (Engineering and Integration Lead, subcontractor to AmeriCarbon)

- Leads Task 2 (Preliminary Process and Site Integration Assessment) and contributes to system modeling, process flow diagrams (PFDs), and mass/energy balance integration.
- Supports development of the Techno-Economic Assessment (Task 6) and future FEL-3 readiness.

Execution Controls and Reporting Cadence

The Project Management Office (PMO), under Ore Spring, will implement an integrated control and reporting system that emphasizes technical performance, schedule adherence, and accountability. Monthly Progress Reports will summarize technical milestones, budget-to-actual performance, safety metrics, and partner activities. Quarterly Steering Committee Reviews will validate milestone completion and address corrective actions where required. Change Control (MOC) procedures will govern scope and budget modifications, ensuring transparent communication and documented decision-making. A shared risk register will be maintained and reviewed monthly, with proactive mitigation measures documented for technical, financial, and schedule risks.

Safety, Quality, and Environmental Management

All partner facilities operate under established environmental, health, and safety (EHS) programs compliant with federal, state, and institutional requirements. UND's chemical hygiene plan and AmeriCarbon's pilot plant safety procedures will guide laboratory and pilot operations. Quality assurance (QA/QC) procedures will include cross-laboratory data verification, analytical calibration, and review of deliverables by the Project Director and Steering Committee prior to submission to CSEA.

Evaluation Points (Stage Gates & Milestones)

Gate / Milestone	Primary Deliverable / Evidence	Decision / KPI
G1 – Project Initiation	Approved Project Management Plan; Partner Agreements Executed	Schedule and communication plan validated; risk log initialized
M1 – Feedstock and Baseline Testing Complete	Pilot-scale test results (AmeriCarbon & UND)	Feedstock performance validated; preliminary yield and quality data established
M2 – REE and Critical Mineral Recovery Trials Complete	Bench-scale Ge/Ga recovery results; REE and ash analyses	Demonstrated process compatibility and recovery factors
G2 – Integration Design Review	Preliminary mass & energy balances; draft process flow diagrams (Worley)	Engineering and data readiness for techno-economic analysis confirmed
M3 – Techno-Economic Assessment Complete	Draft TEA report integrating data from Tasks 3–5	Commercial potential, cost structure, and ND economic impacts validated
G3 – Final Project Review / Closeout	Final report submitted to CSEA; validated integration framework	Project objectives met; commercial integration pathway defined

Stakeholder Engagement and Communication

Ore Spring will maintain continuous engagement with CSEA, NDIC, and local stakeholders throughout the project. Communication will include monthly technical and financial reports, semi-annual technical briefings, and public outreach via UND's research communications and AmeriCarbon's stakeholder network to highlight North Dakota's leadership in critical-materials innovation.

Summary

This management framework ensures that The Forge Project is executed on schedule, within scope, and in full compliance with CSEA program objectives. The integrated approach—combining industrial, academic, and engineering expertise under coordinated project management—provides the structure necessary to achieve technical success, transparent reporting, and measurable outcomes that support North Dakota's clean energy and materials strategy.

TIMETABLE

The Forge Project: Rare Earths and Critical Materials Integration is planned as a 24-month project commencing upon award authorization by the Clean Sustainable Energy Authority (CSEA). The schedule outlined below provides the target start and completion dates for major project activities, including key technical milestones and reporting deliverables.

Task / Activity	Description	Start Date	Completion Date	Deliverable / Reporting Milestone
Project Initiation and Management Setup	Execute partner subcontracts, finalize Project Management Plan (PMP), and convene kickoff meeting.	Month 1	Month 2	Project Kickoff Meeting; Project Management Plan submitted to CSEA.
Task 1 – Project Management (Ongoing)	Continuous coordination, reporting, and oversight throughout all project phases.	Month 1	Month 24	Monthly progress reports; quarterly steering committee reviews; risk register updates.
Task 2 – Preliminary Process and Site Integration Assessment	Worley conducts initial process integration, baseline data review, and site layout study.	Month 2	Month 6	Preliminary Process Integration Summary; included in Q2 Report.
Task 3 – Pitch Integration & Optimization Studies (AmeriCarbon)	Pilot-scale testing using lignite, upgraded lignite, humins, and blended feedstocks. Generate process data on yields, ash content, and	Month 3	Month 14	Interim Technical Report #1 (Month 9); Pilot Test Data Package #1 (Month 14).

	pitch composition.			
Task 4 – REE Process Integration & Optimization Studies (UND)	Produce upgraded carbon by-products and REE-rich residues; conduct purification and demineralization testing; validate product quality.	Month 4	Month 15	Interim Technical Report #2 (Month 12); Data Summary for Integration Model (Month 15).
Task 5 – Ge/Ga Process Integration & Optimization (Microbeam)	Bench-scale testing of AmeriCarbon and UND residues; validate selective vaporization and condensation for Ge/Ga recovery.	Month 6	Month 18	Interim Technical Report #3 (Month 18); Analytical Results Package.
Task 6 – Techno-Economic Assessment (TEA)	Integrate process data into unified engineering and economic model; evaluate commercial potential for Forge site co-location.	Month 16	Month 21	Draft TEA and Integration Report (Month 21).
Task 7 – Technology Development and Commercialization Pathway	Identify remaining technical gaps; develop roadmap for pilot-to-commercial transition and follow-on funding.	Month 20	Month 23	Final Technical Report (Month 23) summarizing integration readiness.

Project Closeout	Submit final reports and documentation; conduct project review with CSEA and partners.	Month 24	Month 24	Final Report and Presentation to CSEA; Project Completion Certification.

Reporting Cadence

• Monthly Progress Reports — Submitted to CSEA within 10 days of month end; include technical updates, budget status, schedule performance, and safety metrics.
• Quarterly Reports — Summarize progress toward milestones, major findings, and planned next steps; Months 3, 6, 9, 12, 15, 18, 21.
• Interim Technical Reports — Issued at completion of major tasks (Tasks 3–5) and submitted to CSEA within 30 days of task completion.
• Final Report and Presentation — Delivered at Month 24, summarizing results, integration framework, and recommendations for commercial implementation at the Forge site.

Overall Schedule Summary

Phase	Duration	Key Milestones
Phase 1 – Project Initiation and Integration Setup	Months 1–3	Kickoff meeting; PMP approved; partner agreements executed.
Phase 2 – Feedstock, REE, and Mineral Optimization	Months 3–18	Completion of pilot- and bench-scale testing (AmeriCarbon, UND, Microbeam).
Phase 3 – Integration, Analysis, and TEA	Months 16–21	Completion of engineering and economic modeling; draft integration report.
Phase 4 – Commercialization Planning and Closeout	Months 21–24	Final report, stakeholder review, and project closeout with CSEA.

This timetable provides a clear framework to manage technical progress, coordinate partner activities, and ensure timely reporting to CSEA. The phased schedule aligns with the project's integration objectives and ensures that technical deliverables and data are available in time to support engineering, economic, and commercialization evaluations.

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 financial assistance 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 projects with a high degree of matching private industry investment.*

Project Associated Expense	NDIC Grant	NDIC Loan	Applicant's Share (Cash)	Other Project Sponsor's Share	Total
Project budget	$2,250,000		$2,250,000		$5,000,000
Total	$2,250,000		$2,250,000		$5,000,000

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

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

PATENTS/RIGHTS TO TECHNICAL DATA

Each participating organization — AmeriCarbon Enterprises, LLC, the University of North Dakota (UND), and Microbeam Technologies, Inc. — brings its own background intellectual property (IP), expertise, and technical data to this project. All such background IP, including pre-existing inventions, know-how, research results, and proprietary methods, will remain the sole property of the originating organization.

Any new data, methods, or intellectual property developed during the course of this project will be governed by mutually agreed terms among the parties and in accordance with applicable North Dakota Industrial Commission (NDIC) and Clean Sustainable Energy Authority (CSEA) policies. Ownership of project-generated IP will be determined based on the nature and level of contribution, with appropriate rights to use the resulting data for research, development, and commercialization as permitted under program guidelines..

STATE PROGRAMS AND INCENTIVES

Ore Spring Materials, LLC is a newly formed entity and has not received any state funding to date. Ore Spring's affiliate, AmeriCarbon Products, LLC, has been the recipient of the following contracts through the Lignite Research Council and funded by the North Dakota Industrial Commission:

NDIC Contract Number	Title	Term of Contract	NDIC Share
Contract No. FY22-XCVII-241	North Dakota Lignite Coal-Based Pitch for Production of High Value Carbon Product	January 2022 through June 2023	$550,000.00
Contract No. FY23-102-251	Engineering Design and Feasibility Analysis for Commercial Graphite and Asphalt Manufacturing from Lignite Derived Carbon Pitch	July 2023 through June 2025	$700,000.00
Contract No. FY24-104-258	Lignite Conversion Reactor Optimization for Commercial Carbon Pitch Manufacturing	July 2024 through January 2026	$743,800.00
Contract No. FY25-107-264	Commercial Plant Design Optimization: Lignite to Critical Carbon Materials	May 2025 through July 2026	$1,499,653

PUBLICATIONS - Selected

1. Ping Wang, Bret Howard, Nicholas Means, Dushyant Shekhawat, David Berry. "Coal chemical-looping with oxygen uncoupled (CLOU) using a Cu-based oxygen carrier derived from natural minerals". Energies 2019, 12, 1453, doi:10.3390/en12081453.
2. Daniel J Haynes, Dushyant Shekhawat, David A Berry, Amitava Roy, James J. Spivey, Effect of calcination temperature on the steam reforming activity of Ni substituted pyrochlore catalysts, Jun 2018 to Applied Catalysis: A: Gen.
3. Ping Wang, Nicholas Means, Bret Howard, Dushyant Shekhawat, and David Berry, The Reactivity of CuO Oxygen Carrier and Coal in Chemical-Looping with Oxygen Uncoupled (CLOU) and In-situ Gasification Chemical-Looping Combustion (iG-CLC), Fuel 217 (2018) 642-649).
4. M.W. Smith, D.A. Berry, D. Shekhawat, D.J. Haynes, J.J. Spivey, Partial oxidation of liquid hydrocarbons in the presence of oxygen-conducting supports: Effect of catalyst layer deposition, Fuel, 89 (2010) 1193-1201.
5. D.J. Haynes, A. Campos, M.W. Smith, D.A. Berry, D. Shekhawat, J.J. Spivey, Reducing the deactivation of Ni-metal during the catalytic partial oxidation of a surrogate diesel fuel mixture, Catal Today, 154 (2010) 210-216.
6. D. Shekhawat, D. A. Berry, H. W. Pennline, E. Granite, J. J. Spivey, Special Issue: Advanced Fossil Energy Utilization, Fuel, Volume 89, Issue 6, January 1, 2010.
7. Maria D. Salazar-Villalpando, D. A. Berry and A. Cugini, Role of Lattice Oxygen in the Partial Oxidation of Methane over Rh/Supported Ceria Catalysts. Isotopic Studies, Solid State Ionics, December 2009.
8. M. Salazar, D. A. Berry and T. H. Gardner, "Partial Oxidation of Methane over Rh/Supported-Ceria Catalysts: Effect of Catalyst Reducibility and Redox Cycles", Published, International Journal of Hydrogen Energy, 33/11, (2008), 2695-2703
9. Shadle, L.J., Berry, D.A., and Syamlal, M., "Coal Gasification", Encyclopedia of Chemical Technology, Concise, 5th Edition (ISBN 978-0-470-04748-4). , John Wiley & Sons, Inc., NY, NY, May 2007.
10. Turton, R.A., Berry, D.A., Gardner, T.G., and Miltz, A., "The Evaluation of Zinc Oxide Sorbents in a Pilot-Scale Reactor: Sulfidation Kinetics and Reactor Modeling", Industrial Engineering and Chemistry, Ind. Eng. Chem. Res. 2004, 43, 1235-1243

PATENTS - Selected

1. U.S. Patent # 9,935,318 SOFC Cathode with Oxygen Reducing Layer, (2018)
2. U.S. Patent 9,598,644 Method of CO and/or CO2 hydrogenation to higher hydrocarbons using doped mixed metal oxides, (2017).
3. U. S. Patent 9,562,203 Methane-rich syngas production from hydrocarbon fuels using multi-functional catalyst/capture agent, (2017).
4. U.S. Patent 9,126,833 Process for continuous synthesis of mixed oxide powders, (2015).
5. U.S. Patent 8,486,301 Method for designing a reforming and/or combustion catalysts system, (2013).
6. U.S. Patent # 7,442,353 "Heat Recirculating Reformer for Fluid Stream Pollutant Removal, (2008).

SYNERGISTIC ACTIVITIES

- Editorial Board Member, "Catalysis Today", January 2006-2009.
- Distinguished Visiting Scientist, Oak Ridge National Laboratory, April 2002.
- Research Management Board Member, Army Core Technology Program (CTP) for Power Systems, June 2005 / 2006.

GREGORY G. HENTHORN

EDUCATION

West Virginia University, Morgantown, WV, Executive MBA (2003);

West Virginia University, Morgantown, WV, J.D. (2000)

West Virginia University, Morgantown, WV, B.S., Chemical Engineering (1995)

RESEARCH AND PROFESSIONAL EXPERIENCE

AmeriCarbon Products, LLC; VP of Corporate Development; Morgantown, WV; 2020-present; Focuses on commercial transactions; investor relations, capital attraction and management; business development with customers and collaborators; administrative and financial oversight.

West Virginia University; Associate Professor (Adjunct); Morgantown, WV; 2019-present; Energy Production and Operations (ENLM 220)

Flat Rock Energy; EVP of Business Development; Morgantown, WV; 2010-2020; Flat Rock is a private equity funded oil and gas exploration and production company that develops, funds, and implements drilling programs in the Appalachian Basin. Founder of company, securing more than $100 million in private equity funding; Negotiated commercial transactions with investors and other oil and gas operators.

Kinetic Clean Energy; Managing Partner; Morgantown, WV; 2007-2010; The company coordinated the origination, development, and finance of several methane-based renewable energy projects. Financed more than $50 million in renewable electric power facility construction projects; Organized facility to convert fleet vehicles to compressed natural gas; Assisted in the formation of a team to commercialize ethane-to-plastics technology.

Fourth Venture Group; Vice President; Morgantown, WV; 2000-2007; Fourth Venture was an angel capital and early stage venture capital firm that served as a launching pad for technology commercialization and economic development. Served as Chief Operating Officer for a 500,000-

member online portal that integrated with hundreds of brick-and-mortar merchants; Worked with DOE laboratories and NGOs to commercialize technologies developed in former Soviet military research institutes; Explored development of a liquefaction facility to convert coal to liquid transportation fuels; Co-founded an enterprise-class business-to-business software company that was focused on the surveying and construction sectors, from establishment of the business to its divestiture; Held executive management positions in two specialized manufacturing companies.

SELECTED PUBLICATIONS & PRESENTATIONS

- "New Business Opportunities in TransTech Energy Technologies", West Virginia Senate Economic Development Committee Meeting, West Virginia State Capitol, January 18, 2011.
- "Opportunities for the Coal Industry to Create Revenue from Carbon Offsets", 36th Annual West Virginia Mining Symposium, West Virginia Coal Association, Civic Center, Charleston, WV, February 18, 2009.
- Bai, Xingji and Henthorn, Greg. "13 Per Day." *Capacity Magazine* Spring (2007): 77-79. Print.

SYNERGISTIC ACTIVITIES

1. **TechConnectWV**, Charleston, WV; Member, Board of Directors, 2004-present; Member, Executive Committee, 2010-present. TechConnectWV is a non-profit, 501(c)(3) organization dedicated to the advancement of science, technology, and the innovation economy in West Virginia.
2. **West Virginia University**, under contract with Kinetic, 2012-2016; *Feasibilities of a Coal-Biomass to Liquids Plant in Southern West Virginia* (Award DE-FE0009997).
3. National Research Center for Coal & Energy, West Virginia University, Morgantown, WV; Consultant, Energy Efficiency Division, under contract with Kinetic, 2010-2011; *Supported establishment of initial TransTech Energy Conference.*
4. **West Virginia High Technology Consortium Foundation**, Fairmont, WV; Consultant, INNOVA Commercialization Group, 2010-2011; *Identification of technology commercialization and investment opportunities at NETL and WVU*

Art Lucas

Senior Principal Process Engineer

Summary

Mr. Lucas has more than twenty-two years of process design and research experience in the Chemical and Polymer industries. Responsibilities have included process engineer, research engineer and other roles.

Education

2000 B.S. Chemical Engineer, West Virginia Institute of Technology, Montgomery, WV

Experience

2023-Present Senior Principal Process Engineer, Worley, Charleston, WV

- Air Permitting & Emissions for Blue Ammonia Technology
- Proposal and Scope Work OSBL Blue Ammonia Technology
- Plastics Recycling Technology
- UniSim Modeling with OLI Software
- Worley Education Passports in Low Carbon Hydrogen, Ambition, Sustainability, Energy

2006-2023 Senior Research Engineer, MATRIC, South Charleston, WV

Technology development and deployment of various technologies at both laboratory and pilot scale as listed below.

- Batch polymerizations with novel technologies
- Liquid-Liquid Extractions
- Membrane technology and filtrations
- High Molecular weight polymerization
- Pyrolysis Technology
- Agitated filter drying and precipitations
- Adsorption Technologies
- Renewable Energy Technology
- Recycle Technology for various consumer products
- Chlorination reactions with shock sensitive byproducts
- Algae processing to make nutraceuticals

- Wiped Film evaporation and azeotropic distillations
- Slurry handling of both miscible and immiscible solutions.
- Solids handling of pseudoplastics and high viscosity polymers

Responsibilities included the following:

- Technical liaison with customers technical staff to develop scope of work, project execution plans and testing protocols.
- Developed all documentation for pilot scale operations. This included but not limited to, P&IDs, mass and energy balances, operating procedures, EHS, Safety assessments, emergency response and daily operational plans.
- Managed customer projects from concept to completing. A Dual role as Senior Research Engineer and Project Manager. Managed average capital expenditures of $500K to as excess of $1.5MM.
- Technical documentation for patent filing for successful technology for both the customer and internal research projects.
- Trained the operation workforce on the new technology deployments. This includes sample methodology as well as operation know how.
- Developed technology packages for renewable energies as part of the Renewable Fuel Standard.
- Worked with customer to mitigate risk for large scale fermentation to acid technology hurdles. Solutions were adopted and customer deployment commercial scale implementation in excess of $300MM.
- Developed and patented technology in Pyrolysis and Reverse Osmosis Membranes.
- Lead engineer for design and implementation of patented continuous biodiesel facility. Overseen technology transfer, prepared design and bid packages and orchestrated project implantation in a cradle to grave role. This also included writing all Standard Operation procedures an defining the safety and compliance issues for the facility.

2006 – 2006 Process Engineer, DuPont Chemical Company, Belle, WV

- Debottlenecking process by redeveloping process conditions.

Solid Handling and Material Transfer

Vacuum Operations

Slurry Transfer

Batch Processing

Blending and Conveying

- Responsible for all activities surrounding production metrics of the unit.
- Provided 24hr coverage for area of unit responsibility to provide direction as require for all production problems.
- Organized a process workflow system that directed the human interfaces with the process for optimal performance.
- Educated/Trained operations on critical paths for success and very instrumental in fostering a higher standard ow work practices of operational employees.
- Developed and implemented new process guidelines and control limits.
- Responsible for operational instructions for evening and night shift employees.

2001 – 2005 Project/Process Engineer, Sunoco Chemical – Kenova, WV

Extrusion Process

- Implemented Rheology technologies for improved process control.
- Project engineer for de-bottlenecking extrusion line.

Capital $1.75 MM

Designed and implemented Master Batch Additive System

- Rotating equipment

Twin Screw Extruders

Gear pumps

Blenders

Conveyors

Rotary valves

Pelletizers

Bulk material transfer

Gravity and pneumatic conveying systems

- Decreased off spec product by improving raw additive blend methods.
- Fully utilized new and existing PLC components for decreasing labor efforts along additive system.
- Orchestrated work efforts with hourly group to obtain new process workflow and procedure for new equipment.
- Preventative maintenance routines and monitoring for new equipment.
- Daily engineering support to production. Organized and developed "Best Practices" along extrusion line using root cause analysis.

300% increase in reliability

Increased first pass prime material from 93% to 98.2%.

Polymerization Process:

- Improved first stage reaction control by installing a refrigerated water/glycol system.
    - Twin screw and reciprocating compressor technology
- Operating Discipline Rollout member
- Spheripol Catalyst Technologies
- Provided engineering support to operations for high activity catalyst trials.
- Combined reaction kinetics and catalyst technologies to minimize byproduct formation.
- Decreased off-spec product by 50% by developing and implementing IMR models for online Rheology measurement.

Propylene Purification:

- Catalyst technologies for feedstock purifications
- Installed and commissioned first Nickel catalyst bed within Chemicals division ($100K capital).

Nolan L. Theaker

Senior Research Manager – Critical Minerals, Center for Process Engineering Research
University of North Dakota, Grand Forks, ND 58202

Education and Training

University of Louisville	Chemical Engineering	B.S. 2016
University of Louisville	Chemical Engineering	M.Eng. 2017
University of North Dakota	Chemical Engineering	Pursuing PhD

Research and Professional Experience

2017-Present Senior Research Manager, College of Engineering and Mines Research Institute.

Responsibilities include high-level innovative research and development of novel concepts for submission of funding proposals. Coordinated and led efforts associated with downstream rare earth element concentration operations that have resulted in the development of final process flow diagrams and process designs. Principle Investigator to $6.5M pilot-scale REE extraction and concentration project, as well as PI/Co-PI on 7 other proposals, managing up to $10M in total project funds involving pilot-scale design, construction, and operation; resource identification and quantification; engineering-scale economic and engineering analyses; and novel process development and commercialization. Key contributor/PI to multiple proposals involving REE/CM extraction and/or concentration from multiple, conventional and unconventional feedstocks. Proposed efforts associated with coal conversion and value improvement using chemical/thermal methods. Co-PI for project involving CO_2 utilization from coal-derived flue gases.

2016-2017 Research Assistant, University of Louisville Conn Center.

Research involved design and operation of multi-stage electrochemical reactor scheme for efficient production of fuels from CO_2. Developed nano-functionalized electrocatalysts for improvements in activity and selectivity for targeted reactions in two phase reaction systems. Implemented phase-segregation devices for multi-step electrochemical reaction system, with planned production cost below research benchmarks to date.

2014-2015 Co-op Engineer, University of Kentucky CAER.

Research involved improvement and operation of a DOE bench-scale CO_2 capture unit in multiple reaction conditions, including enzymatic and amine-based systems. Evaluation and comparison of catalyst performance in a holistic view for CO_2 capture was conducted, including novel organic and enzymatic catalysts. Implemented system changes for improved user functionality of the system, including development of control systems and equipment selection for easy manual usage.

Publications/Presentations

1. **Theaker, N.**, Strain, J. M., Kumar, B., Brian, J. P., Kumari, S., & Spurgeon, J. M. (2018). Heterogeneously Catalyzed Two-Ctep Cascade Electrochemical Reduction of CO_2 to Ethanol. *Electrochimica Acta, 274*, 1-8. doi:10.1016/j.electacta.

2. Park, D., Middleton, A., Smith, R., Laudal, D., **Theaker, N.**, Hsu-Kim, H., Jiao, Y. A Biosorption-based approach for the selective extraction of REEs from coal byproducts. *Separation and Purification Technology*. 2020.

3. Dong, Z; Deblonde, G; Middleton, A; Hu, D; Dohnalkova, A; Kovarik, L; Qafoku, O; Shutthanandan, S; Jin, H; Hsu-Kim, H; **Theaker, N**; Jiao, Y; Park, D. "Microbe Encapsulated Silica Gel Biosorbent for Selective Extraction of Scandium from Coal Byproducts." *Environmental Science and Technology.* 2021.
4. Mann, M; **Theaker, N**; Benson, S; Palo, D. "Investigation of Rare Earth Element Extraction from North Dakota Coal-Related Feedstocks – Final Report". Submitted March 31, 2020.
5. Mann, M., **Theaker, N.**, Ling, A., Haugen, C., Winburn, R., Brewer, J., Benson, S., Benson, A., James, D., Goven, G., Koenig, A, Srinivasachar, S. "Feasibility Study of a One Tonne per day Rare Earth Extraction and Concentration Plant from Low-Rank Coal Resources." Submitted January 28, 2022.
6. **Theaker, N.**, Rew, B., Laudal, D., Mann, M. Investigation of rare earth element extraction from North Dakota Coal-Related Feed Stocks. 2019 NETL Annual Crosscutting Projects Review Meeting. April 9th, 2019. Pittsburgh, PA.
7. **Theaker, N.** "Extraction of Rare Earth Elements from Lignite Coal – Kinetics of Extraction and Bench-Scale Updates." 2019 Annual Society of Mining Engineering" Presented February 2, 2019.
8. Zygarlicke, C; Folkedahl, B; Feole, I; Kurz, B; **Theaker, N**; Benson, S; Hower, J; Eble, C. "Rare-Earth Elements (REEs) in U.S. Coal-Based Resources: Sampling, Characterization, and Round-Robin Interlaboratory Study – Final Report". Submitted September 30th, 2019.
9. Gautam, M; Hofsommer, D. T; **Theaker, N**; Paxton, W. F; Grapperhaus, C. A; Spurgeon, J. M. "The effect of flue gas contaminants on electrochemical reduction of CO2 to methyl formate in a dual methanol/water electrolysis system." Chem Catalysis, 2022.
10. Spurgeon, J; **Theaker, N**; Phipps, C; Uttarwar, S; Grapperhaus, C. A. "A Comparative Technoeconomic Reduction of CO2 with Methanol to Produce Methyl Formate." ACS Sustainable Chemistry & Engineering, 2022.

Patents/Applications:

1. Theaker, Nolan; Laudal, Dan. 2020. Method for Leaching Rare Earth Elements and Critical Minerals from Organically Associated Materials. USA. 63/112,846A, filed Nov. 12, 2020.
2. Theaker, Nolan; Laudal, Dan; Lucky, Christine. 2020. Generation of Rare Earth Elements from Organically-Associated Leach Solutions. USA. 63/112,842A, filed Nov. 12, 2020.

Synergistic Activities

Mr. Theaker's principal area of research interest include energy, fuels, and alternative critical material research. These include developing alternative uses and sources of fuels and valuable materials, both carbon and mineral based, as well as developing new and unconventional sources of energy-critical materials.

*NAME Nicholas Anthony Dyrstad-Cincotta *Required fields

ORCID ID (Optional)

*POSITION TITLE Research Operations Manager

*PRIMARY ORGANIZATION & LOCATION University of North Dakota, Grand Forks, ND

***PROFESSIONAL PREPARATION - (see PAPPG Chapter II.D.2.h.i.a.3)**

PREVIOUS ORGANIZATION(S) & LOCATION(S)	DEGREE (if applicable)	RECEIPT DATE* (MM/YYYY)	FIELD OF STUDY
University of North Dakota, Grand Forks, ND	M. Sc	12/2018	Mechanical Engineering
University of North Dakota, Grand Forks, ND	B.A	05/2018	Mechanical Engineering
University of North Dakota, Grand Forks, ND	M.B.A	05/2022	Business

Note - For Fellowship applicants only, please include the start date of the Fellowship.

***APPOINTMENTS AND POSITIONS - (see PAPPG Chapter II.D.2.h.i.a.4)**

Start Date - End Date	Appointment or Position Title, Organization, and Location
2023-Present	Research Operations Manager, UND College of Engineering and Mines Research Institute(Formerly Institute for Energy Studies), Grand Forks, ND
2021-2023	Research Engineer, UND Institute for Energy Studies, Grand Forks, ND
2018-2021	Engineer, UND Institute for Energy Studies, Grand Forks, ND
2016-2018	Junior Engineer, UND Institute for Energy Studies, Grand Forks, ND
2015	Quality Engineering Co-op, United Technologies Corporation Aerospace Systems, Jamestown, ND
2013-2015	Research Assistant, UND Institute for Energy Studies, Grand Forks, ND

***PRODUCTS - (see PAPPG Chapter II.D.2.h.i.a.5) Products Most Closely Related to the Proposed Project**

Tomomewo, O. S., Dyrstad-Cincotta, N., Mann, D., Ellafi, A., Alamooti, M., Srinivasachar, S., & Nelson, T. (2020, September 18). Proposed Potential Mitigation of Wastewater Disposal Through Treated Produced Water in Bakken Formation. American Rock Mechanics Association.

Dyrstad-Cincotta, N. “Supercritical Treatment Technology for Water Purification.” North Dakota Energy Conference & Expo (NDECE), Grand Forks, ND. November 2019.

D., Mann, M., Srinivasachar, S., Dyrstad-Cincotta, N. “Supercritical Treatment Technology for Water Purification.” U.S. Department of Energy (DOE) Solar Energy Technologies Office (SETO) Concentrating Solar-Thermal Power (CSP) Program Summit 2019, Oakland, CA. March 2019.

Nasah, J., Jensen, B., Dyrstad-Cincotta, N., Gerber, J., Laudal, D., Mann, M., Srinivasachar, S. “Segregation of Unreacted Char from Oxygen Carriers During Chemical Looping Combustion.” 5th International Conference on Chemical Looping, 24-27 September 2018, Park City, Utah, USA.

Nasah, J., Gerber, J., Laudal, D., Mann, M., Srinivasachar, S., Dyrstad-Cincotta, N., Jensen, B. “Method for Separation of Coal Conversion Products from Oxygen Carriers.” Journal, International Journal of Greenhouse Gas Control. 2019.

Other Significant Products, Whether or Not Related to the Proposed Project (see PAPPG Chapter II.D.2.h.i.a.5)

RESEARCH AWARDS AND MAJOR PROJECT ACTIVITIES
Award: NDIC-R-046-056 - "Electrostatic Lubrication Filtration of Wind Turbine Oil Reservoirs" (2021-2024)

Award: NDIC-FY21-XCIV-233 - "Electrostatic Filtration of Large Lubricant Reservoirs" (2021-2023)

Project Activity: Key Personnel on DE-0031835 - "Rare Earth Element Extraction and Concentration at Pilot-Scale from North Dakota Coal-Related Feedstocks" (Ongoing)

***Synergistic Activities - (see PAPPG Chapter II.D.2.h.(i)(a)(6))**

Mr. Dyrstad-Cincotta principal areas of expertise are emissions control for advanced and traditional coal power generation and supercritical water treatment systems. He has specific expertise on fluid-bed based technology development, aiding in the development effort for all fluidized bed systems of the CLC group. He has experience in emissions monitoring at bench, pilot and field scale, and has performed multiple combustion-based testing for technology development or verification. More recently, he served as technical lead for the commisioning and operation of UND's Rare Earth Element Extraction pilot plant research project.

Other areas under which Mr. Dyrstad-Cincotta has been active include coal-based pollution measurement and control (sulfur oxides, aerosol formation and nitrogen oxides), underground coal gasification, coal beneficiation and natural gas processing. Mr. Dyrstad-Cincotta has several years’ experience in planning, executing and reporting of day-to-day activities associated with bench-scale and pilot-scale research programs. He is also currently the lead programmer for process control systems (PCS) in the College of Engineering and Mines Research Institute and has taken on the role of aiding the rest of the UND College of Engineering & Mines in their PCS design and programming efforts.

***Certification**:

When the individual signs the certification on behalf of themselves, they are certifying that the information is current, accurate, and complete. This includes, but is not limited to, information related to domestic and foreign appointments and positions. Misrepresentations and/or omissions may be subject to prosecution and liability pursuant to, but not limited to, 18 U.S.C. §§287, 1001, 1031 and 31 U.S.C. §§3729-3733 and 3802.

Signature (Please type out full name): Nicholas Anthony Dyrstad-Cincotta   Date: 11/20/2024

*NAME Xiaodong Hou

*Required fields

ORCID ID (Optional)

*POSITION TITLE Research Associate Professor

*PRIMARY ORGANIZATION & LOCATION University of North Dakota, Grand Forks, ND

***PROFESSIONAL PREPARATION - (see PAPPG Chapter II.D.2.h.i.a.3)**

PREVIOUS ORGANIZATION(S) & LOCATION(S)	DEGREE (if applicable)	RECEIPT DATE* (MM/YYYY)	FIELD OF STUDY
Shanghai Jiao Tong University	Ph.D.	07/2009	Polymer Chemistry and Physics
Shaanxi University of Science and Technology	M. Eng.	07/2005	Chemical Engineering
Shaanxi University of Science and Technology	B. Eng.	07/2002	Chemical Engineering

Note - For Fellowship applicants only, please include the start date of the Fellowship.

***APPOINTMENTS AND POSITIONS - (see PAPPG Chapter II.D.2.h.i.a.4)**

Start Date - End Date	Appointment or Position Title, Organization, and Location
2022-Present	Research Associate Professor, University of North Dakota CEM Research Institute, Grand Forks, ND, USA
2018-2022	Research Assistant Professor, University of North Dakota Institute for Energy Studies, Grand Forks, ND, USA
2014-2017	Analytic Chemist/Lecturer, University of North Dakota Institute for Energy Studies, Grand Forks, ND, USA
2013-2014	Interim Lab Director/Analytic Chemist, University of North Dakota Environmental Analytical and Research Laboratory, Grand Forks, ND, USA
2010-2013	Postdoctoral Researcher, University of North Dakota Chemistry Department, Grand Forks, ND, USA

***PRODUCTS - (see PAPPG Chapter II.D.2.h.i.a.5) Products Most Closely Related to the Proposed Project**

1. Xiaodong Hou. Battery Cathodes from Humic Acid. US Non-provisional Patent Application 20220123316, 17/558080.
2. Xiaodong Hou and Shuai Xu. Battery Anodes from Humic Acid. US Non-provisional Patent Application 20220115641, 7/558023.
3. Xiaodong Hou and Shuai Xu. Battery Materials and Fabrication Methods, PCT/US2021/044488, and US Provisional Application No. 63/124,487.
4. Pushparaj, R. I.; Hou, X.; Xu, S.; Zhang, X.; Abdelmalek, B.; Zhang, R., Coal-derived porous carbon anodes for Na-ion batteries. Renewable and Sustainable Energy 2024, 2 (1), DOI: 0.55092/rse2024000X
5. Zhang, X.; Pushparaja, R. I.; Mann, M.; Hou, X., Coal-Derived Graphene Foam and Micron-Sized Silicon Composite Anodes for Lithium-ion Batteries. Electrochimica Acta 2022, 434, 141329.
6. Xu, S.; Hou, X.; Wang, D.; Zuin, L.; Zhou, J.; Hou, Y.; Mann, M., Insights into the Effect of Heat Treatment and Carbon Coating on the Electrochemical Behaviors of SiO Anodes for Li-Ion Batteries. Advanced Energy Materials 2022, 12 (18).
7. Liu, X.; Han, J.; Hou, X.; Altincicek, F.; Oncel, N.; Pierce, D.; Wu, X.; Zhao, J. X., One-pot synthesis of graphene quantum dots using humic acid and its application for copper (II) ion detection. Journal of Materials Science 2021, 56 (8), 4991-5005.
8. Xu, S.; Zhou, J.; Wang, J.; Pathiranage, S.; Oncel, N.; Robert Ilango, P.; Zhang, X.; Mann, M.; Hou, X., In Situ Synthesis of Graphene-Coated Silicon Monoxide Anodes from Coal-Derived Humic Acid for High-Performance Lithium-Ion Batteries. Advanced Functional Materials 2021, 31 (32), 2101645.

Other Significant Products, Whether or Not Related to the Proposed Project (see PAPPG Chapter II.D.2.h.i.a.5)

9. Pushparaj, R. I.; Cakir, D.; Zhang, X.; Xu, S.; Mann, M.; Hou, X., Coal-Derived Graphene/MoS2 Heterostructure Electrodes for Li-Ion Batteries: Experiment and Simulation Study. ACS applied materials & interfaces 2021, 13 (50), 59950-59961.

10. Ilango, P. R.; Savariraj, A. D.; Huang, H.; Li, L.; Hu, G.; Wang, H.; Hou, X.; Kim, B. C.; Ramakrishnah, S.; Peng, S., Electrospun flexible nanofibers for batteries: design and application. Energy Environ. Rev 2023, 6, 12. Reagen, S.; Wu, Y.; Liu, X.; Shahni, R.; Bogenschuetz, J.; Wu, X.; Chu, Q. R.; Oncel, N.; Zhang, J.; Hou, X.;

11. Combs, C.; Vasquez, A.; Zhao, J. X., Synthesis of Highly Near-Infrared Fluorescent Graphene Quantum Dots Using Biomass-Derived Materials for In Vitro Cell Imaging and Metal Ion Detection. ACS applied materials & interfaces 2021, 13 (37), 43952-43962.

12. Hou, X.; Hou, Y.; Mann, M., Porous Silicon/Lignite-derived Graphene Composite Anodes for Lithium ion batteries. In 36th International Battery Seminar and Exhibition, Fort Lauderdale, FL, 2019.

13. Baker, J.; Xu, S.; Mann, J.; Dockter, A.; Hou, Y.; Mann, M.; Hou, X., Preparation of Lithium Ion Battery Cathode Composites Using Leonardite-Derived Humic Acid. In 2018 AIChE Annual Meeting, Pittsburg, PA, 2018.

***Synergistic Activities - (see PAPPG Chapter II.D.2.h.(i)(a)(6))**

• Principal Investigator: Dr. Hou is the technical group lead of battery research at CEM Research Institute, the major active projects include "Engineering Design and Feasibility Analysis for Commercial Graphite and Asphalt Manufacturing from Lignite-Derived Carbon Pitch (Subcontractor to AmeriCarbon LLC)", awarded $700,000 by NDIC Lignite Research Program, "Advanced Processing of Coal and Coal Waste to Produce Graphite for Fast-Charging Lithium Ion Battery Anode" awarded $1,000,000 (DE-FE0032139), and " Lignite-derived Carbon materials for Li-ion Battery Anode (DE-FE0031984)", awarded $500,000 by DOE NETL ACP program, "The Preparation of a High Capacity Graphene Modified Graphite /SiOx Anode Electrode Batteries", awarded $259,796 by a private cell manufacturer. "Porous Silicon/Lignite-Derived Graphene Composite Anodes for Li-Ion Batteries (DE-FE0026825/S000045)", awarded $369,581 by DOE UCFER. "New Battery Charing Technology", awarded $248,229 by NDIC Research ND program. "Advanced Lithium Batteries for Unmanned Aircraft Systems" $140,000 and "Lignite-Derived Graphene/Si Anode for Li-ion Battery" awarded $150,000 by UND VPR Post-Doctoral Program.

• Lab Director: Dr. Hou has served as the director/manager for the Advanced Materials Characterization Laboratory and Environmental Analytic Research Laboratory since 2014 and being lead the establishment of Advanced UAV and Satellite Materials Characterization laboratory.

• Industrial Collaboration: Dr. Hou has been working with multiple companies on battery R&D, including Packet Digital, and as a consultant at a local battery company Clean Republic from 2014 to 2017

• Invited Lecture & Presentations: He presents at multiple battery- and coal-relevant conferences.

• Graduate Faculty: Dr. Hou mentors one postdoc, four Ph.D. students, one M.S. graduate and several undergraduates on Coal-derived materials for Li-ion battery research.

***Certification**:

When the individual signs the certification on behalf of themselves, they are certifying that the information is current, accurate, and complete. This includes, but is not limited to, information related to domestic and foreign appointments and positions. Misrepresentations and/or omissions may be subject to prosecution and liability pursuant to, but not limited to, 18 U.S.C. §§287, 1001, 1031 and 31 U.S.C. §§3729-3733 and 3802.

Signature
(Please type out full name): Xiaodong Hou

Date: 11/20/2024

Dr. Daniel A. Laudal
daniel.laudal@und.edu / 701-777-5745
Executive Director | College of Engineering & Mines Research Institute (CEMRI)
Director | Center for Process Engineering Research Center (CPER)
University of North Dakota (UND)

Education and Training

University of North Dakota	Chemical Engineering	B.S.
University of North Dakota	Chemical Engineering	Ph.D.

Research and Professional Experience

2022-Present Executive Director and Research Professor, UND CEMRI

As Executive Director, leading the research division of the College of Engineering & Mines, with total external research expenditures of $20M/year, 80+ faculty and staff researchers, and research centers in AI, cybersecurity, water, infrastructure, materials, and process engineering. As Research Professor, technical expertise includes critical minerals, carbon products, carbon capture, utilization and storage, and advanced power generation systems. Research is focused on applied research and technology development with significant experience in process scale-up and techno-economic analyses.

2021-Present Director, UND CPER

Leading the Center for Process Engineering Research, a multidisciplinary research center focused on applied research and technology development in areas such as energy, mining/minerals, materials, chemicals/petrochemicals, environmental, and many other fields that require process engineering expertise. UND's CPER aims to drive innovation and facilitate the seamless transition of groundbreaking discoveries into practical real-world applications. As Director, leading a team of full-time dedicated faculty and staff researchers and managing resources towards effectively achieving CPER's goals: innovation to develop novel solutions; supporting small business and startups; conducting state of the art research; engaging industry partnerships; educating and training the workforce; and contributing to policy development.

2019-2021 Environmental Manager / Project Tundra Manager, Minnkota Power Coop.

Led the environmental regulatory compliance and environmental planning efforts for a generation & transmission cooperative serving eastern ND and northwestern MN. As Project Tundra Project Manager, led Minnkota's development of a $1.5B world-scale carbon capture and storage project for the Milton R. Young Station, a lignite coal fired power plant in ND. Responsibilities included leading development of the design, permitting and financing of the carbon capture plant and geologic storage facility.

2016-2018 Manager: Major Projects, UND Institute for Energy Studies (IES).

Primary roles included developing and writing funding proposals, managing research projects, coordinating IES research staff and students, and process design/development of innovative solutions to challenges in the energy industry. Principal Investigator or Project Manager or several DOE, State and industry funded projects. Research focused on the following major areas: carbon management for the power industry, production of co-products from coal and associated materials, value-added opportunities/technology development for North Dakota's energy industries.

2012-2015 Research Engineer, UND Institute for Energy Studies.
Lead researcher or principal investigator on several federal, state and industry funded projects. Work involved early-stage R&D of novel processes and technologies, primarily focusing on laboratory- and bench-scale demonstrations. Areas of focus included chemical looping combustion and post combustion carbon dioxide capture.

2008-2012 Research Engineer, UND Energy & Environmental Research Center.
Research involved design and operation of various lab and pilot-scale gasification, combustion and advanced power systems. Gained invaluable experience with high pressure and high temperature systems and fluidized beds.

2006-2008 Field Engineer, Schlumberger Oilfield Services.
Design, execution, and evaluation of well cementing operations in the Williston Basin.

Awards and Honors

Lignite Energy Council Distinguished Service Award – Research & Development: October, 2020 'In appreciation of your leadership during the engineering and design stages of Project Tundra.'

Selected Publications/Patents

Laudal, D., Benson, S. "Rare earth element extraction from coal." U.S. Patent No. 10,669,610. March 2017

Theaker, N., **Laudal, D.** "Method for leaching rare earth elements and critical minerals from organically associated materials." U.S. Patent No. 11,913,090. February 2024.

Theaker, N., **Laudal, D.,** Lucky, C. "Generation of rare earth elements from organically associated leach solutions." U.S. Patent No. 17/519,346. Filed May 2022.

Laudal, D., Benson, S., Addleman, S., Palo, D. "Leaching behavior of rare earth elements in Fort Union lignite coals of North America." International Journal of Coal Geology 191 (2018) 112-124.

Laudal, D., Benson, S., Addleman, S., Palo, D. "Rare earth elements in North Dakota lignite coal and lignite-related materials." ASME Journal of Energy Resources and Technology 140 (2018).

Park, D., Middleton, A., Smith, R., Deblonde, G., **Laudal, D.,** Theaker, N., Hsu-Kim, H., Jia, Y. "A biosorption-based approach for selective extraction of rare earth elements from coal byproducts." Separation and Purification Technology. Volume 241:116726. June 2020.

Bellal, A., Hou, X., Nasah, J., Van der Watt, J., **Laudal, D.**, Hoffman, J. 2024. Performance and economic viability assessment of a novel CO2 adsorbent for manufacturing and integration with coal power plants. *Chemical Engineering Journal, 498, 155604*

Van der Watt, J.G., **Laudal, D**., Krishnamoorthy, G., Feilen, H., Mann, M., Shallbetter, R., Nelson, T., Srinivasachar, S. "Development of a spouted bed reactor for chemical looping combustion." Journal of Energy Resources and Technology. 140(11), 112002 (8 pages), November 2018.

Nelson, T., van der Watt, J.G., **Laudal, D**., Feilen, H., Mann, H., Srinivasachar, S. "Reactive jet and cyclonic attrition analysis of ilmenite in chemical looping combustion systems." International Journal of Greenhouse Gas Control. Volume 91, December 2019, 102837.

Nasah, J., Jensen, B., Dyrstad-Cincotta, N., Gerber, J., **Laudal, D**., Mann, M., Srinivasachar, S. "Method for separation of coal conversion products from oxygen carriers." International Journal of Greenhouse Gas Control. Volume 88, September 2019, pages 361-370.

Synergistic Activities

- PhD Research focused on development of a novel technology to recover rare earth elements from lignite coal and was the foundation for UND's ongoing efforts related to REE/CM. https://commons.und.edu/theses/2123/.
- Original PI on Phase 2 of DE-FE0027006, the bench-scale demonstration of UND's lignite-based REE/CM technology.
- Current Project Director / Project Manager on DE-FE0032295, a FEED and business planning study geared towards commercializing UND's lignite-based REE/CM technology.
- While at Minnkota managed a $50M portfolio of DOE, State of ND, and investor funding supporting the development of Project Tundra.
- Served as a project advisor on UND's existing Phase 1 CORE-CM project on the Williston Basin

IDENTIFYING INFORMATION:

NAME: Benson, Alexander

POSITION TITLE: Chief Operating Officer

PRIMARY ORGANIZATION AND LOCATION: Microbeam Technologies Inc., Minnetonka, Minnesota, United States

Professional Preparation:

ORGANIZATION AND LOCATION	DEGREE (if applicable)	RECEIPT DATE	FIELD OF STUDY
University of St Thomas., St. Paul, Minnesota, United States	BS	12/2011	Mechanical Engineering

Appointments and Positions

2024 - present Chief Operating Officer, Microbeam Technologies Inc., Minnetonka, Minnesota, United States

2024 - 2024 Program Manager, Microbeam Technologies Inc., Minnetonka, Minnesota, United States

2019 - 2024 Sr. Project Manager, Microbeam Technologies Inc., Minnetonka, Minnesota, United States

2017 - 2019 Sr. Research Engineer (part-time), Microbeam Technologies Inc., Denver, Colorado, United States

2017 - 2019 Manufacturing Manager, Medtronic - Minimally Invasive Technology Group, Boulder, Colorado, United States

2016 - 2017 Sr. Product Engineer, Medtronic - Minimally Invasive Technology Group, Boulder, Colorado, United States

2015 - 2016 Sr. Manufacturing Engineer, Medtronic Energy and Component Center, Minneapolis, Minnesota, United States

2012 - 2015 Manufacturing Engineer, American Medical Systems, Minnetonka, Minnesota, United States

2007 - 2012 Lab Assistant (part-time), Microbeam Technologies Inc, Grand Forks, North Dakota, United States

Products

Products Most Closely Related to the Proposed Project

1. Fuka M, Kolb E, Benson A, Benson S., inventors. Microbeam Technologies, Inc., assignee. System And Method For Predicting Abundance Of Rare Earth Elements. United States of America 11,733,184 B2. 2023 August 22.
2. Benson A, Benson S, Kolb E, Fuka M. Development of Low-Cost Rare Earth Element Analysis and Sorting Methods. [revised 2021 January]. [Print]. 2017 July. Other: Contract No. FY18-LXXXIII-213
3. Benson SA, Benson AS., inventors. Microbeam Technologies Incorporated, assignee. System and Method for Producing Critical Minerals. United States of America 12,031,165 B2.

2024 July 07.

Other Significant Products, Whether or Not Related to the Proposed Project

1. Benson S, Patwardhan S, Stadem D, Langfeld J, Benson A, Desell T. Application of Condition Based Monitoring and Neural Networks to Predict the Impact of Ash Deposition on Plant Performance. Accepted for presentation at 28th International Conference on the Impact of Fuel Quality on Power Production and the Environment, 2022.; 2022.

Certification:

When the individual signs the certification on behalf of themselves, they are certifying that the information is current, accurate, and complete. This includes, but is not limited to, information related to domestic and foreign appointments and positions. Misrepresentations and/or omissions may be subject to prosecution and liability pursuant to, but not limited to, 18 U.S.C. §§ 287, 1001, 1031 and 31 U.S.C. §§ 3729-3733 and 3802.

Certified by Benson, Alexander in SciENcv on 2025-09-30 14:37:31

IDENTIFYING INFORMATION:

NAME: Benson, Steven

POSITION TITLE: President, sbenson@microbeam.com, 701-213-7070

PRIMARY ORGANIZATION AND LOCATION: Microbeam Technologies Incorporated , Grand Forks, North Dakota, United States

Professional Preparation:

ORGANIZATION AND LOCATION	DEGREE (if applicable)	RECEIPT DATE	FIELD OF STUDY
Pennsylvania State University, University Park, Pennsylvania, United States	PHD	05/1987	Fuel Science
Minnesota State University, Moorhead, Minnesota, United States	BS	07/1977	Chemistry

Appointments and Positions

1991 - present	President, sbenson@microbeam.com, 701-213-7070, Microbeam Technologies Incorporated , Grand Forks, North Dakota, United States
2015 - 2017	Associate Vice President for Research, Energy & Environmental Research Center, University of North Dakota, Grand Forks, North Dakota, United States
2010 - 2014	Chair Petroleum Engineer Department and Director Institute for Energy Studies, University of North Dakota, Grand Forks, North Dakota, United States
2008 - 2010	Professor, Chemical Engineering, University of North Dakota, Grand Forks, North Dakota, United States
1994 - 2008	Associate Director for Research/Senior Research Manager, Energy & Environmental Research Center, University of North Dakota, Grand Forks, North Dakota, United States
1986 - 1994	Senior Research Manager, Energy & Environmental Research Center, University of North Dakota, Grand Forks, North Dakota, United States
1984 - 1987	Graduate Research Assistant, Pennsylvania State University, University Park, Pennsylvania, United States
1983 - 1984	Research Supervisor, UND Energy Research Center, Grand Forks, North Dakota, United States
1977 - 1983	Research Chemist, ERDA and US DOE, Grand Forks Energy Technology Center, Grand Forks, North Dakota, United States

Products

Products Most Closely Related to the Proposed Project

1. Benson SA., Benson AS.. Systems and Method for Producing Critical Minerals. Patent No.: US 12,031,165 B2. 2024 July 07.

2. Fuka M, Kolb E, Benson A, Benson S. System and Method for Predicting the Presence of Rare Earth Elements. Patent No. US 11,733,184 B2. 2023 August 22.
3. Laudal D, Benson S. Rare Earth Extraction from Coal. US Patent US 10,669,610 B2. 2020 June 02.
4. Laudal DA, Benson SA, Addleman RS, Palo D. Leaching behavior of rare earth elements in Fort Union lignite coals of North America. International Journal of Coal Geology. 2018 April 15; 191:112.
5. Benson AS, Patwardhan S, Kolb E, Benson SA. Production of Germanium Concentrates from Coal Ash. SBIR Phase I - Topic Area #A244-055.. 2025 August 19.

Other Significant Products, Whether or Not Related to the Proposed Project

1. Lyu Z, Patwardhan S, Stadem D, Langfeld J, Benson S, Thoelke S, Desell T. Neuroevolution of recurrent neural networks for time series forecasting of coal-fired power plant operating parameters. The Genetic and Evolutionary Computation Conference (GECCO 2020). 2021 July 10.
2. Benson AS, Benson SA, Stadem D, Kolb E, Rew B, Morgan D. Development of Low-Cost Rare Earth Element Analysis and Sorting Methods. Final Report, ND Industrial Commission, Contract No. FY18-LXXXIII-213. 2021 January 01.
3. Laudal DA, Benson SA, Palo D, Addleman AS. Rare Earth Elements in North Dakota Lignite Coal and Lignite-Related Materials. ASME, J. Energy Resour. Technology. 2018 April 09; 140(6):062205.
4. Stadem D, Patwardhan S, Fuka M, Benson S. Condition Based Monitoring and Predicting Ash Behavior in Coal Fired Boilers - III - Coal Tracker Optimization. Pittsburgh Coal Conference. 2019 September.

Certification:

I certify that the information provided is current, accurate, and complete. This includes but is not limited to information related to domestic and foreign appointments and positions.

I also certify that, at the time of submission, I am not a party to a malign foreign talent recruitment program.

Misrepresentations and/or omissions may be subject to prosecution and liability pursuant to, but not limited to, 18 U.S.C. §§ 287, 1001, 1031 and 31 U.S.C. §§ 3729-3733 and 3802.

Certified by Benson, Steven in SciENcv on 2025-09-29 20:45:36

Industrial Commission

Tax Liability Statement

Applicant:

Ore Spring Materials, LLC
3001 Cityview Drive
Morgantown, WV 26501

Application Title:

The Forge Project: Rare Earths and Critical Materials Integration

Program:

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

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

Gregory G. Hatfield
Signature

Authorized Agent, Chief Business Officer
Title

Oct. 15, 2025
Date

North American COAL

October 14, 2025

AmeriCarbon Forge, LLC
c/o AmeriCarbon Enterprises, LLC
Attn: Mr. Greg Henthorn, Chief Business Officer
3001 Cityview Drive
Morgantown, WV 26501

Re: Support The Forge Project in North Dakota

Dear Mr. Henthorn:

North American Coal, LLC (NACoal) is pleased to express its support for the applications being submitted by AmeriCarbon Forge, LLC and Ore Spring Materials, LLC to the Clean Sustainable Energy Authority (CSEA) for The Forge Project and the associated Rare Earth and Critical Materials Integration Project. Both projects represent transformative opportunities to advance value-added lignite utilization and domestic manufacturing in North Dakota.

As the leading producer of lignite coal in North Dakota, NACoal remains committed to supporting innovation that utilizes North Dakota's lignite as a strategic resource for economic development and job creation. We recognize the importance of developing domestic sources of advanced carbon materials and critical minerals, particularly those essential to industrial, infrastructure, and defense applications.

Currently, NACoal is considering investing up to $6 million in the commercial facility to be constructed as part of The Forge Project. Any such capital investment will be contingent upon completion of due diligence, mutually satisfactory definitive agreements, final project financing structure, and approval by NACoal's Board of Directors.

In addition to our potential equity participation, NACoal expects to continue supporting the project through its affiliate The Falkirk Mining Company, which operates the Falkirk Mine in McLean County, North Dakota—the planned feedstock source for The Forge Project. We anticipate that the project will strengthen the long-term viability of lignite operations by expanding the economic uses of this resource beyond power generation.

NACoal also recognizes the strategic significance of the Rare Earth and Critical Materials Integration Project being advanced by Ore Spring Materials in collaboration with AmeriCarbon, the University of North Dakota, and Microbeam Technologies. The potential to recover rare earth elements and critical minerals from by-product ash streams produced by the Forge facility offers a compelling opportunity to establish an integrated value chain for critical materials within the state. NACoal views this integration as a valuable bolt-on to the Forge Project, enhancing North Dakota's leadership in critical mineral recovery and clean industrial innovation.

We are encouraged by AmeriCarbon's technical progress, the strength of its partnerships with the University of North Dakota and other institutions, and the alignment of these projects with the state's economic goals. NACoal looks forward to continuing its collaboration with AmeriCarbon and its affiliates as they move toward commercial implementation of these important initiatives in North Dakota.

Sincerely,

NORTH AMERICAN COAL, LLC

Carroll L Dewing

Carroll L. Dewing
Senior Vice President and Chief Operating Officer

RAINBOW
ENERGY CENTER

918 E Divide Ave
Bismarck, ND 58501
rainbowenergycenter.com

October 14, 2025

AmeriCarbon Forge, LLC
c/o AmeriCarbon Enterprises, LLC
Attn: Greg Henthorn, Chief Business Officer
3001 Cityview Drive
Morgantown, WV 26501

Subject: Support of The Forge Project

Dear Mr. Henthorn:

Rainbow Energy Center, LLC is pleased to convey its strong endorsement of **The Forge Project** being advanced by AmeriCarbon and NACCO Natural Resources. The project's proposed location, near our Coal Creek Station operations, presents a unique opportunity for local synergy, strategic partnership, and regional economic development.

Rainbow is proud to be part of the electrical generation system in North Dakota, owning Coal Creek Station and Nexus Line, LLC, to deliver reliable power across the region. As part of our core mission, we are committed to exploring and supporting innovative technologies and value-added industrial uses of regional resources.

We view The Forge Project as complementary to our operations and regional energy ecosystem. The facility's production of Eco-Pitch™ from North Dakota lignite coal — using AmeriCarbon's proprietary process — dovetails with the region's broader ambitions to harness natural resources, enhance domestic manufacturing capacity, and build resilience in strategic supply chains.

Rainbow is committed to working cooperatively with AmeriCarbon to explore beneficial collaborations, including possible coordinated infrastructure use (energy, utilities, transmission access). We believe The Forge Project offers meaningful benefit to the county and state through economic stimulus, job creation, and long-term strategic advantage in energy and materials sectors.

Rainbow also recognizes the alignment between The Forge Project and the complementary rare earth element (REE) integration initiatives being advanced by AmeriCarbon and its affiliates, as well as NACCO Natural Resources, the University of North Dakota, and Microbeam Technologies. These efforts reinforce one another and present a valuable opportunity to leverage shared infrastructure and regional expertise to support critical mineral recovery and high-value carbon production within North Dakota's energy corridor. Rainbow wishes AmeriCarbon success in securing the Clean Sustainable Energy Authority award and looks forward to being a constructive collaborator as the project progresses.

Sincerely,

Jessica K. Bell

Jessica K. Bell, Vice President External Affairs
Rainbow Energy Center, LLC

Cc: David Straley (NACCO Natural Resources)

Worley Group, Inc.
500 Lee Street East, Suite 1300
Charleston, WV 25301

October 14, 2025

AmeriCarbon Forge, LLC
c/o AmeriCarbon Enterprises, LLC
Attn: Mr. David A. Berry, Chief Executive Officer
3001 Cityview Drive
Morgantown, WV 26501

Subject: Letter of Support – CSEA Application for The Forge Project

Dear Mr. Berry:

Worley is pleased to express its support for AmeriCarbon Forge, LLC's application to the North Dakota Clean Sustainable Energy Authority (CSEA) for funding of The Forge Project—a first-of-its-kind commercial manufacturing facility for Eco-Pitch™, AmeriCarbon's patented coal tar pitch derived from North Dakota lignite coal. The Forge Project represents a critical step toward the domestic production of advanced carbon materials that support industrial, infrastructure, and defense applications across the United States.

As Worley continues to provide engineering and design services for the Forge Project, we remain confident in AmeriCarbon's progress toward commercial scale production. Upon completion of the FEL-3 engineering design package, Worley anticipates the opportunity to submit a proposal to AmeriCarbon for Detailed Engineering Design services and potential participation in later project phases as an EPC contractor or EPC-M provider, subject to mutual agreement and commercial terms. While these discussions remain preliminary, Worley looks forward to continuing its close technical collaboration with AmeriCarbon through future phases of project execution.

Worley is proud to support AmeriCarbon's commitment to innovation and to North Dakota's leadership in developing value-added energy products from lignite coal resources. We believe that The Forge Project, located near the Falkirk Mine in McLean County, represents an important milestone in advancing domestic carbon manufacturing and expanding the state's role in sustainable industrial development.

Respectfully,

DocuSigned by:
Daniel Noel
E7C06C9BF0F44A3...

Daniel L. Noel, P.E.
Project Manager
Worley Group, Inc.

VERTX PARTNERS
602 Virginia Street East Suite 202
Charleston, WV 25301
vertxpartners.org

Mr. Greg Henthorn
Chief Business Officer
AmeriCarbon Forge, LLC
c/o AmeriCarbon Enterprises, LLC
3001 Cityview Drive
Morgantown, WV 26501

14 Oct 2025

Dear Mr. Henthorn:

It is my pleasure to provide this letter of support for AmeriCarbon and its proposal to the North Dakota Clean Sustainable Energy Authority (CSEA) for The Forge Project, which will establish a first-of-its-kind commercial-scale manufacturing facility for Eco-Pitch™. This project is directly aligned with critical Department of Defense (DoD) and defense-industrial base objectives to secure a domestic supply of high-performance carbon materials essential to the nation's infrastructure, energy, and defense sectors.

As a retired U.S. Air Force Colonel and former Program Director and System Program Manager for the $66 billion F-22 Raptor stealth fighter program, I spent much of my career ensuring that America's most advanced air-dominance weapon system maintained technological superiority through secure and resilient supply chains. At Wright-Patterson Air Force Base, I led a 2,200-person government–industry enterprise responsible for every aspect of the program's lifecycle — including management, technology development, programming, planning and budgeting, contracting, risk management, airworthiness, and 24/7 customer support and sustainment of the entire operational F-22 fleet. That experience gave me firsthand insight into the critical importance of secure defense supply chains — and why projects like this one, which return essential materials manufacturing to U.S. soil, are vital to our national security.

Through the firm I founded, Vertx Partners, I have collaborated with AmeriCarbon for several years, helping the company connect with defense contractors, DoD officials, and technology transition offices. During that time, I have seen AmeriCarbon secure initial DoD funding and receive letters of interest and support from defense contractors, all validating a serious and well-documented need for a secure domestic source of coal-tar-pitch and related advanced carbon products. AmeriCarbon is now actively engaged with potential customers in materials validation programs—an essential step toward full qualification and adoption in mission-critical systems.

I fully support AmeriCarbon's efforts to advance The Forge Project, which will not only expand domestic carbon manufacturing but also create an anchor platform for integration with rare-earth-element recovery operations being developed by its affiliate, Ore Spring Materials, LLC—further strengthening the national materials supply chain.

I am confident that AmeriCarbon has the leadership, technology, and partnerships required to deliver on this vision and to provide tangible benefits to U.S. defense readiness and industrial resilience.

Respectfully,

Sean M. Frisbee, Colonel, USAF (ret)
President
sean.frisbee@vertxpartners.org
304-276-8999

UNIVERSITY OF NORTH DAKOTA

UND.edu

COLLEGE OF ENGINEERING & MINES

Office of the Dean
Upson II Room 165
243 Centennial Dr Stop 8155
Phone: 701.777.2180
Website: engineering.UND.edu

October 10, 2025

Gregory Henthorn
Chief Business Officer
Ore Spring Materials, LLC, c/o AmeriCarbon Enterprises, LLC

Re: Letter of Commitment in Support of the Proposal Entitled "The Forge Project: Rare Earths and Critical Materials Integration" submitted to the North Dakota Industrial Commission's Clean Sustainable Energy Authority

Dear Mr. Henthorn:

The University of North Dakota College of Engineering & Mines (UND-CEM) is pleased to express its intent to collaborate with Ore Spring Materials and AmeriCarbon on the above-referenced proposal submitted to the North Dakota Industrial Commission's Clean Sustainable Energy Authority (CSEA). This letter conveys UND's commitment to participate in the project as a subrecipient, contingent upon successful award and final negotiation of terms and budget.

UND's ongoing lignite-based rare earth element (REE) and critical mineral recovery program has established a strong foundation for producing upgraded lignite carbon ores (LCOs) and associated byproducts such as humins and humic acids. These materials present a unique opportunity to create high-value carbon products that complement AmeriCarbon's Eco-Pitch™ liquefaction process. This collaboration will allow both organizations to accelerate commercialization of value-added carbon materials while supporting North Dakota's goals for clean and sustainable energy development.

UND's Proposed Scope of Work

UND anticipates contributing to the project under three broad, integrated work areas:

1. Feedstock Evaluation

UND will evaluate and supply upgraded lignite from REE processing and humins from humic acid extraction for AmeriCarbon's liquefaction testing. Through iterative evaluation with AmeriCarbon, UND's bench- and pilot-scale work will include refining physical and chemical beneficiation methods to produce low-ash feedstocks and characterizing their suitability for high-quality pitch production. This effort will assess how the removal of organically associated inorganics influences liquefaction performance and pitch quality.

2. R&D on Premium, High-Purity Carbon Pathways

Building on UND's rare earth leaching and purification expertise, the team will investigate advanced demineralization and purification methods to produce ultra-high-purity carbon materials from both LCO feedstocks and liquefaction products. These studies will inform AmeriCarbon's ability to access premium markets for battery-grade graphite and other high-value carbon applications. UND will conduct bench-scale optimization and laboratory graphitization studies, including electrochemical evaluation of resulting graphite anodes using both coin and 18650-type cells.

3. Engineering and Techno-Economic Integration

UND will collaborate with AmeriCarbon and their engineering contractor on process integration and economic modeling for potential co-location of rare earth extraction and Eco-Pitch™ facilities. This work will leverage the engineering and costing frameworks developed under UND's prior DOE- and NDIC-supported front-end engineering design (FEED) studies, adapted to evaluate the combined technical and economic potential of an integrated REE recovery, pitch production, and synthetic graphite manufacturing system.

An indicative total budget of approximately **$800,000 over a 24-month period** is anticipated for UND's participation, subject to adjustment and negotiation upon award.

Project Benefits and Impact

The proposed collaboration will directly strengthen North Dakota's leadership in lignite innovation and critical minerals recovery by:

- Expanding the value proposition of UND's rare earth extraction platform through high-value carbon co-products;
- Enhancing AmeriCarbon's liquefaction process with feedstocks uniquely derived from lignite and humic materials, potentially improving operability, carbon yield and purity; and
- Demonstrating a pathway to integrated, high-purity carbon and critical mineral production that supports clean energy technologies and domestic supply chain resilience.

UND-CEM strongly supports this initiative and looks forward to working closely with the Ore Spring Materials team to advance these objectives. Please do not hesitate to contact me should additional information be required.

Sincerely,

DocuSigned by:
B19AB8472D964A9...

Ryan Adams, Ph.D.
Dean
College of Engineering & Mines
University of North Dakota
ryan.s.adams@und.edu

DocuSigned by:
Daniel Laudal
9CFF8579D0B9464...

Daniel Laudal, Ph.D.
Executive Director
College of Engineering & Mines Research Institute
University of North Dakota
daniel.laudal@und.edu

MICROBEAM
TECHNOLOGIES, INC.

www.microbeam.com

October 14, 2025

Ore Spring Materials, LLC
c/o AmeriCarbon Enterprises, LLC
Attn: Mr. Greg Henthorn, Chief Business Officer
3001 Cityview Drive
Morgantown, WV 26501

Dear Mr. Henthorn:

Microbeam Technologies, Inc. ("Microbeam") is pleased to express its intent to collaborate with Ore Spring Materials, LLC and AmeriCarbon Enterprises, LLC on The Forge Project: Rare Earths and Critical Materials Integration proposal being submitted to the North Dakota Industrial Commission's Clean Sustainable Energy Authority (CSEA). This letter conveys Microbeam's commitment to participate as a subrecipient, contingent upon successful award and final negotiation of terms and budget

Microbeam's proposed role in the project is to conduct applied research, testing, and analysis on concentrated ash and residue streams derived from AmeriCarbon's Eco-Pitch™ process, which converts lignite and related feedstocks into engineered carbon materials. The scope of work will include processing and characterization of rare earth elements (REE) and selected critical minerals (CM) (such as germanium, gallium and antimony)-contained in byproducts from pilot-scale production runs designed to simulate operations at the future Forge Project site.

Microbeam will apply its analytical, mineralogical, and chemical separation (pyrometallurgical and hydrometallurgical processing) expertise to determine REE-CM concentration, distribution, and recovery potential. Activities will include bench-scale testing, process simulation, and refinement of separation and upgrading methods to support development of an integrated REE-CM recovery system alongside AmeriCarbon's Eco-Pitch™ manufacturing operations.

An indicative total budget of $300,000 over a 24-month period is anticipated for Microbeam's participation, subject to adjustment and negotiation upon award. Microbeam is proud to support this collaborative effort, which aligns closely with our company's mission to advance practical, market-driven solutions for the valorization of North Dakota's lignite resources. The integration of REE-CM recovery with value-added carbon manufacturing represents a transformative step toward creating new industries, expanding domestic critical materials supply chains, and diversifying the state's energy economy.

As part of the engagement, Microbeam anticipates contributing $15,000 in cost share toward the project. This contribution may include a combination of cash and in-kind support such as personnel time, laboratory resources, and analytical services. The final structure of this contribution will be confirmed during project contract negotiations and is contingent upon award of funding and mutually agreed terms among the project participants.

We look forward to contributing our expertise and to continuing our productive partnership with Ore Spring Materials, AmeriCarbon, and the University of North Dakota.

Sincerely,

Dr. Steven Benson, President
Microbeam Technologies, Inc.

Shipping: 4200 James Ray Drive, Ste. 193, Grand Forks, ND 58202-6090
Mailing: PO Box 5, Victoria, MN 55386-0005
Phone: 701-757-6200
Fax: 701-738-4899
info@microbeam.com

A Family Of Companies - CHARLESTON, W.V. -

DICKINSON GROUP

October 14, 2025

Mr. Greg Henthorn
Chief Business Officer
AmeriCarbon Forge, LLC
3001 Cityview Drive
Morgantown, WV 26501

Dear Mr. Henthorn:

I am writing in support of your application to the North Dakota Clean Sustainable Energy Authority (CSEA) for **The Forge Project**, which proposes the construction of a commercial-scale manufacturing facility for Eco-Pitch™. The Forge Project represents a major step forward in establishing domestic manufacturing capacity for advanced carbon materials that will serve critical roles in industrial, infrastructure, and defense applications.

The Dickinson Group is a family-office private-equity investment firm based in Charleston, West Virginia. The Dickinson family has been part of the Kanawha Valley community for more than 200 years. We maintain substantial holdings in natural resources, real estate, and energy, and we draw upon our multi-generational experience and values to help capitalize and grow innovative and sustainable businesses that impact strategic domestic supply chains.

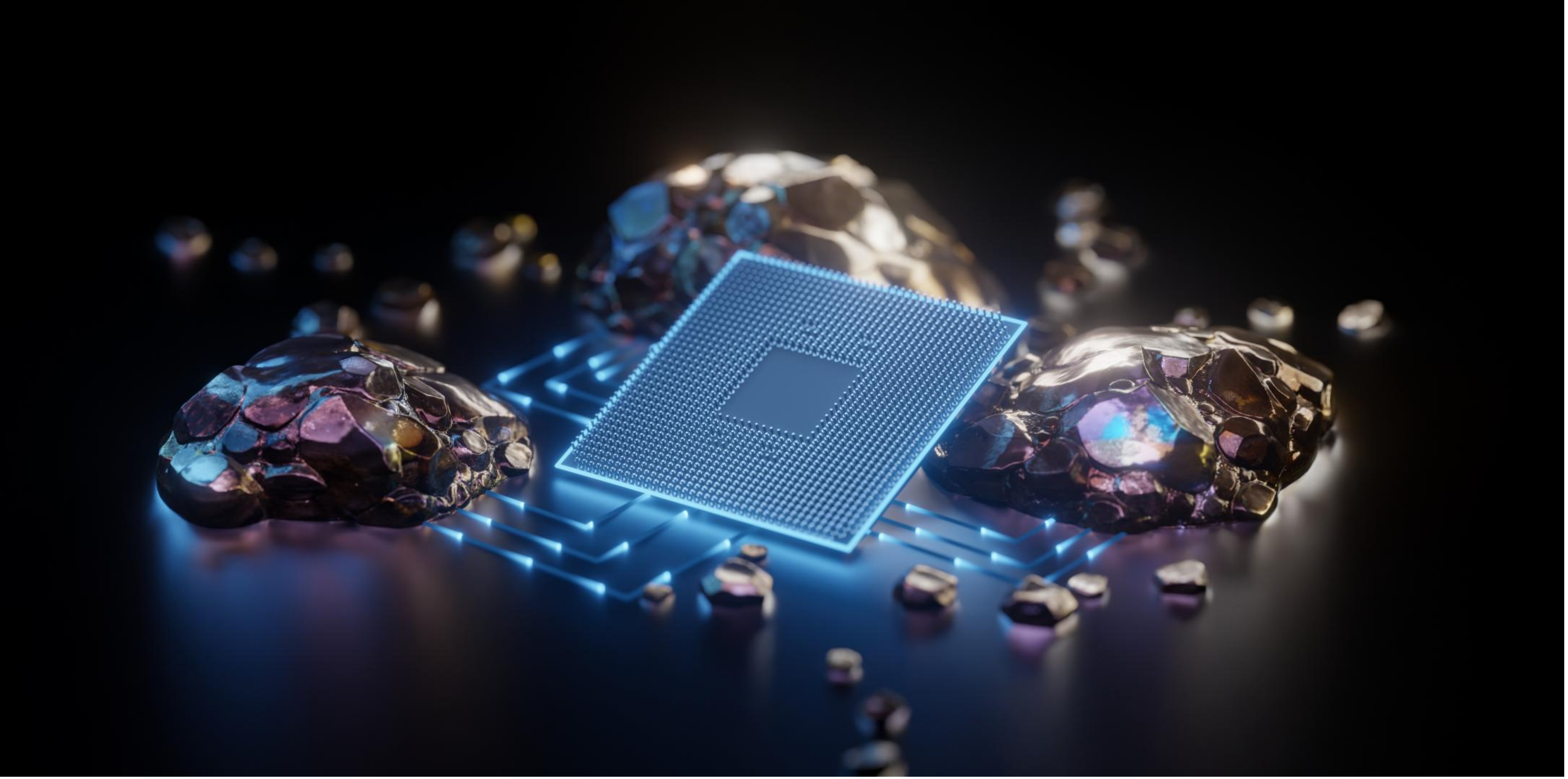
We share North Dakota's vision to create value-added industries that utilize lignite coal for high-technology applications. AmeriCarbon's Eco-Pitch™ process exemplifies this opportunity—transforming a regional natural resource into a high-value engineered carbon material through an innovative and environmentally responsible process. We also recognize the longer-term opportunity to integrate rare-earth-element (REE) recovery from by-product ash at the Forge facility, in coordination with AmeriCarbon's affiliate, Ore Spring Materials, LLC. This complementary effort could further strengthen the project's impact on U.S. supply-chain security and resource recovery.

The Dickinson Group believes we can support this project in a number of ways, including potential capital investment in AmeriCarbon Forge, LLC to support your cost-share commitment. Any capital investment will, of course, be subject to customary due diligence and approval by our investment board. As you know, our family of companies and partners have already demonstrated our commitment to AmeriCarbon's success, having made a seven-figure investment in AmeriCarbon and its affiliates to date.

We are encouraged by AmeriCarbon's progress and confident that The Forge Project in North Dakota will help establish a strong foundation for domestic critical materials production. We look forward to continuing our relationship with AmeriCarbon as you advance this transformative project.

Sincerely,

Steve Platz
President & CEO



THE FORGE PROJECT

RARE EARTHS AND CRITICAL MATERIALS INTEGRATION

JANUARY 29, 2026 – BISMARCK, NORTH DAKOTA

ORESPRING

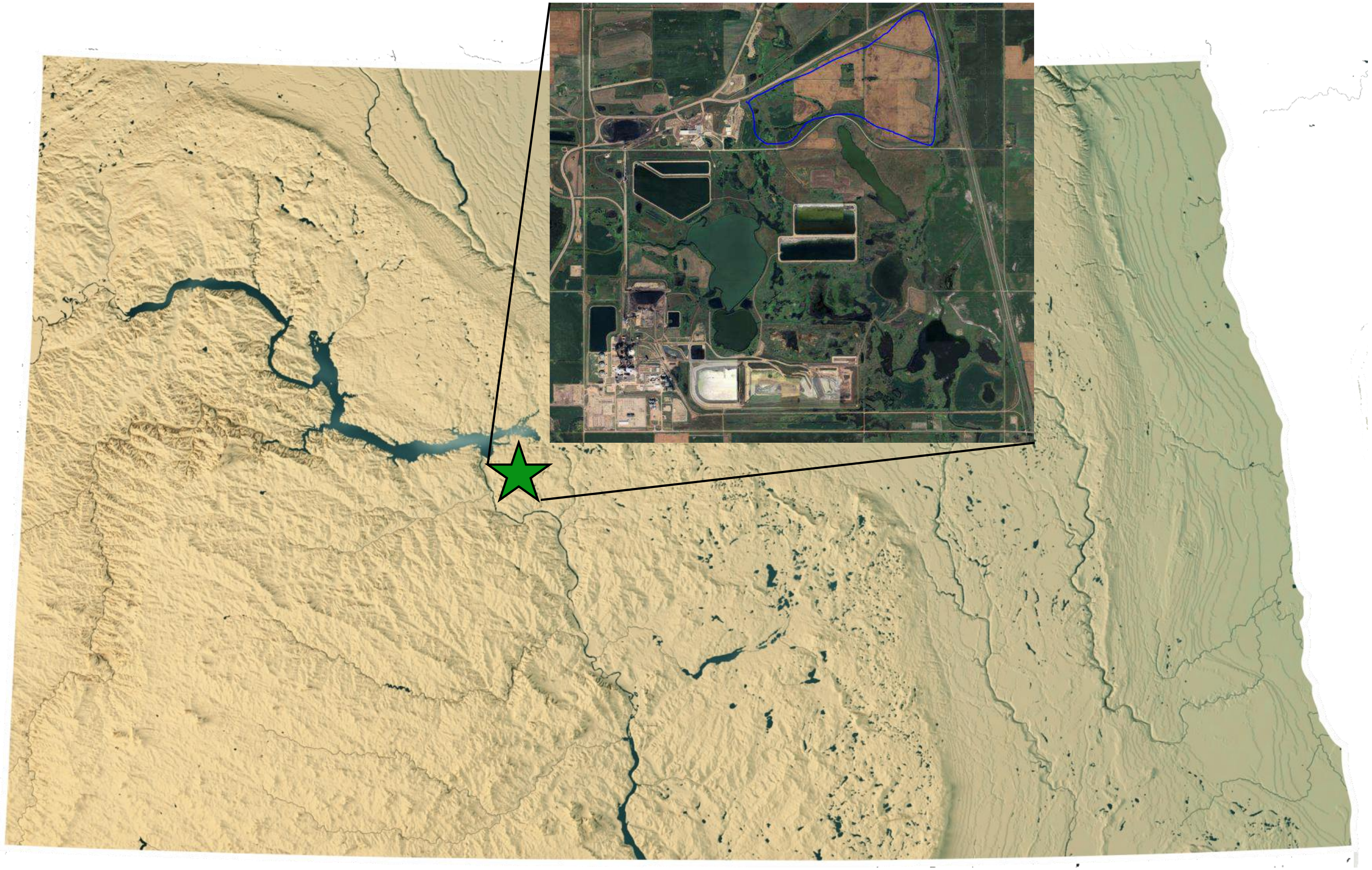
PROJECT AND VISION

FORGE PROJECT VISION

MCLEAN COUNTY, NORTH DAKOTA

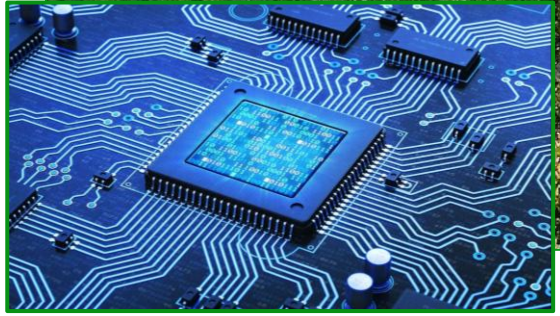
The **Forge Project** is being developed as a **next-generation industrial platform** that redefines how North Dakota's lignite resources are used—diversifying beyond combustion to produce advanced carbon materials and critical minerals essential to modern infrastructure, clean & sustainable energy, and national defense.

Over time, the Forge Project is envisioned as an **integrated ecosystem** linking coal mining, power generation, carbon pitch manufacturing, rare earth element recovery, and critical-materials processing within a single, co-located operating footprint—creating a scalable, high-value manufacturing hub built around North Dakota resources.



PROBLEM TO BE ADDRESSED

REDUCING RELIANCE ON FOREIGN SOURCES FOR CRITICAL MATERIALS



<u>This project addresses two overlapping issues:</u>

- ✓ U.S. dependence on foreign carbon materials + critical minerals
- ✓ Disconnected technology silos (carbon, REEs, Ge/Ga)

<u>What this project does:</u>

Integrates **three demonstrated pilot-scale technologies** into a complementary platform

<u>What CSEA funding unlocks:</u>

Decision-grade data → commercial deployment readiness

This project **reduces uncertainty**, enabling much larger downstream investments.

SUMMARY OF NEED

- ❖ Critical minerals (REEs, Ge, Ga): geopolitically constrained supply
- ❖ Carbon materials (pitch, graphite precursors): import-dependent
- ❖ North Dakota lignite: abundant potential for advanced manufacturing
- ❖ Gap: no integrated carbon + critical-materials manufacturing platform

This project reduces uncertainty, enabling much larger downstream investments.

ORE SPRING'S CSEA PROPOSAL

AT A GLANCE

Project Title
Rare Earths and Critical Materials Integration

Long Term Vision
The Forge Project is a phased, integrated industrial initiative designed to develop a co-located ecosystem for coal mining, power generation, carbon pitch manufacturing, rare earth element recovery, and critical-mineral production in North Dakota.

Proposed Project Duration
24 months (CSEA integration and risk-reduction phase)

Project Cost
$4.5 million total project cost
- $2.25 million – CSEA grant request
- $2.25 million – Matching funds (cash and in-kind)

Future phases are planned to scale this integrated platform toward commercial demonstration and full industrial deployment.

This project is the integration step that converts pilot-scale technologies into commercially fundable industrial systems.

Applicant
Ore Spring Materials, LLC (applicant)

Project Team
AmeriCarbon Products, LLC
University of North Dakota
Microbeam Technologies, Inc.
Worley Group (engineering & integration)

Industry Support
NACCO Industries
The North American Coal Corporation
Falkirk Mining Company
Rainbow Energy Center

UNIQUE PROPERTIES OF LIGNITE

EXCELLENT SOURCE FOR CARBON AND REES

Lignite has unique properties

- ✓ Higher moisture content
- ✓ Higher oxygen content
- ✓ Lower carbon content
- ✓ Lower heating value
- ✓ Higher volatiles
- ✓ **Large fraction of inorganic content bound in organic form**

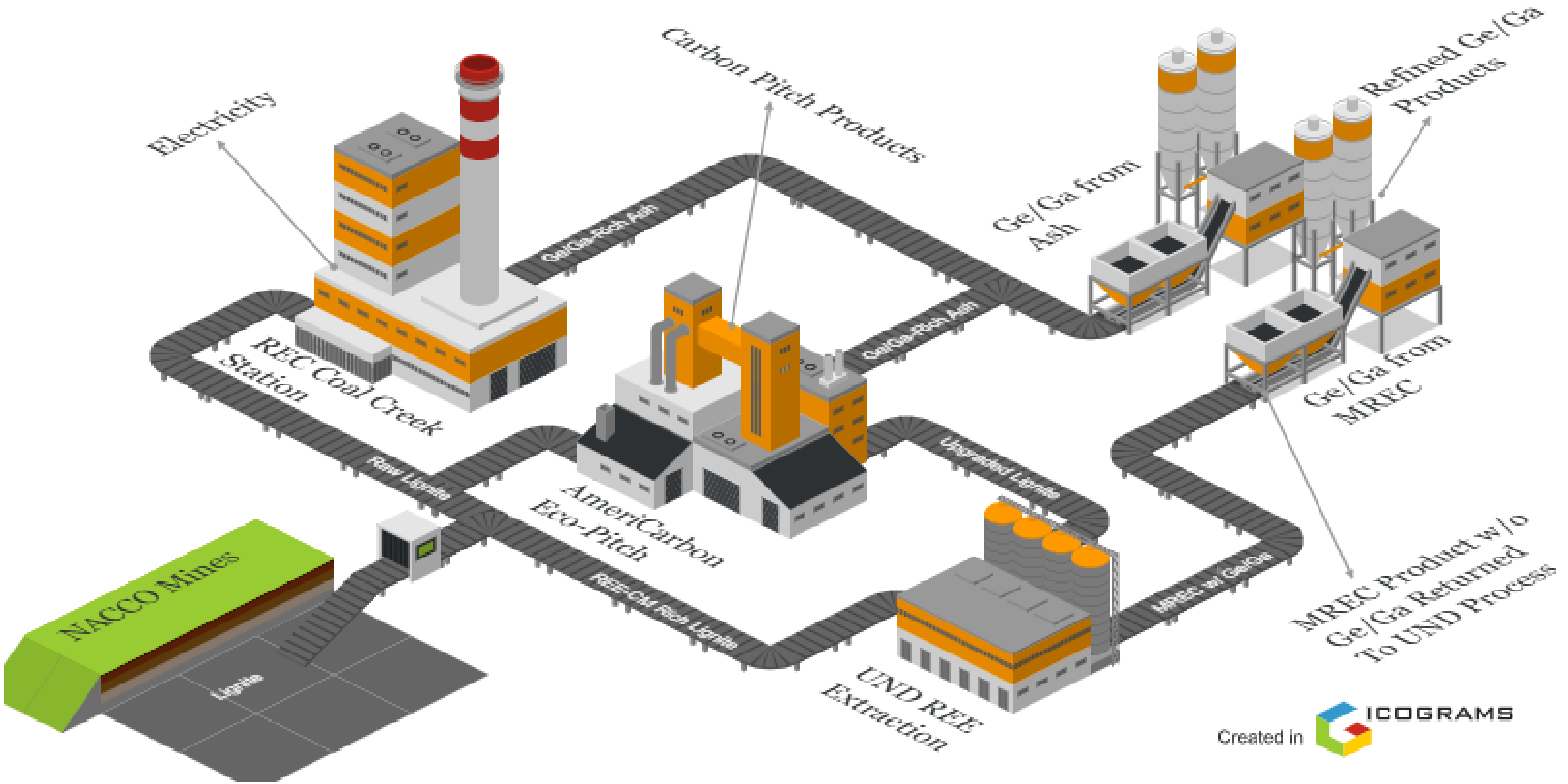
Advantage: Many high-value metals, like the rare earths, are organically bound and far easier to extract

Advantage: Easy-to-extract organic bound metals means production of high-purity carbon materials is made easier

Lignite's chemistry is not a liability—it is the enabling feature.

LIGNITE-BASED INDUSTRIAL PLATFORM

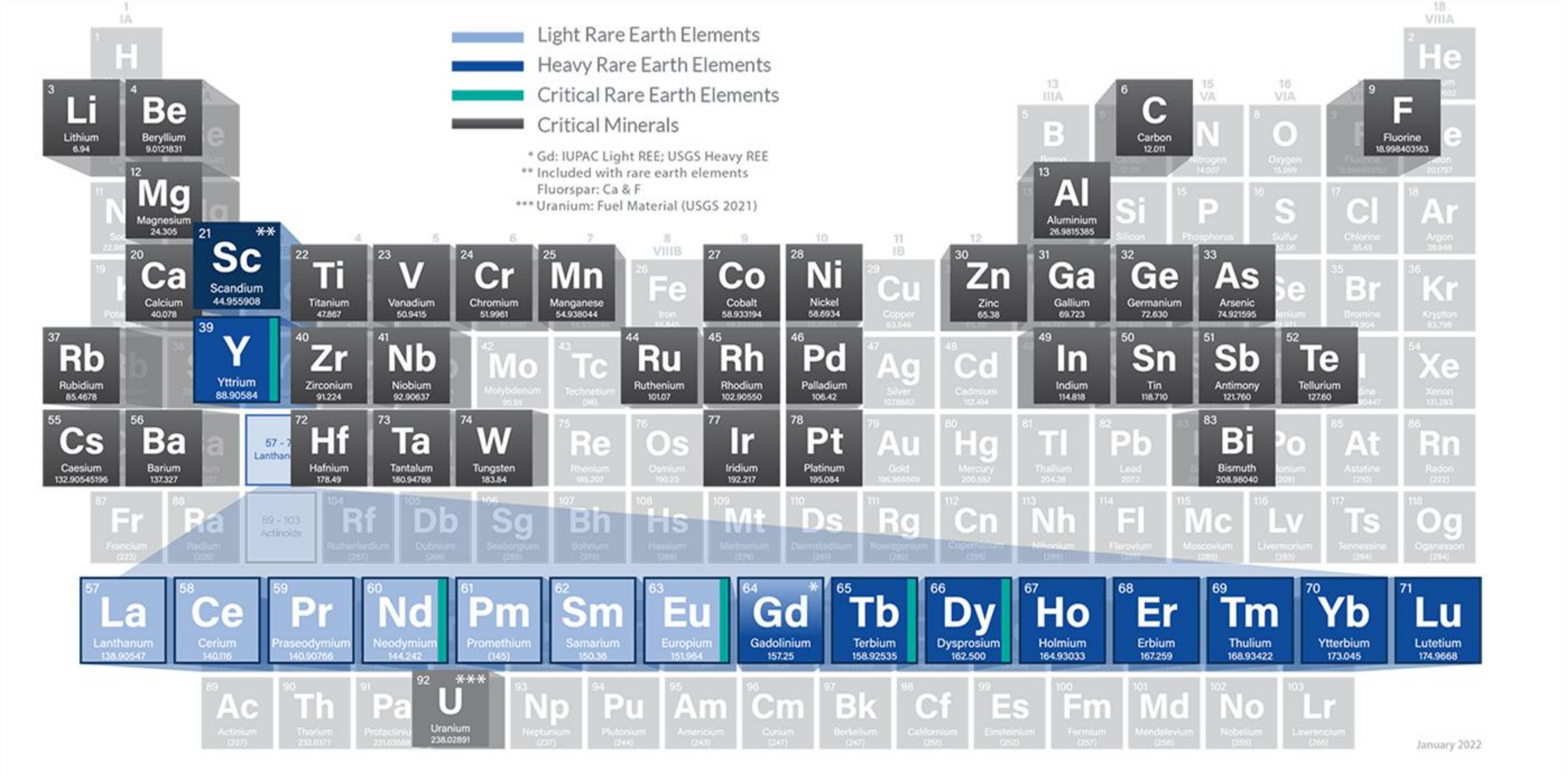
COAL TO ELECTRICITY, CARBON MATERIALS, AND RARE EARTH ELEMENTS



MARKETS

REEs, CARBON, AND CRITICAL MINERALS

GENERALLY, NOT FOUND TOGETHER NATURALLY



Most REE mines are rich in light REEs, while heavy REEs are much rarer. In contrast, the identified lignite coal seams have higher concentrations of heavy REEs, which are generally scarcer and more valuable.

REEs, CARBON, AND CRITICAL MINERALS

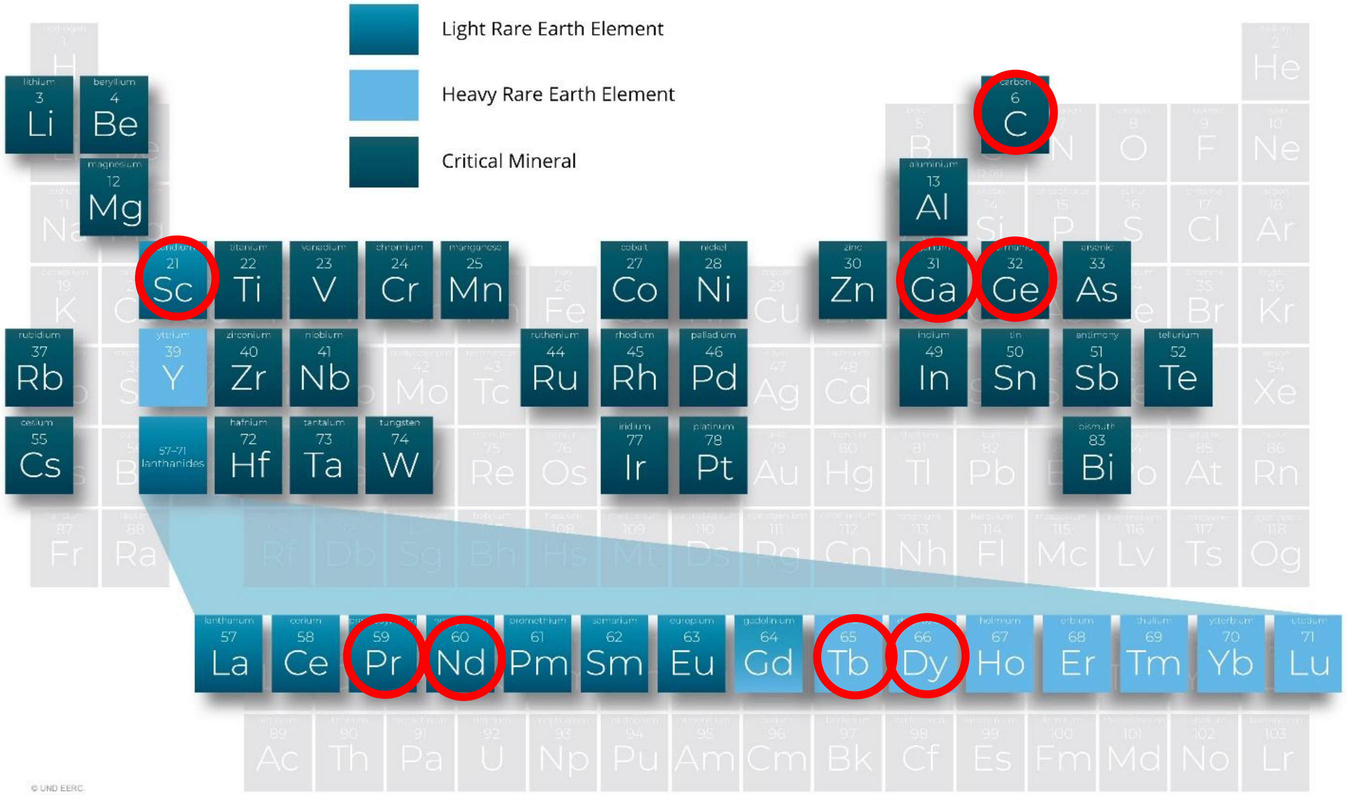
Defense & Aerospace

Energy Systems

Critical Minerals

Electronics & Computing

Advanced Manufacturing



Primary economic drivers for project technology

ORESPRING

GALLIUM & GERMANIUM

STRATEGIC MATERIALS

Gallium

Semiconductors

LEDs

Solar panels

Pressure sensors

Mobile phones

Alloying agent

High temperature thermometers, barometers

Medical applications

Nuclear medicine – look for inflammation, infection, cancer

Germanium

Solid state electronics

Semiconductors

Fiber optics

Optics lenses

Fluorescent lighting

Infrared applications

Thermal imaging

Alloying agent

Catalyst for plastics

ORESPRING

Our near-term critical-materials focus is on **germanium** and **gallium** because they present the strongest combination of supply risk, market value, and technical compatibility with coal-derived by-products. REEs—particularly **heavy REEs**—represent an additional, selective value stream, while carbon products provide the economic backbone that enables the integrated system.

GALLIUM & GERMANIUM

CRITICAL DEFENSE AND STRATEGIC APPLICATIONS

Germanium is critical to many defense and civilian applications

- Defense
  - Optics/Night Vision – soldier, tanks, planes
  - Semiconductors – solar cells for satellites
- Civilian
  - LEDs
  - Fiber Optics
  - Solar Cells
  - Semiconductors

No domestic production of Ge

- Primarily imported from China
  - China has put export controls in place
- Historically produced from zinc byproducts or coal ash (not domestically)

Domestic supply is extremely low – discussions around need to go to national reserves

GERMANIUM MARKETS

SIGNIFICANT OPPORTUNITY

	Sector	Annual Market	Justification
TAM	Defense	$45M	US defense market is at least 38,000 kg of Ge metal and dioxide at $1,300/kg for metal and $880/kg for dioxide with a 3.85% CAGR
	Commercial	$169M	Global market is roughly 130,000 kg/yr at average price of $1,300/kg for applications like fiber-optic components, photovoltaics, and specialty electronics
SAM	Defense	$10-15M	The US DoD's R&D, procurement and prototyping budgets for Ge-based optics and electronics – covering SBIR, OTA, and pilot-scale efforts in thermal imaging and space-based sensor systems – are estimated at $50-70M over the next 5 years
	Commercial	$8-12M	The key commercial segments account for an estimated $40-60M in serviceable opportunities for high-purity Ge feedstock
SOM	Defense	$8-12M	MTI could realistically capture $40-60M of the market over 5 years through Phase III SBIR transitions, pilot deployments, and direct supply agreements with partners in the Ge supply chain.
	Commercial	$3-5M	Through licensing this technology to commercial refiners and offtake partners, MTI could access an additional $3-5M per year in revenues by Year 5 through technology fees and materials sales.

TAM – total addressable market
SAM – serviceable available market
SOM – serviceable obtainable market

These are very conservative estimates – this used a price of $1,300/kg for Ge metal, but it is currently at $4,945/kg according to scrapmonster.com

GALLIUM MARKETS

SIGNIFICANT OPPORTUNITY

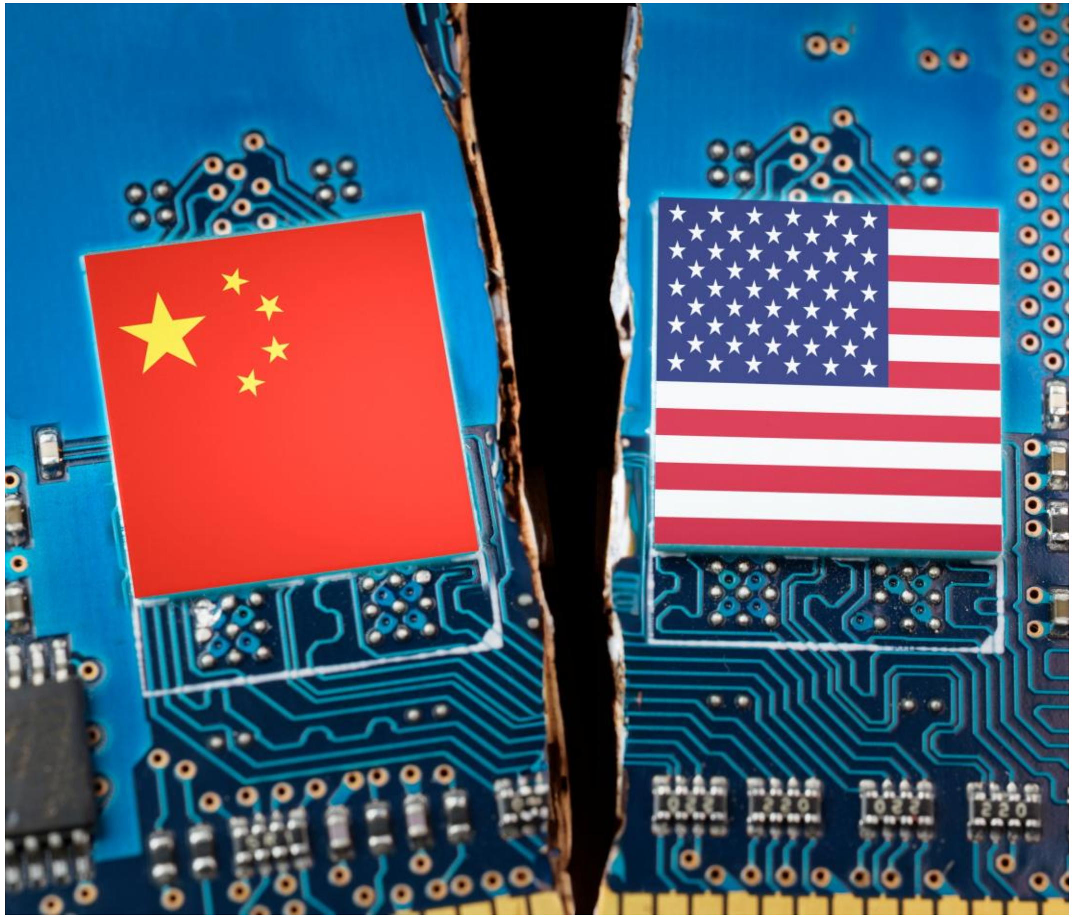
Strategic Problem: U.S. relies 100% on imported gallium; China controls 99% of global low-purity Ga

Market Pull: Ga-critical sectors (semiconductors, defense, aerospace) driving growth to $2.54B by 2034.

Microbeam Solution: Pyrometallurgical recovery of Ga from coal ash—U.S. resource with elevated Ga levels.

Impact: Creates resilient domestic supply and supports defense systems (GPS, radar, missiles).

Advantage: Coal-derived Ga is abundant, domestic, and bypasses global export constraints.



GALLIUM & GERMANIUM CONSUMPTION

ENABLING MATERIALS FOR STRATEGIC MARKETS

Gallium

U.S. Consumption

- Metal: 12,000 kg/yr (2022)
- GaAs Wafers: 550,000 kg/yr (2022)

U.S. reliant on 100% of consumption

Importation

- China 53%
- Germany 13%
- Japan 13%
- Ukraine 5%
- Other 16%

Germanium

U.S. Consumption

- 30,000 kg/yr (metal & GeO2)

U.S. reliant on >50% of consumption

Importation

- China 54%
- Belgium 27%
- Germany 9%
- Russia 8%
- Other 2%

U.S. Geological Survey. (2023, January). *Germanium - USGS Publications Warehouse*. Germanium, Mineral Commodity Summaries, January 2023. https://pubs.usgs.gov/periodicals/mcs2023/mcs2023-germanium.pdf

U.S. Geological Survey. (2023, January). *Gallium - USGS Publications Warehouse*. Gallium, Mineral Commodity Summaries. https://pubs.usgs.gov/periodicals/mcs2023/mcs2023-gallium.pdf

REE MARKETS

AUGMENTING PROJECTED REVENUE FROM GALLIUM & GERMANIUM

- Magnets and Sc are important focus, with a current spot price of:
  - Nd/Pr oxides - ~$60/kg
  - Dy oxide - ~$300/kg
  - Tb oxide - ~$1,200/kg
  - Sc metal - ~$4,000/kg
  - All magnets are expected to rise, especially with trade instability, and floor prices might be an option given below. Sc could fall, but a price floor of ~$1,000-2,000/kg metal ($500-800/kg oxide) before a larger market (aerospace) is believed to exist
- MP Materials' floor price given by DoD on NdPr is $110, almost 100% additional over current spot

- Major US competitor – MP Materials (Mt. Pass resource)
  - Extremely light-REE rich (combined Dy and Tb concentration in REEs <0.04%)
  - Refining facility planned to not refine Sm-Lu oxides, due to complete lack of total content in Mt. Pass resource
- Other sources – Bear Lodge (WY), Haleck Creek (WY)
  - Both extremely LREE-rich as well, with combined Dy+Tb concentration below 0.05%
- Lignite-based REEs estimated to have Dy+Tb content of >5% on REE basis, allowing equivalent production rates to larger facilities at magnitudes lower processing volumes
  - Supports smaller-scale carbon processing to match with REE products

ORESPRING

OFFTAKE OPPORTUNITIES

REES AND HUMIC ACID

REEs

Rare Earth Salts LLC has expressed “all REEs produced from lignite at a 1 MTPD facility could be immediately sold into their offtake markets”

- MP Materials also hungry for HREE-rich concentrate – can market to their new magnet facility as a planned off-take
- UND has ties with other refiners (U-CORE, Phoenix Tailings, Canadian efforts) to ensure lignite-based products are fully monetized at the best prices
  - Unique lignite-produced products offer benefits over conventional REE concentrates in both REE distribution and lack appreciable quantities of any costly diluents

Ge and Ga offtake options into the defense and energy sectors can support long-term revenue forecasting, along with potential DoD interest in the REE space

Humic Acid

Global Market of ~$1.5-2B, with an immense CAGR of 12-18% depending on sources

- Tied primarily to the growth in organic produce and farming, as HA can take place of synthetic fertilizers

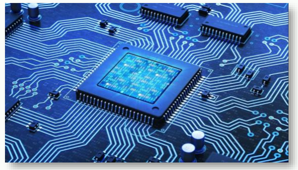
North American market shows a current price of $1,200-$2,000 per ton, given grade

- High chance REE-extracted humic acids will experience a high price due to premium benefits

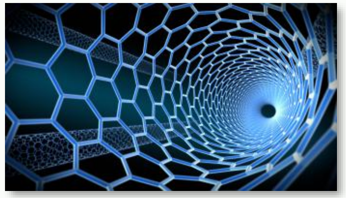
CARBON PRODUCT MARKETS

COMMERCIAL

Electric Arc Furnace Electrodes


Computer Chips


Carbon Fibers


Graphene Nano Tubes

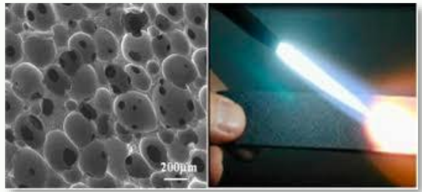

Carbon Foams


Automobiles


Batteries / Energy Storage

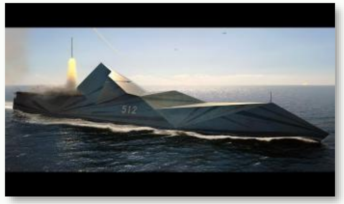
DEFENSE


Lightweight Personnel Armor


Conductive/Insulating Foams


Radar Absorbing Planes


Rocket Tiles

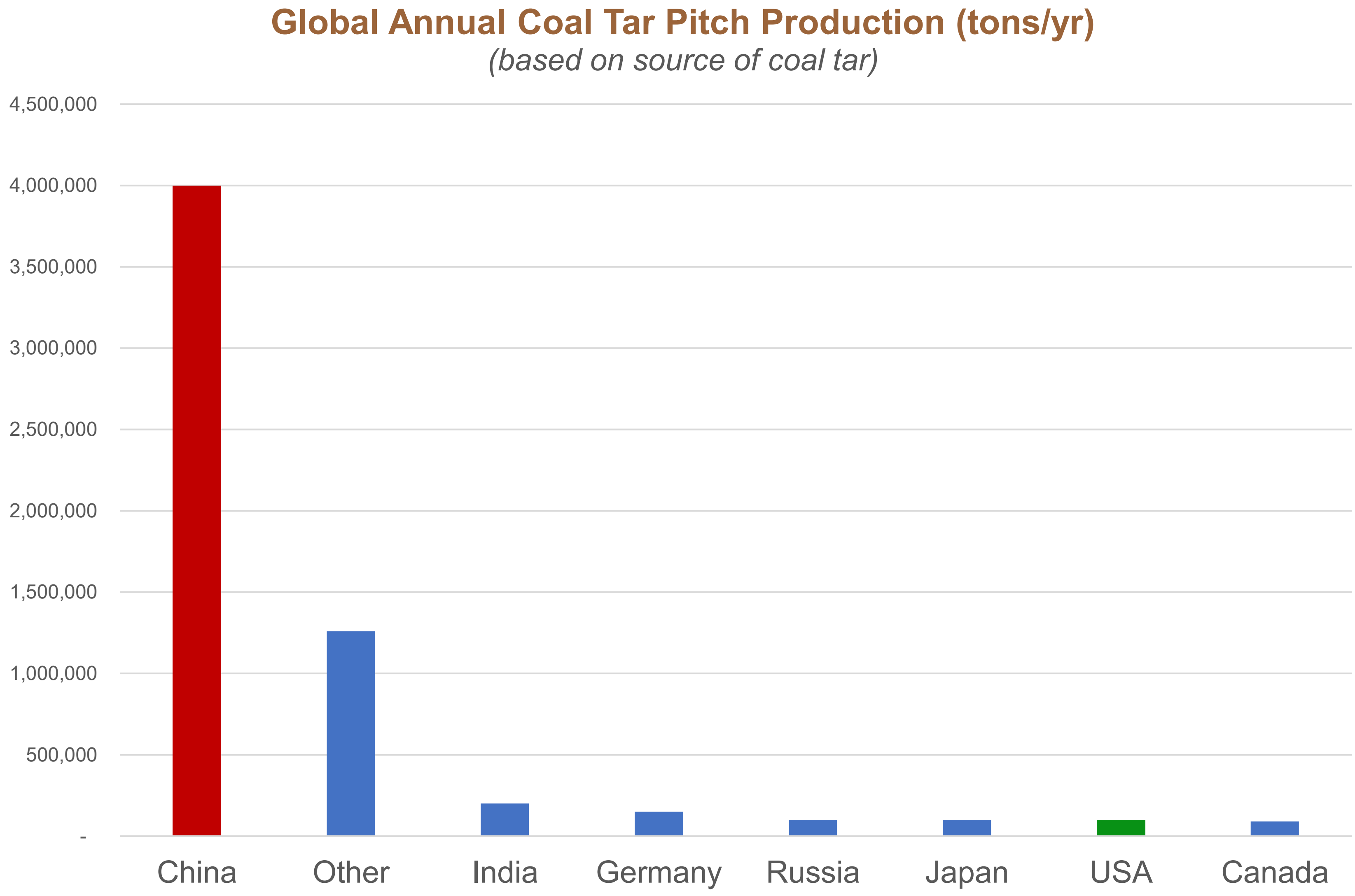

Tactical Battleships


Rocket Nozzle Throats


Advanced Tanks

Reliance on Chinese supply and lack of domestic production leaves the United States vulnerable to geopolitical and military pressure.

VULNERABLE CARBON SUPPLY CHAIN



China	**4,000,000**	**tons/yr**
Other	**1,260,000**	**tons/yr**
India	**200,000**	**tons/yr**
Germany	**150,000**	**tons/yr**
Russia	**100,000**	**tons/yr**
Japan	**100,000**	**tons/yr**
USA	**100,000**	**tons/yr**
Canada	**90,000**	**tons/yr**
	6,000,000	**tons/yr**

AmeriCarbon Module
15,000 tons/yr coal tar pitch
15,000 tons/yr byproducts

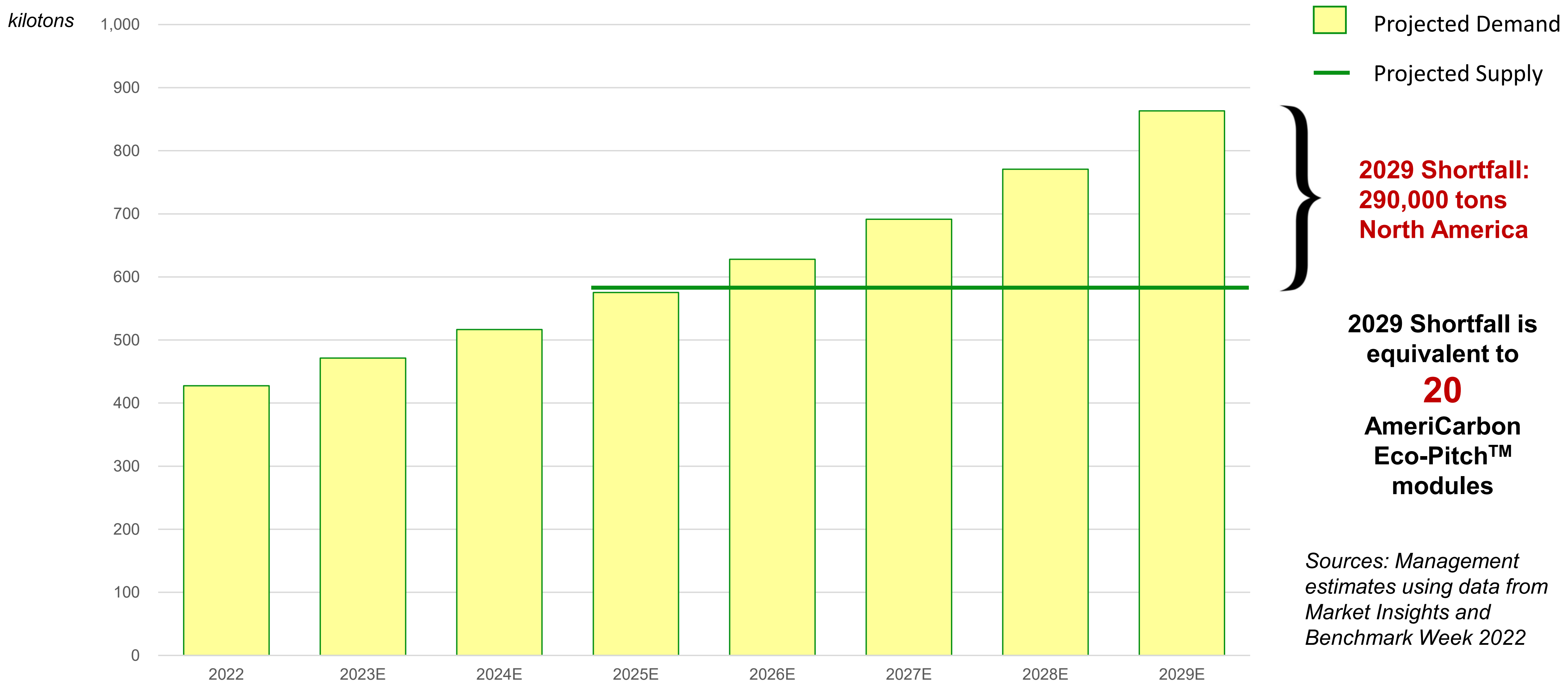
Note:
Most coal tar pitch production in the United States involves domestic distilleries that source foreign coal tar.

ORESPRING

Data sources: Market Research Future, Mordor Intelligence, Technavio, Ken Research, Knowledge Sourcing Intelligence, HJ Research, Absolute Reports, SkyQuest Technology, IspatGuru, Research in China, Volza, OECD Coal Information, Benchmark Week

SUPPLY / DEMAND CRUNCH

DEMAND IS RAPIDLY OUTPACING SUPPLY – ADDITIONAL PLANTS NEEDED



2029 Shortfall: 290,000 tons North America

2029 Shortfall is equivalent to 20 AmeriCarbon Eco-Pitch™ modules

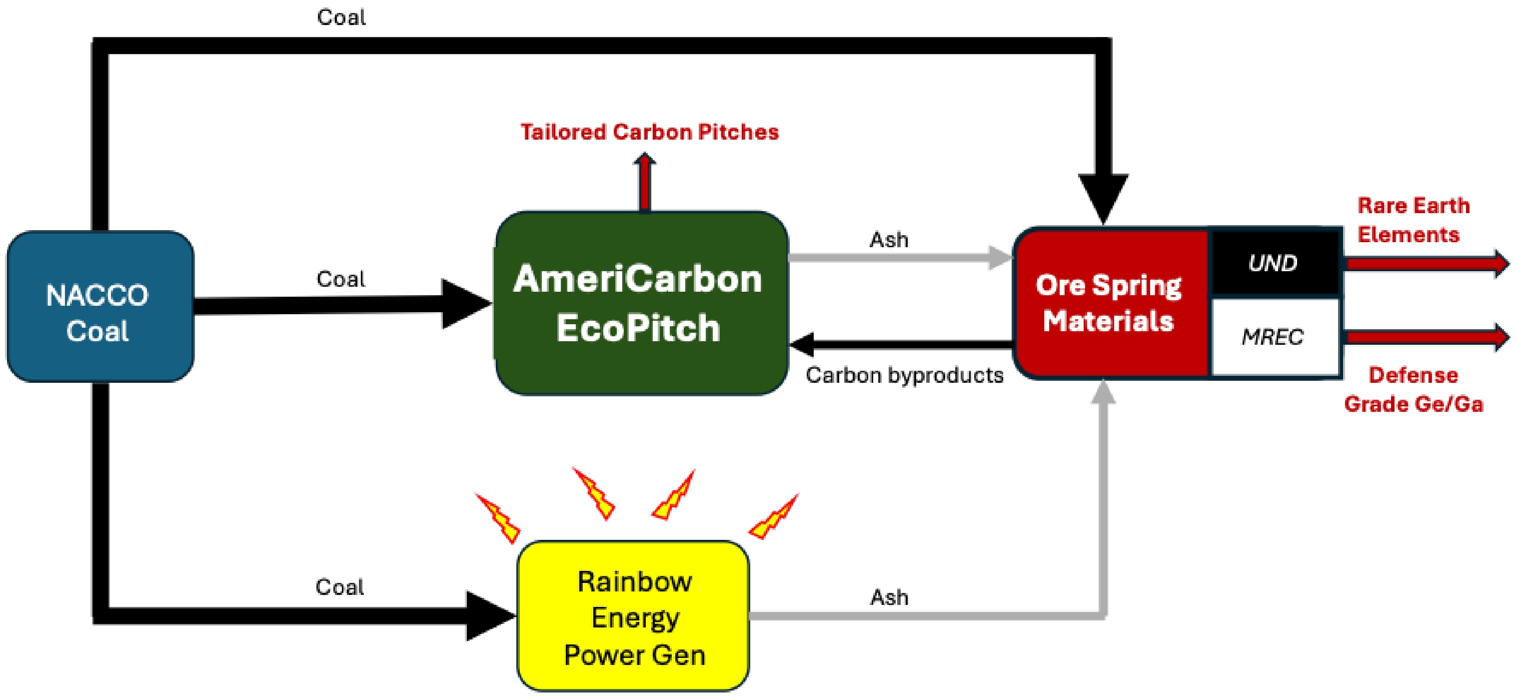
Sources: Management estimates using data from Market Insights and Benchmark Week 2022

Global coal tar pitch demand is growing at an estimated 9.3% CAGR[(1)] while pitch supply is decreasing in the United States. These estimates exclude the opportunities in energy storage and asphalt binder.

BACKGROUND TECHNOLOGIES

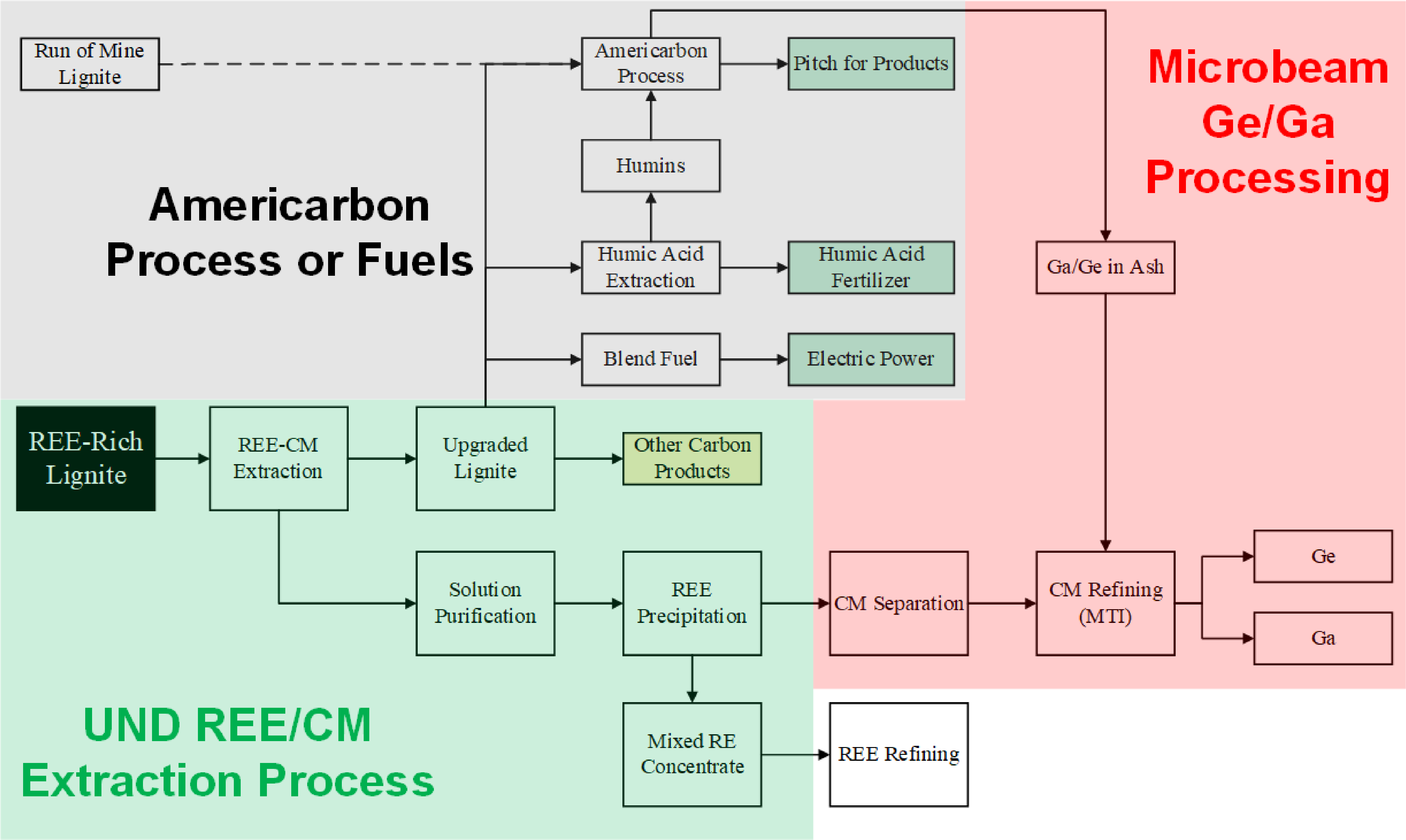
TECHNOLOGY INTEGRATION

FOCUS OF PROJECT



PROJECT OBJECTIVE:
Integration of the intersection of three underlying groups of technologies:

- ✓ UND's REE extraction and carbon-upgrading platform
- ✓ Microbeam's Ge/Ga and critical-mineral recovery technologies
- ✓ AmeriCarbon Forge's Liquid Carbon Process for Eco-Pitch^{TM} manufacturing


Run of Mine Lignite
Americarbon Process
Pitch for Products
Microbeam Ge/Ga Processing
Humins
Americarbon Process or Fuels
Humic Acid Extraction
Humic Acid Fertilizer
Ga/Ge in Ash
Blend Fuel
Electric Power
REE-Rich Lignite
REE-CM Extraction
Upgraded Lignite
Other Carbon Products
Ge
Solution Purification
REE Precipitation
CM Separation
CM Refining (MTI)
Ga
UND REE/CM Extraction Process
Mixed RE Concentrate
REE Refining

UND REE/CM TECHNOLOGY

UNIVERSITY OF NORTH DAKOTA

TECHNOLOGY DEVELOPMENT

2016-2017: Lab-scale (60 g batches)

- **Key result**: Unique properties of lignite make it a valuable resource for REE recovery; patented UND REE extraction and concentration technology

2017-2020: Bench-scale (50 kg batches)

- **Key result**: High purity REE mixtures can be economically generated from ND lignite coal

2020-2025: Pilot-scale (500 kg/hour)

- **Key result**: Demonstrated technology at commercially-relevant scale in a continuous process & validated economic feasibility

UND UNIVERSITY OF NORTH DAKOTA COLLEGE OF ENGINEERING & MINES

U.S. DEPARTMENT OF ENERGY | NETL NATIONAL ENERGY TECHNOLOGY LABORATORY

MICROBEAM TECHNOLOGIES, INC.

BARR

RARE EARTH SALTS

NORTH AMERICAN COAL CORPORATION

GREAT RIVER ENERGY

Minnkota Power COOPERATIVE

BNI energy AN ALLETE COMPANY

Lignite Energy Council

GREAT NORTHERN

NORTH DAKOTA UNIVERSITY SYSTEM ACCESS. INNOVATION. EXCELLENCE.

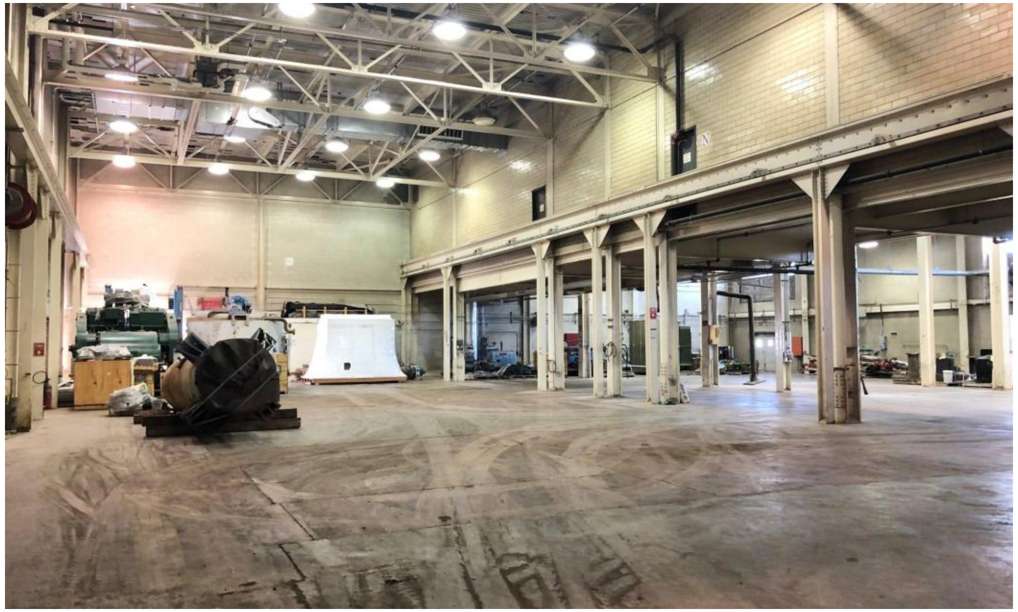
NORTH DAKOTA GEOLOGICAL SURVEY 1895

UNIVERSITY OF NORTH DAKOTA

PILOT PLANT PROGRESSION

UNIVERSITY OF NORTH DAKOTA
COLLEGE OF ENGINEERING & MINES

A Blank State: 2020



Fully Operational and Exceeding Targets

- ✓ 140 tons of REE-rich coal processed to date – produced several 10s of kilograms of REE products
- ✓ Up to 93% pure mixed rare earth concentrates produced – far exceeding commercial requirements

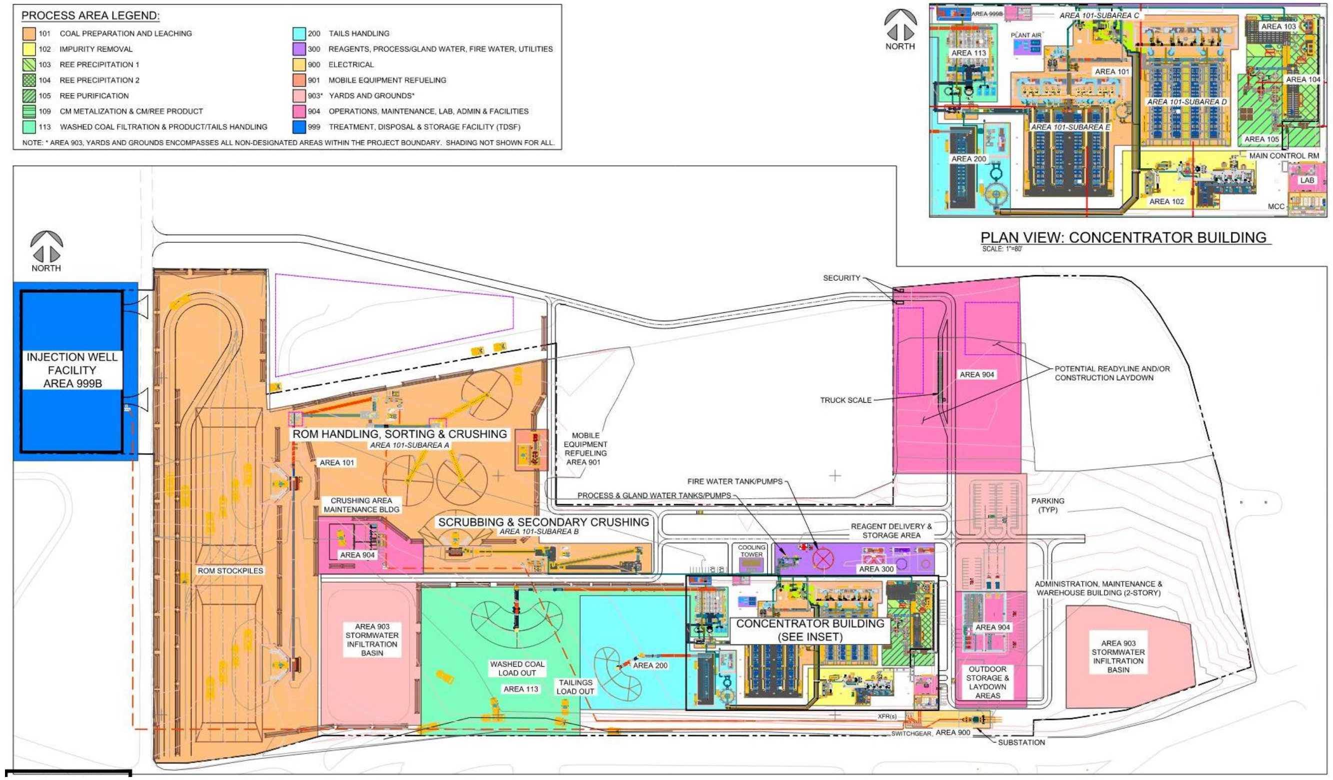
UNIVERSITY OF NORTH DAKOTA

FRONT END ENGINEERING & DESIGN (FEED) STUDY

2023-2025: $10M FEED focused on upstream concentration and downstream refining

Key results:

- Identified major technical and economic risk drivers
- Identified methods to reduce capital and operating costs and improve technology performance
- Developed commercialization plan



ORESPRING

UNIVERSITY OF NORTH DAKOTA

COMMERCIALIZATION – STAGED DEPLOYMENT

1. Commercial demonstration (proposed to DOE) - $100M
   - Produce products and generate net revenue from REE and carbon product proceeds
   - Scale of 30-50K tons per year of lignite used
2. Identify additional near-term, high-value resources
   - Plants envisioned at 300-500K tons per year of REE-enriched lignite
   - Anticipated to have discounted paybacks <10 years when combined with appropriate byproducts
3. Continue expansion to high-grade resources
   - Considering new solid or solution mining of ultra-rich REE lignites

MICROBEAM REE TECHNOLOGY

MICROBEAM TECHNOLOGIES

GALLIUM & GERMANIUM RECOVERY

Microbeam Technologies, based in Grand Forks, North Dakota, and Minnetonka, Minnesota, is an applied research and development firm specializing in fuel characterization, ash behavior, and critical-mineral recovery from coal and carbonaceous feedstocks. Microbeam's relevant experience includes:

- ✓ Development of a proprietary vaporization and selective-condensation process for germanium (Ge) and gallium (Ga) recovery from mixed REE concentrates (MREC) derived from UND's process;
- ✓ Successful bench-scale validation of this system under a DOE/NDIC-funded project (Award DE-FE0032522), achieving > 90 wt% purity of Ge/Ga concentrates;
- ✓ Operation of advanced analytical laboratories equipped with scanning electron microscopy, and X-ray fluorescence (XRF) for mineralogical and compositional mapping; and
- ✓ Longstanding collaboration with UND on REE characterization and process optimization.

Microbeam's role in The Forge Project is to lead the critical-mineral recovery and refinement tasks, evaluating AmeriCarbon's ash by-products as feedstocks for Ge/Ga separation and contributing process data to the integrated economic model.

AMERICARBON – ECO-PITCH™

AMERICARBON MANUFACTURING PROCESS

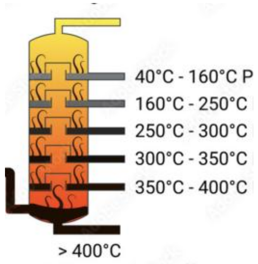
EFFICIENT AND DIRECT PRODUCTION OF COAL TAR PITCH

Eco-Pitch™ Liquid Carbon Process

Coal
(Carbon Ore)

Coal Tar Pitch
(liquefied Carbon)

Concentrated Ash
(Contains REEs)



Liquid By-Products
(High Value)

AmeriCarbon

Primary Focus

- BINDER PITCH
- IMPREGNATING PITCH
- MESOPHASE PITCH

Emerging Focus

- NEEDLE COKE
- SYNTHETIC GRAPHITE

Primary Carbon Products

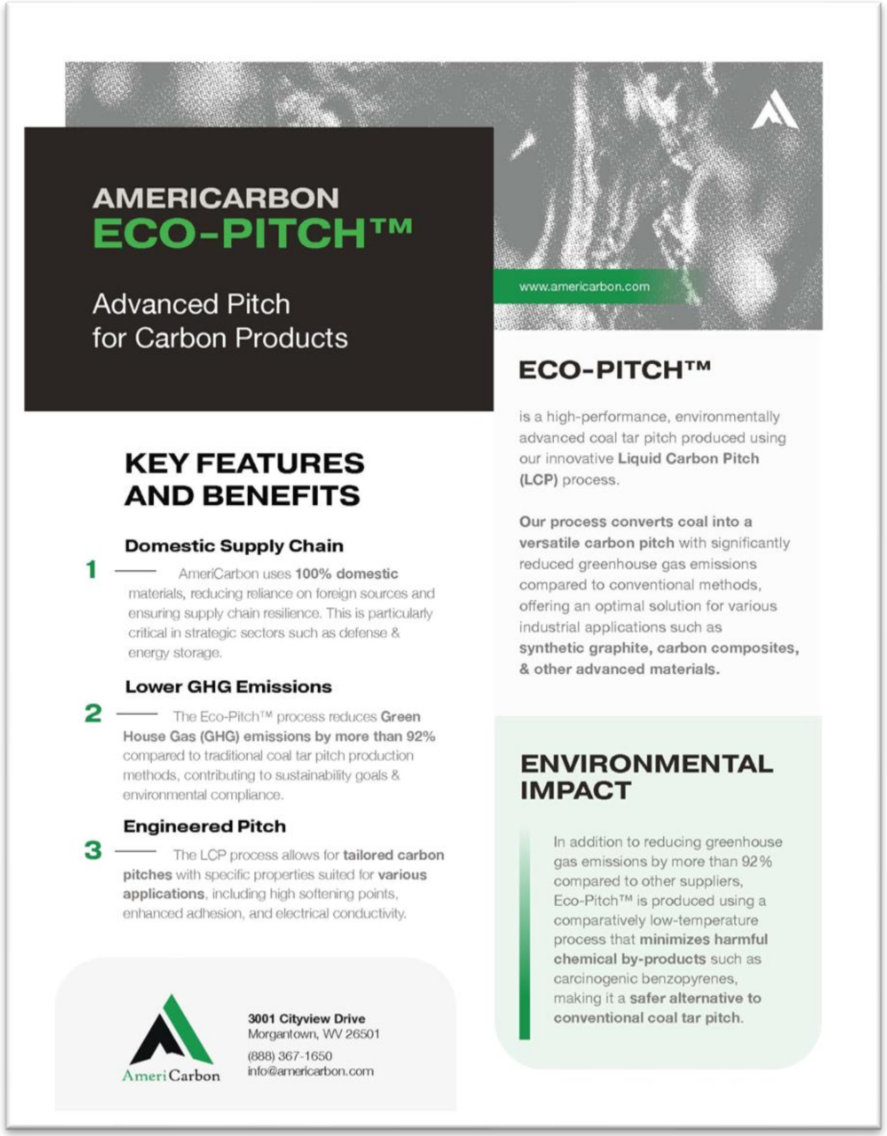
- BATTERY ANODES
- ELECTRODES CARBON/GRAPHITE
- ISOMOLDED GRAPHITE
- CARBON FOAMS
- CARBON FIBERS & COMPOSITES
- ASPHALT BINDER

ORESPRING

AmeriCarbon's process reduces GHG emissions by more than 92% compared to current industry supply.

AMERICARBON APPLICATIONS

ENABLING CARBON PRODUCTS



AMERICARBON
ECO-PITCH™

Advanced Pitch
for Carbon Products

www.americarbon.com

ECO-PITCH™

is a high-performance, environmentally advanced coal tar pitch produced using our innovative **Liquid Carbon Pitch (LCP)** process.

Our process converts coal into a versatile carbon pitch with significantly reduced greenhouse gas emissions compared to conventional methods, offering an optimal solution for various industrial applications such as **synthetic graphite, carbon composites, & other advanced materials.**

KEY FEATURES AND BENEFITS

Domestic Supply Chain

1 — AmeriCarbon uses **100% domestic** materials, reducing reliance on foreign sources and ensuring supply chain resilience. This is particularly critical in strategic sectors such as defense & energy storage.

Lower GHG Emissions

2 — The Eco-Pitch™ process reduces **Green House Gas (GHG) emissions by more than 92%** compared to traditional coal tar pitch production methods, contributing to sustainability goals & environmental compliance.

Engineered Pitch

3 — The LCP process allows for **tailored carbon pitches** with specific properties suited for **various applications**, including high softening points, enhanced adhesion, and electrical conductivity.

ENVIRONMENTAL IMPACT

In addition to reducing greenhouse gas emissions by more than 92% compared to other suppliers, Eco-Pitch™ is produced using a comparatively low-temperature process that **minimizes harmful chemical by-products** such as carcinogenic benzopyrenes, making it a **safer alternative to conventional coal tar pitch.**

AmeriCarbon

3001 Cityview Drive
Morgantown, WV 26501
(888) 367-1650
info@americarbon.com

PRODUCT APPLICATIONS

- Graphite Electrodes
- Synthetic Graphite
- Battery Anodes
- Asphalt Binders
- Carbon-Carbon Composites
- Radar Absorbent Materials
- Conductive Inks
- Wind Turbine Blades
- Tank & Vehicle Frames
- Lightweight Armor
- Space Shuttle Tiles
- Carbon-Based Filters
- Building Materials
- Electronics Materials
- Rocket Nozzles and Heat Shields
- Wear-Resistant Coatings
- Battery Packs for UAVs
- Carbon Foam for Insulation

PITCH SOFTENING POINTS	(°C) LO - HI
Asphalt Grade Binder Pitch	50 - 80
Impregnation Pitch	60 - 80
Binder Pitch	80 - 100
Battery Grade Synthetic Graphite	90 - 100
Lo-Hi Mesophase Pitch	120 - 300+

This table outlines the different types of Eco-Pitch™ produced by AmeriCarbon, along with their respective softening points. ***Each type is tailored to meet the needs of specific industrial applications****, ranging from binder and impregnation uses to synthetic graphite and mesophase pitches.*

Binder Pitch
for Carbon-Carbon Composites
- Adhesives for High-Temperature Applications

Eco-Pitch™ can be tailored as binder pitch, an adhesive material used in the production of carbon-carbon composites and various carbon products. It serves as a **critical binding agent**, holding together carbon particles or fibers to form a cohesive material. Binder pitch is essential in high-temperature applications, such as the manufacturing of **carbon electrodes and aerospace components**, where it provides structural integrity, thermal stability, and resistance to mechanical stress.

Mesophase Pitch
for Advanced Carbon Materials
- Graphite Fibers & Structural Composites

Mesophase type Eco-Pitch™ is used to produce **high-strength carbon fibers and composites.** These materials find applications in critical industries such as **aerospace, defense,** and **high-performance automotive manufacturing.** The mesophase pitch's unique structure enables the production of fibers with excellent mechanical properties, including high strength-to-weight ratios and superior thermal conductivity, making it indispensable for advanced composite materials.

Isomolded Graphite
for High Precision Components

Eco-Pitch™ serves as a key raw material for isomolded graphite, which is used to manufacture high-strength, precision components for industries such as **aerospace, semiconductors,** and **industrial machinery.** The tailored pitch offers consistent particle size and distribution, enabling superior mechanical properties, high thermal conductivity, and corrosion resistance. This makes it **ideal for demanding applications requiring tight tolerances and high performance.**

Synthetic Graphite
for EV Batteries & Stationary Grid Storage
- Battery-Grade Carbon Pitch

Eco-Pitch™ is a critical feedstock for the production of synthetic graphite used in **lithium-ion batteries** for both **electric vehicles (EVs)** and **stationary grid energy storage systems**. Its tailored properties enhance energy density, cycling stability, and charge-discharge efficiency, providing a sustainable and reliable domestic solution to meet the growing demand for energy storage. AmeriCarbon's Eco-Pitch™ reduces reliance on foreign sources, **addressing the critical need for a stable supply of battery-grade synthetic graphite in these rapidly expanding sectors.**

Impregnating Pitch
for Enhancing Strength, Density, & Conductivity
- Batteries & Carbon-Carbon Composites

Impregnating pitch supercharges carbon and graphite materials by infiltrating and filling their pores, dramatically **enhancing strength, density, and conductivity**. Used in critical applications like graphite anodes for **high performance batteries** and **carbon-carbon composites for aerospace**, it ensures components can meet the toughest demands.

PITCH SOFTENING POINTS	(°C) LO - HI
Asphalt Grade Binder Pitch	50 - 80
Impregnation Pitch	60 - 80
Binder Pitch	80 - 100
Battery Grade Synthetic Graphite	90 - 100
Lo-Hi Mesophase Pitch	120 - 300+

PLANNED AMERICARBON FORGE FACILITY

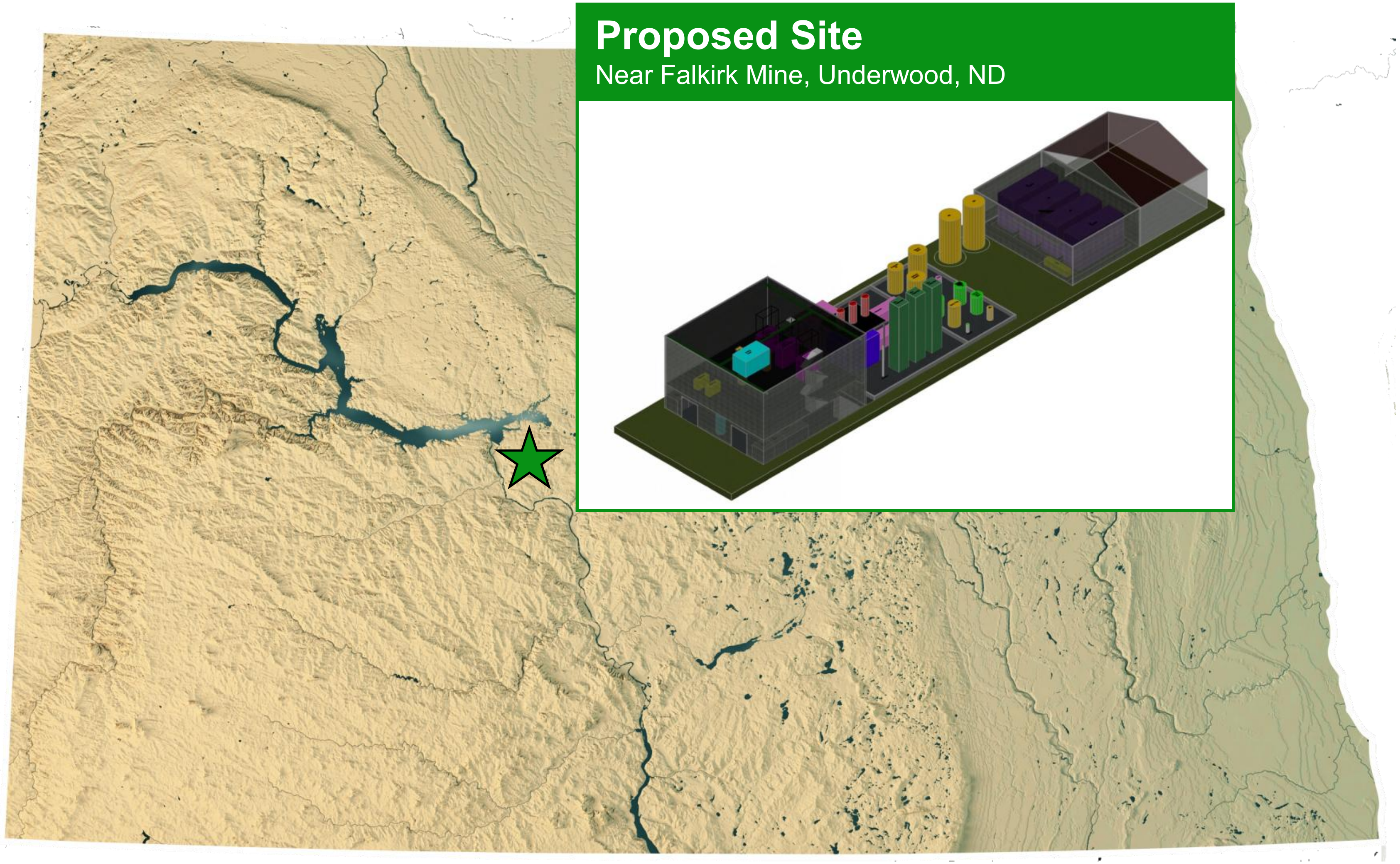
MCLEAN COUNTY PLANT

Project Partners:

- AmeriCarbon
- The North American Coal Corporation

Status:

- Site identified
- Joint venture established
- Anticipated to be online in late 2027 or early 2028



PROJECT SPECIFICS

RARE EARTHS AND CRITICAL MATERIALS INTEGRATION

PROJECT OBJECTIVES

- ✓ Integrate and optimize feedstock utilization — Demonstrate the use of upgraded lignite, humins, and humic-acid residues from UND's rare earth extraction process as alternative or blended feedstocks for AmeriCarbon's Eco-Pitch™ process. This effort will refine process parameters to tailor pitch compositions for distinct industrial applications while maximizing yield and carbon efficiency.
- ✓ Develop and evaluate by-product valorization pathways — Characterize and optimize AmeriCarbon's process residues and ashes for use as feedstock in Microbeam's Ge/Ga recovery technology, enabling recovery of high-purity germanium, gallium, and other strategic minerals.
- ✓ Advance purification and demineralization techniques — Conduct joint studies with UND, Worley Group, and prospective customers to enhance removal of ash, sulfur, and metallic impurities from carbon and feedstock streams to achieve ultra-high-purity carbon suitable for advanced materials markets.
- ✓ Perform process integration and engineering design — Engage Worley Group to develop process flow diagrams (PFDs), material and energy balances, and site-integration studies that define how the carbon manufacturing, REE extraction, and critical mineral recovery systems can be co-located and operated synergistically at AmeriCarbon's Forge site in McLean County, ND.
- ✓ Conduct techno-economic assessment and commercialization planning — Quantify the technical performance, cost structure, and economic impacts of the integrated system, including potential product revenues, co-product credits, and state-level economic multipliers.

The project will demonstrate a scalable model for the co-production of engineered carbon and critical materials—advancing national supply chain resilience while creating new markets and industrial opportunities within North Dakota's lignite resource base.

ORESPRING

RARE EARTHS AND CRITICAL MATERIALS INTEGRATION

PROJECT TEAM

ORESPRING

Applicant

Contractors to Ore Spring

UNIVERSITY OF NORTH DAKOTA

AmeriCarbon

MICROBEAM TECHNOLOGIES, INC.

Worley
energy | chemicals | resources

RARE EARTHS AND CRITICAL MATERIALS INTEGRATION

PROJECT BUDGET

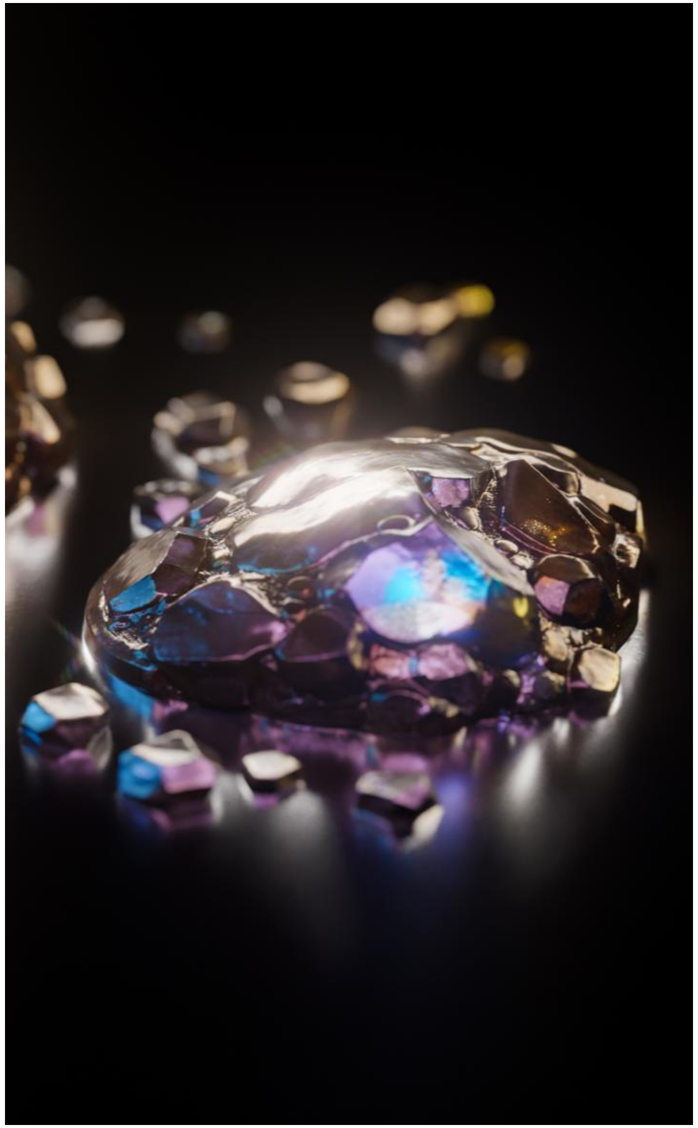
Total Project Cost:
$4.5 million ($2.25 million requested from CSEA grant program, and $2.25 million in matching)

Task 1	Project Management	$100,000
Task 2	Preliminary Process and Site Integration Assessment	$100,000
Task 3	Pitch Integration & Optimization Studies	$2,975,000
Task 4	REE Process Integration & Optimization Studies	$800,000
Task 5	Ge/Ga Process Integration & Optimization Studies	$300,000
Task 6	Technoeconomic Assessment	$150,000
Task 7	Technology Development and Commercialization Path	$75,000
		Total: $4,500,000

RARE EARTHS AND CRITICAL MATERIALS INTEGRATION

PROJECT TIMELINE

Phase	Duration	Key Milestones
Phase 1 – Project Initiation and Integration Setup	Months 1–3	Kickoff meeting; PMP approved; partner agreements executed.
Phase 2 – Feedstock, REE, and Mineral Optimization	Months 3–18	Completion of pilot- and bench-scale testing (AmeriCarbon, UND, Microbeam).
Phase 3 – Integration, Analysis, and TEA	Months 16–21	Completion of engineering and economic modeling; draft integration report.
Phase 4 – Commercialization Planning and Closeout	Months 21–24	Final report, stakeholder review, and project closeout with CSEA.



CONTACT

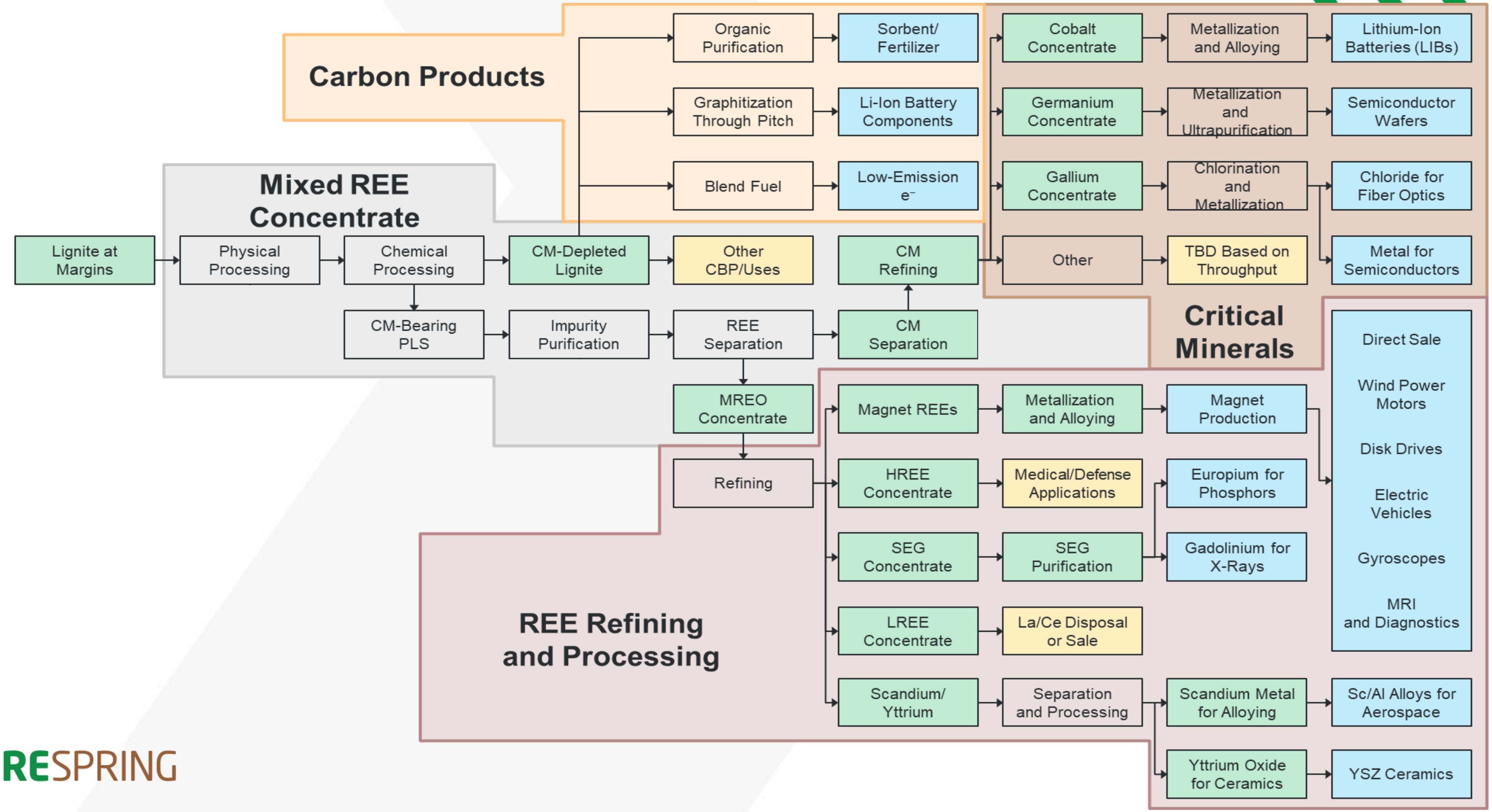
ORE SPRING MATERIALS, LLC

Greg Henthorn
Chief Business Officer
AmeriCarbon Enterprises, LLC
(304) 685-6017
greg.henthorn@americarbon.com

APPENDIX

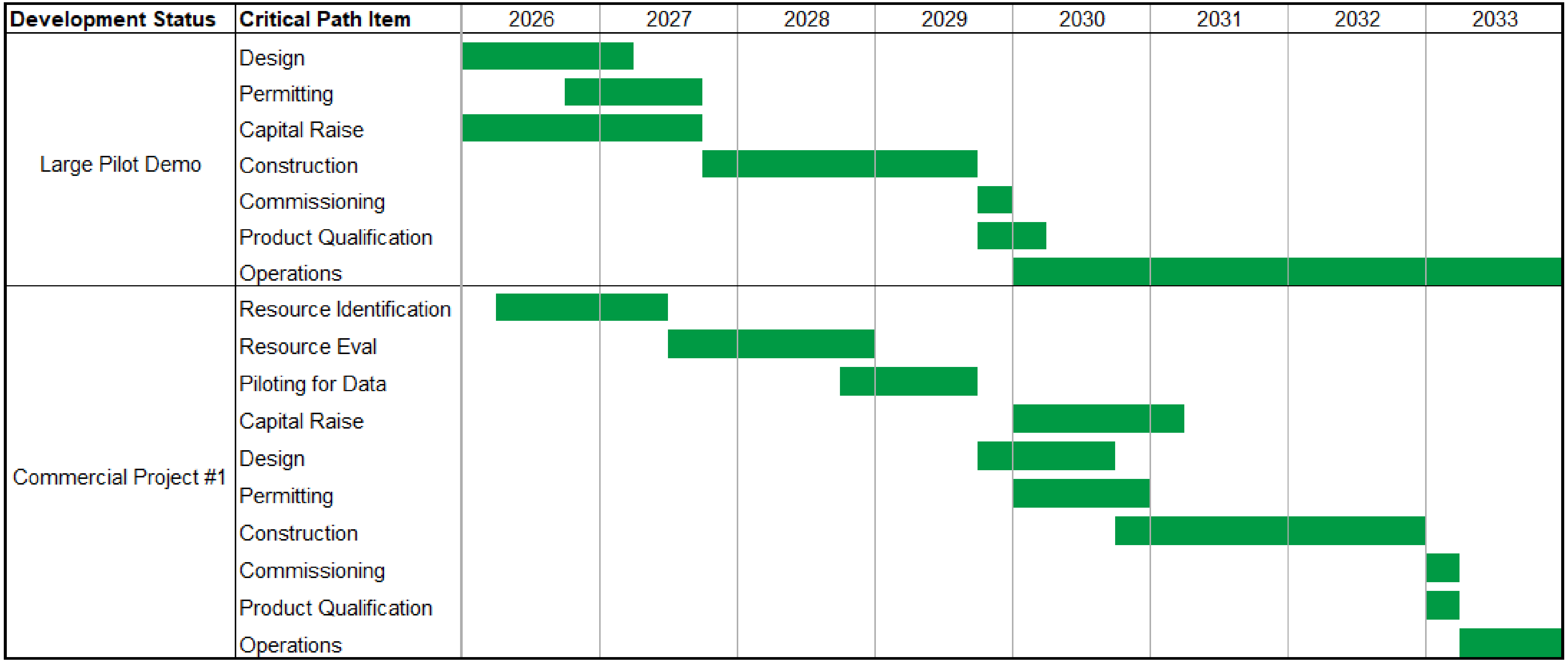
ORESPRING

The Ultimate Potential – A Full Value Chain for Many Industries



ORESPRING

Commercial Deployment – Stages 1 & 2



CSEA Grant Round 6 Technical Review Summary

C-06-G Commercial Deployment of Carbon Dioxide Capture, Transport, and Storage for Dakota Spirit AgEnergy, Harvestone Low Carbon Partners

Grant Request: $0

Loan Request: $20,000,000

Total Project Costs: $94,513,473

Average Technical Review Score: **283.5/315 (Good)**

Selected Technical Reviewer Comments:

I believe this proposal is technically sound.

This project proposal demonstrates a fully developed project plan and budget with most contractors already selected.

This project will demonstrate commercial scale medium distance carbon dioxide transportation. This technology will be important for many renewable fuel facilities as well as the first phase of conventional EOR and second phase of unconventional EOR.

The project demonstrates a likely positive impact on the state's economy by securing the long-term viability of the ethanol facility, creating ~25 new trucking jobs, and protecting corn demand for local producers. However, the proposal focuses heavily on economic benefits and the *gross* volume of CO_2 sequestered (250,000 tons). It notably fails to address or calculate the emissions generated by the diesel truck transport required to move this CO_2. Without an analysis of the transport emissions, the *net* environmental impact—a core metric for CSEA—is not fully quantified.

The proposed project is technically sound and presents a high likelihood of success due to the applicant's proven track record and the utilization of an existing, permitted Class VI storage asset. The partnership with the EERC and the high level of private matching funds (approx. 80%) significantly de-risk the financial and regulatory aspects of the proposal. The "virtual pipeline" concept is innovative and could provide a vital blueprint for stranded ethanol assets across the state.

However, the proposal contains a notable gap in its impact analysis: it fails to calculate or deduct the emissions generated by the truck fleet required to transport the CO_2. While the gross sequestration volume (250,000 tons) is significant, the lack of a lifecycle analysis (LCA) for the transport phase obscures the true *net* environmental benefit. Despite this oversight, the project's strategic value to the state and its readiness for commercialization merit a strong recommendation for funding. The project economics are totally dependent on federal tax policies that may encounter resistance at various administration levels resulting in project delays.

DAKOTA SPIRIT
A HARVESTONE COMPANY

CSEA Loan Application

Submitted to:

Clean Sustainable Energy Authority
North Dakota Industrial Commission

Project Title:

Commercial Deployment of Carbon Dioxide Capture, Transport, and Storage

Submitted by:

HLCP Prodco, LLC on behalf of Dakota Spirit AgEnergy, LLC

Date Submitted:

October 15, 2025

Harvestone LCP
1815 Schafer St. Suite 220
Bismarck, ND 58503

October 15, 2025

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

RE: Harvestone Low Carbon Partners' Loan Application for Clean Sustainable Energy Authority

To the Clean Sustainable Energy Authority (CSEA):

Please find enclosed the loan application from Harvestone Low Carbon Partners for Dakota Spirit AgEnergy's project for "*Commercial Deployment of Carbon Dioxide Capture, Transport, and Storage*". Our project intends to capture carbon dioxide from Dakota Spirit ethanol production and transport via truck to our operational Class VI injection well at Blue Flint Ethanol for permanent sequestration.

This project further drives innovation across North Dakota's agricultural and energy sectors while delivering measurable economic benefits for the state. The project seeks to advance carbon capture technology, develop non-pipeline transport solutions, and expand CO_2 storage capabilities for ethanol facilities. HLCP will leverage similar infrastructure and technology at Dakota Spirit to the operational capture facility at Blue Flint. Growing access to low carbon market opportunities and enhancing profitability for local corn producers. By integrating sustainable low carbon technologies into ethanol production, the project strengthens long-term market access for agricultural commodities and reinforces the resilience of biorefineries and their supply networks throughout North Dakota.

The potential support from CSEA provides Dakota Spirit a unique opportunity to advance our project on an aggressive schedule and serve as a template for producers without direct access to CO_2 storage and potentially supporting future opportunities around Enhanced Oil Recovery within the North Dakota; thereby showing a quick return on CSEA invested support with an operational project in the first quarter of 2027.

For any questions regarding our application, please contact our project lead, Adam Dunlop, at 701-442-7503 or adunlop@harvestonelcp.com. Thank you for your consideration.

Sincerely,

Jeff Zueger
CEO
Harvestone Low Carbon Partners

Clean Sustainable Energy Authority

North Dakota Industrial Commission

Application

Project Title:

Commercial Deployment of Carbon Dioxide Capture, Transport, and Storage for Dakota Spirit AgEnergy

Applicant:

HLCP ProdCo, LLC

Date of Application:

October 15, 2025

Amount of Request
Grant: $0
Loan: $20,000,000

Total Amount of Proposed Project:

$94,513,473

Duration of Project: August 2025-March 2027

Point of Contact (POC):

Adam Dunlop

POC Telephone:

(701) 251-3961

POC Email:

adunlop@harvestonelcp.com

POC Address:

1815 Schafer St. Suite 220
Bismarck, ND 58503

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CONFIDENTIAL Appendix

ABSTRACT

Objective:

This project will capture and liquefy the carbon dioxide (CO_2) emissions from the Dakota Spirit AgEnergy (DSA) Ethanol facility, safely transport to the Blue Flint Sequester (BFS) facility in Underwood, North Dakota, and permanently geologically sequester the CO_2 into the active Class VI storage well. The designed transportation of the CO_2 will create a "virtual pipeline" through contracted trucking with a dedicated North Dakota-based carrier, ensuring safe and permanent delivery of CO_2 to the Blue Flint facility in McLean County, North Dakota.

The project is designed to sequester approximately 250,000 metric tons of CO_2 per year, which will significantly lower the carbon intensity (CI) of the ethanol produced at Dakota Spirit. This reduction in CI will enhance access to premium low-carbon fuel markets and unlock financial incentives under federal programs such as 45Q and 45Z. Ultimately, the project will strengthen the financial viability of Dakota Spirit's ethanol production and the agricultural and manufacturing industries it supports across North Dakota.

Expected Results:

This project will enable the capture, transportation, and permanent storage of CO_2 from DSA into the BFS Class VI CO_2 sequestration well near Underwood, ND. The project will include the design and construction of a CO_2 capture and liquification plant and the associated loadout and receiving infrastructure. The project will secure all necessary County, State, and Federal permits and regulatory approvals to support project implementation and revenue generation. The project will design and deliver a unique trucking solution to safely transport CO_2 from the DSA capture facility to the BFS facility.

The project will generate additional tax revenue for both the local community and the State, create hundreds of temporary construction jobs, five new full-time positions at the facility, and support approximately 25 truck driving positions. In addition, it will demonstrate the technical and economic feasibility of carbon capture transportation and storage technologies while protecting and enhancing environmental quality through a significant reduction in carbon emissions.

Duration:

The project is expected to require 20 months to complete, with targeted completion in the 1st Quarter of 2027.

Total Project Cost:

Total project costs are approximately $94,513,473. This application requests the Clean Sustainable Energy Authority for a loan of $20,000,000 which represents approximately 20% of the total project costs.

Participants:

Harvestone Low Carbon Partners will provide overall management for the project. The Energy and Environmental Research Center (EERC) will provide technical and regulatory support. McGough will serve as Engineering Procurement and Construction (EPC) contractor, and Salof will act as the primary technology provider. Together project partners will design, manufacture and install the major equipment required for carbon capture, compression, dehydration, and liquefaction and loading of the liquefied CO_2.

PROJECT DESCRIPTION

Objectives:

The project will demonstrate CO_2 can safely be transported via truck between capture facilities and permanent storage locations. This project will capture and liquefy carbon dioxide (CO_2) emissions from the Dakota Spirit AgEnergy (DSA) Ethanol facility, safely transport the liquefied CO_2 to the Blue Flint facility in Underwood, North Dakota, and permanently geologically sequester it into an active Class VI CO_2 deep subsurface storage well. Successful deployment of this process may enable similar CO_2 transport for beneficial use projects to develop across the state.

The project will enhance the financial viability of low carbon ethanol production within the region. There are numerous markets for biofuels with aggressive carbon reduction strategies. This has increased financial opportunity for renewable fuel producers who can reduce the carbon intensity of the renewable fuel they produce. Ethanol production via fermentation generates a relatively pure stream of carbon dioxide thus avoiding the expense of gas separation. Ethanol facilities that can capture and permanently sequester the fermentation CO_2 stream represent the single largest opportunity to reduce the carbon intensity (CI) of fuel produced. This CI advantage, along with the 45Q and 45Z tax code benefit, enhances the financial incentives to permanently sequester CO_2.

The Dakota Spirit Ag Energy C02 Capture, Transportation, and Storage project will ensure continued market access and enhanced financial stability, while promoting economic development across industries and the state of North Dakota.

Significant due diligence has been completed, and the project is scheduled to advance. The key activities necessary to bring the CO_2 sequestration into a commercial application include:

1. Construction of the Capture Compression & Dehydration Facility (CCDF) and Loadout infrastructure
2. Design and construction of the CO_2 receiving facility and integration into flowline
3. Finalization of agreements with a dedicated carrier for CO_2 transport
4. Submission and approval of a Major Modification to the existing North Dakota Class VI CO_2 Geologic Sequestration Permit

Methodology:

This project utilizes advanced methods to capture high-purity CO_2 produced during fermentation at the Dakota Spirit Ag Energy ethanol facility. The collected CO_2 will be compressed into a liquid and loaded into specially designed transport trailers, then conveyed by a dedicated North Dakota-based carrier to a receiving location near Blue Flint. At this location, the CO_2 will be combined with the CO_2 from Blue Flint that is currently being sequestered and be injected into a permitted saline geologic formation for permanent sequestration. The methodology employs proven capture technology similar to the system currently in use at Blue Flint ethanol. The transportation process features an innovative truck-based approach. Storage operations will comply with Class VI standards and are supported by a comprehensive Monitoring, Reporting, and Verification (MRV) plan to guarantee long-term containment.

Construct Capture Compression & Dehydration Facility and Loadout Infrastructure (CCDF)

This project includes the design, procurement, and construction of a 785 metric tonnes per day Capture, Compression, & Dehydration facility. This plant will consist of compressors, blowers, a cooling system, CO_2 purification vessels, dryers, and other process tanks and pumps, as well as the electrical gear and instrumentation systems required to operate this equipment. This project also includes the construction of a new building to house the process equipment. The system will be highly automated and will be a state-of-the-art designed and constructed facility. The loadout infrastructure includes a total of 4 storage tanks each with a capacity of ~113,000 gallons, a re-condenser system to reliquefy both vapor boil-off from the storage tanks and vapor recovered from filling trucks, as well as 4 loadout stations equipped with pumps, meters, electrical gear and automation to ensure the safe and efficient loading of liquid CO_2 into transport trailers. A small building will also be constructed to house the electrical gear and other necessary components of the loadout facility.

Construct CO_2 Receiving & Injection Facility

The CO_2 receiving facility will be constructed near the Blue Flint ethanol facility and will consist of 2 large storage tanks, each with a capacity of ~113,000 gallons, a re-condenser system to reliquefy both vapor boil-off from the storage tanks and vapor recovered during offloading from the transport trailers into the storage tanks, as well as 4 truck offloads, each with a pump that will move liquid CO_2 from the transport trailers into the storage tanks. The receiving facility will also have 2 high pressure pumps to inject the liquid CO_2 from the storage tanks into the existing Blue Flint flowline and ultimately into the Class VI injection well. This facility will also have the electrical and automation systems necessary to ensure safe and efficient offloading of liquid CO_2 into storage and ultimately injected into the Class VI well. There will be a small building constructed to house the electrical gear and other necessary functions of the offload facility.

Execute Transportation Agreements with dedicated carrier for CO_2 transport

Dakota Spirit intends to collaborate with a North Dakota-based carrier to facilitate continuous CO_2 transportation to the receiving site near Blue Flint Ethanol. The carrier will be responsible for owning and operating a fleet of CO_2 trailers designed for this purpose. HLCP has conducted a request for proposal process with multiple carriers regarding this opportunity. HLCP has selected a carrier that satisfies the necessary requirements for Dakota Spirit's CO_2 transportation needs. Final negotiations on the transportation agreement are currently in progress, with execution expected by the end of the year. This timeline is intended to allow the carrier adequate time to order dedicated CO_2 storage trailers, establish a fleet for the project, onboard the necessary drivers and employees, and be operational in advance of CO_2 capture facility completion. The principal terms of the transportation agreement are outlined in Appendix I.

Submission and approval of North Dakota Class VI CO_2 Geologic Sequestration Major Modification Permit application

HLCP contracted EERC to support development and advancement of a storage facility permit major modification for Blue Flint Sequester Company, located in McLean County, North Dakota, to increase the annual permitted injection volume to approximately 500,000 tonnes. The primary scope of work includes updating the geologic model with new surrounding well data, history matching the reservoir model with operational data, delineating an extended Area of Review (AOR) through new simulation work for the CO_2 plume extent boundaries, reestablishing the Pore Space area,, reevaluating the testing and monitoring program along with the revision of the greenhouse gas reporting program Monitoring, Reporting, and Verification (MRV) plan. The MRV plan will be submitted for approval by the Environmental Protection Agency (EPA). The modified storage facility permit will be submitted to the North Dakota Department of Mineral Resources (ND-DMR). The process will include development of permit submittal, ND-DMR review, a public hearing, and if approved a docket order.

Anticipated Results:

This project will demonstrate the safe, commercial-scale use of truck-based CO_2 transport for permanent geologic storage—a first-of-its-kind in North America. It will result in the permanent sequestration of approximately 3 million metric tons of CO_2 over the project life, reducing the carbon intensity of ethanol from Dakota Spirit Ag Energy and enabling access to premium low-carbon fuel markets. The project will also generate valuable operational, regulatory, and economic data to support the replication of this model across rural ethanol facilities, while further establishing North Dakota as a leader in flexible, scalable CCS deployment. The project will:

- Inject millions of dollars into the local economy.
- Protect existing jobs in the energy industry.
- Provide additional jobs in construction and operational phases.
- Yield environmental benefits associated with reduced carbon emissions.
- Provide incremental tax revenue to State.
- Provide new revenue stream to pore space owners.
- Provide proof of concept and inform design of potential future storage projects.
- Demonstrate class VI permit modification protocols.
- Produce liquefied CO_2 for other possible future uses.

Facilities:

The project involves two key HLCP facilities: Dakota Spirit AgEnergy (DSA) and Blue Flint Ethanol (BFE). CO_2 from the fermentation process at DSA will be captured and liquified in a newly constructed building adjacent to the DSA ethanol production facility. The liquified CO_2 will then be loaded onto CO_2 trailers through an onsite truck rack before being transported to BFE. Upon arrival at BFE, the CO_2 will be offloaded into storage adjacent to the BFE ethanol plant. The receiving site will be directly connected to the injection line for the BFE CO_2 capture facility, delivering liquid CO_2 from both facilities to the operational Class VI injection well.

Dakota Spirit AgEnergy

Harvestone Low Carbon Partners (HLCP) owns and operates the Dakota Spirit Ethanol facility near Spiritwood, North Dakota. Dakota Spirit purchases about 27 million bushels of corn from approximately 500 local corn producers and produces over 80 million gallons of ethanol each year along with an estimated 165,000 tons of dry distillers grains and about ~33 million lbs of corn oil. A byproduct of fermentation at the facility is carbon dioxide (CO_2). Dakota Spirit produces about 250,000 metric tons per year of CO_2, which is currently scrubbed and released to the atmosphere. HLCP has explored many opportunities to put this CO_2 to beneficial use and believes geological sequestration now provides the best opportunity for the biorefinery, the State, and the environment. The Capture, Compression, and Dehydration Facility (CCDF) will be located on Dakota Spirit plant property. More information about HLCP facilities is provided in APPENDIX A

The Capture Compression and Dehydration Facility will utilize a proven and established Salof liquefaction design. The Plant is designed to capture the CO_2 gas produced during the fermentation of corn into ethanol. The CO_2 Liquefaction Plant will compress, dehydrate and liquefy the CO_2. The plant is designed to meet throughput, purity, and electrical consumption guarantees under worst case supply temperature and pressure scenarios. In addition, the plant is normally able to operate at a 28% turndown ratio. An overview and process flow for the liquefaction plant and loadout is provided in APPENDIX H.

Blue Flint Ethanol

The captured and liquefied CO_2 will be transported from Dakota Spirit AgEnergy to the Blue Flint Ethanol facility using a dedicated fleet of trucks. Upon arrival at the Blue Flint Ethanol production plant, the CO_2 will be offloaded at designated truck offloading racks and be transferred into onsite storage tanks located adjacent to the plant.

Once unloaded and stored, high pressure pumps will increase the CO_2 pressure to a super critical state and push directly into an existing flowline that currently handles the CO_2 stream captured from the Blue Flint Ethanol facility. This process enables the commingled sequestration of CO_2 from both the Dakota Spirit AgEnergy and Blue Flint Ethanol facilities at the CO_2 injection well, supporting integrated carbon storage efforts.

The receiving facility will feature two large storage tanks (~113,000 gallons each), advanced vapor recovery and re-liquefaction systems, multiple truck offload stations with pumps, high-pressure pumps for flowline injection, and integrated electrical and automation equipment housed in a dedicated building. This comprehensive system will enable the safe and efficient offloading, storage, and sequestration of CO_2, supporting future storage initiatives and providing new revenue streams for pore space owners.

Resources:

Key resources include CO_2 capture and compression equipment, specialized transport trailers, receiving infrastructure near the storage site, and qualified personnel for operations, monitoring, and regulatory compliance.

HLCP will be reliant on various project partners, technical experts, professional contractors, and service providers to complete the construction and permitting for the project.

The capture, loadout, receiving, metering, and pumping assets will utilize engineering, design, and construction managed by McGough which is providing an EPC wrap to the project. They will be supported by multiple subcontractors and technology providers such as Salof.

Subsurface technical expertise along with modeling and permitting development will be provided by HLCP and the EERC.

HLCP- HLCP team successfully developed and has operated the Blue Flint Capture and Sequestration site since October 2023- demonstrating both developmental and operational skills unique in any industry. They have met all regulatory requirements and have successfully negotiated and put in place the first of its kind Tax Equity Transaction with Bank of America.

McGough – McGough is a premier construction firm with offices in key markets in the central and southern US and operates nationally. McGough has a history of successfully completing complex industrial projects spanning from power generation, agriculture and food processing, refineries, water/wastewater, manufacturing and more. McGough will serve as EPC for the construction of the Capture, Compression, and Dehydration facility located at DSA

Salof Ltd Inc. – Salof is a manufacturer of modular process systems for the CO_2, LNG, and industrial refrigeration markets, based in New Braunfels, Texas. The company specializes in systems for carbon capture and storage, CO_2 liquefaction, natural gas processing, and heavy hydrocarbon removal, offering turnkey solutions and aftermarket services.

I. C. Thomasson – I. C. Thomasson Associates, Inc., a Salas O'Brien Company (ICT) is an employee-owned, multidisciplinary engineering consulting firm providing expertise in mechanical, electrical, controls, plumbing, fire protection, information technology, energy efficiency, and environmental services.

KLJ – KLJ Engineering is a national, multi-disciplinary engineering firm founded in 1938 that provides services in a wide range of areas including aviation, power, environmental, public works, structural, and land development. The company offers planning, design, and support for infrastructure projects and works with both public and private clients across the United States from its headquarters in Bismarck, North Dakota.

EERC – The Energy & Environmental Research Center is a research, development, demonstration, and commercialization facility focused on energy and environment technologies development. For over 20 years, the EERC has been a world leader in carbon storage, providing foundational site characterization, laboratory analyses, modeling, simulation, and regulatory permitting support. The EERC has a successful track record across the energy industry and with North Dakota's Underground Injection Control (UIC) Class VI permitting program authorities to permit commercial-scale CCS projects.

Dedicated Carrier – Dakota Spirit will partner with a dedicated, ND based carrier to operate 24/7 transportation of CO_2 to the receiving site at Blue Flint Ethanol. The carrier will own and operate a specialized fleet of CO_2 trailers. HLCP has completed a Request for Proposal (RFP) process with multiple local and national carriers participating. HLCP has selected a carrier and is currently in final negotiations of the transportation agreement. Key terms of the transportation agreement can be found in Appendix I

Techniques to Be Used, Their Availability and Capability:

All efforts will be led by the HLCP team who successfully developed and are currently operating the Blue Flint CCS project. The project integrates proven technologies, including CO_2 capture from ethanol fermentation, compression, truck-based transport, and Class VI geologic storage. While each technique is commercially available, truck-based CO_2 transport has traditionally been utilized to transport industrial and beverage grade CO_2 at conditions similar to those that will be utilized in this project. This project will be the first to demonstrate trucked CO_2 transport and storage at full commercial scale, establishing its viability for broader deployment across rural regions without pipeline access and can be a demonstration of how this could be applied for beneficial uses such as enhance oil recovery (EOR).

Environmental and Economic Impacts while Project is under Construction:

Environmental Impacts

The project is expected to significantly reduce the lifecycle carbon emissions of ethanol produced by Dakota Spirit by 40%. This reduction will enhance access to high value low-carbon fuel markets and help meet environmental targets set by local, state, and federal jurisdictions, while also delivering a range of broader environmental benefits.

By integrating proven CO_2 capture from ethanol fermentation, compression, truck-based transport, and Class VI geologic storage, the project demonstrates a comprehensive approach to minimizing the carbon footprint associated with ethanol production. This effort supports the transition to cleaner energy by preventing substantial volumes of $CO_2$from being released into the atmosphere, thereby contributing to climate change mitigation.

Furthermore, the project's deployment of truck-based CO_2 transport and storage at commercial scale is particularly significant for rural regions without pipeline access. It establishes a replicable model for carbon management in agricultural areas, helping preserve the viability of local biofuel industries and supporting sustainable rural economies.

During the construction phase, environmental impacts will be carefully managed to minimize the project's footprint. Efforts will focus on limiting land disturbance and controlling emissions from construction activities and trucking operations. The project's commitment to environmental stewardship extends to ensuring compliance with all applicable regulations and pursuing best practices in carbon capture and storage.

In the long term, the successful implementation of this project positions North Dakota as a leader in flexible carbon capture and storage (CCS) deployment. It lays the groundwork for future low-carbon infrastructure and the potential for additional applications such as enhanced oil recovery (EOR). The knowledge and operational experience gained will inform the development of future large-scale CO_2 transport and storage projects, further amplifying the project's positive environmental impact across the region.

Economic Impacts

Ensuring continuous operations at DSA during challenging market conditions will positively affect the economy of central North Dakota. Ethanol production serves as a market outlet for local corn producers. Without ethanol production, producers may experience higher transportation costs, lower basis, and more difficulty marketing their corn. HLCP employs approximately 160 staff and has annual payroll of approximately $22 million per year. Corn purchases at DSA and BFE will likely exceed $200 million in value passed to local producers and into adjacent communities in 2025.

This project will require an investment of nearly $95 million to reach commercial production. During construction, businesses providing skilled contract work will be needed. Industries such as hospitality and tourism will see additional customers, as contract workers will require hotels, fuel, and other amenities. The project will also include real property components that will generate additional value to support local county and school districts. The project will also comply with Federal Prevailing Wage and Apprenticeship requirements.

The project's real property components are expected to generate new taxable value, providing additional revenue streams to support local county governments and school districts. These investments not only boost immediate economic activity but also lay a foundation for long-term community growth by enhancing infrastructure and public services.

On a broader scale, the project helps sustain the agricultural economy by ensuring continued demand for corn from local producers. By keeping biofuel markets open and competitive, it protects farm income and supports rural livelihoods. Payments to property owners for subsurface pore space use will also serve as an investment in the rural economy, incentivizing participation and benefiting landowners.

The successful implementation of this project positions North Dakota as a leader in flexible carbon capture and storage (CCS) deployment. It creates a replicable model for ethanol plants and rural industries lacking pipeline access, further enhancing economic stability by attracting future CCS-related investments and associated industries. The resulting knowledge and operational experience will support the development of additional large-scale CO_2 transport and storage projects, including EOR, amplifying economic impacts across the region.

Ultimately, the project serves as a catalyst for both immediate and sustained economic growth, helping secure the viability of local agriculture, expanding job opportunities, and strengthening the fiscal health of communities throughout central North Dakota.

Ultimate Technological and Economic Impacts:

This project positions North Dakota as a leader in flexible CCS deployment, demonstrating that truck-based CO_2 transport can operate successfully at commercial scale. It creates a model for ethanol plants and rural industries without pipeline access, helping sustain local agriculture by keeping biofuel markets open and competitive. It also lays the groundwork for future low-carbon infrastructure and potential CO_2 supply for EOR.

Commercial Scale operation proves technology viability

Dakota Spirit produces about 250,000 tonnes per year of CO_2. Much larger sources of CO_2 exist in ND with limited access to on-site sequestration. This project will produce valuable knowledge that could enable future efforts in large-scale CO_2 transport and storage. HLCP intends to optimize the process of storing, loading, transporting, and receiving CO_2 via truck. The project will develop best practices to ensure this process is safe and efficient. It will focus on maximizing timeliness and capacity of transport to drive down transport costs and minimize CO_2 losses associated with loading and unloading.

This project will be the first ever Major Modification to a ND issued Class VI Storage Facility permit. The process utilized for modifying the permit will provide a template for any future Class VI modifications required in ND.

Improved viability of ethanol plants

For ethanol plants to remain competitive it is critical to differentiate our products and create new markets beyond the commodity demand for fuel ethanol. Decreasing the carbon intensity of ethanol through CCS represents the best opportunity to differentiate the commodities we produce from those of other producers and position our company assets to operate at full capacity for years to come.

Economics to Surface/Pore space ownership

With the State's primacy for authority and regulation of Class VI Geologic Subsurface Storage wells along with favorable geologic formations, North Dakota is a popular target for Carbon Capture and Storage (CCS) projects. In a carbon-constrained future, CCS projects will continue to be a mechanism by which North Dakota could continue to supply energy from our diverse fuel sources to the nation. Assets within the state and from outside are investigating storage opportunities with a primary focus being in the western and central regions. In North Dakota, subsurface pore space is considered the property of the surface owner. Therefore, to inject and store CO_2 in the subsurface, financial consideration must be provided to the surface owner. These payments will serve as an investment in the rural economy.

Why the Project is Needed:

This project addresses a critical gap in carbon capture infrastructure for rural ethanol producers who lack access to CO_2 pipelines or nearby geologic storage capabilities. Without a viable transport and sequestration solution, these facilities risk losing access to low-carbon fuel markets and valuable incentives such as the 45Q or 45Z tax credit. By demonstrating that truck-based CO_2 transport to permanent storage can operate successfully at commercial scale, this project ensures that North Dakota's farming and biofuel economy remains competitive. It also strengthens the state's position as a national leader in carbon management, enabling broader CCS adoption across rural America, and could also enable potential future applications such as enhanced oil recovery (EOR).

STANDARDS OF SUCCESS

Emissions reduction and reduced environmental impacts

Measuring success against an emission reduction goal for this project is straightforward from a measurement standpoint compared to other projects. The EPA specifies measurement techniques and calculations to ultimately track the amount of carbon dioxide stored. This project will sequester approximately 250,000 tons of CO_2 per year from fermentation, which is the equivalent to taking about 50,000 cars off the road each year. Over its planned lifespan this project will prevent more than 3 million tons of CO_2 emissions from reaching our atmosphere. We believe opportunity exists to expand the project and provide even larger reductions if incentives and regulations to minimize CO_2 emissions are maintained or increased.

Increased energy sustainability

Ethanol is a renewable fuel. It is already the most widely accepted and cost-effective alternative to increase sustainability in liquid transportation fuels. The biogenic CO_2 emitted from the fermentation process is the same CO_2 that corn originally captured from the atmosphere during photosynthesis. Therefore, CCS from ethanol fermentation can be viewed as removing CO_2 from the atmosphere while concurrently producing a sustainable liquid transportation fuel. There is approximately a 40% reduction of carbon intensity of the ethanol production process when deploying carbon capture.

Value to North Dakota

The ethanol industry has substantial economic effects on the overall economy of North Dakota. About half of the corn grown in the state is utilized in ethanol production. Providing low carbon intensity transportation fuel has been a foundational element of HLCP's business model. Another sequestration project will further solidify the financial future for the organization, its employees, and the local suppliers who rely on HLCP as a purchaser or supplier of goods and services. Both Agricultural and Energy leaders recognize the value of this project to North Dakota. Letters of support can be found in Appendix D, attached to the application.

According to the North Dakota Department of Mineral Resources (DMR), the Bakken Formation holds an estimated 167 billion barrels of oil in place (OIP). To date, cumulative production has reached roughly 5 billion barrels, meaning less than 3% of the in-place resource has been recovered. This extremely low recovery factor highlights both the tight nature of the Bakken reservoir and its substantial untapped potential.

Looking ahead, CO_2-enhanced oil recovery (EOR) represents a promising path to unlock additional barrels from this mature unconventional play. The combination of existing extensive well infrastructure, advanced completion technologies, and the growing availability of captured CO_2 make it technically feasible to test and scale CO_2 injection in selected areas.

Pilot-scale CO_2 injection tests will be essential to evaluate injectivity, miscibility, and incremental recovery under Bakken-specific conditions. The EERC led Bakken Production Optimization Program (BPOP) report on EOR recovery studies published on April 30, 2021 indicates "CO_2needs to be tested on a larger scale... logistics of gathering and handling it... both from sourcing and transportation... within oilfield EOR operations."

The availability of a liquid CO_2 supply, which can be trucked to pilot sites, offers a practical and localized source of large, continuous CO_2 volumes—an important enabler for near-term field trials. Successful pilots would establish the technical and economic foundation for broader CO_2 EOR deployment across the Bakken, improving recovery efficiency while contributing to emissions reduction and carbon management goals.

Explanation of how the public and private sector will make use of the project's results, and when and in what way.

Former Governor Burgum set a goal for the state of North Dakota to be carbon neutral by 2030. "Of all the opportunities, perhaps none has more potential than carbon capture and storage," he said on May 15, 2021[1]. Successful execution of this project will exemplify steps and strategies others can follow to help North Dakota reach this goal through "innovation not regulation." This innovative commercial scale project will provide a clear roadmap for similar projects that do not have direct access to pipeline or the geology necessary for sequestration.

This project will be the first major modification submittal of a ND-DMR Class VI geologic sequestration permit, setting the development and standard for all future ND Class VI permit modifications. Establishing the blueprint for the permit modification application will allow other operators the benefit of improved efficiency in the application process, reduced redundancy in documentation, and a more organized review by the ND-DMR permitting authority. This will provide clarity between the operator and ND-DMR authority with a structured approach to include essential information as per modification type, such as updated site characterization, operational history matching, AOR delineation, pore space agreements, and testing and monitoring plans, ensuring compliance with specific provisions of the Class VI regulations.

The potential commercialization of the project's results

This IS a commercial project. Commercialization of non-pipeline CO_2 transport presents a pathway for ethanol producers without access to suitable geological formations and the ability supports future opportunities around enhanced oil recovery.

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

This project will improve upon existing CCDF design to increase both the percentage of CO_2 captured and the energy efficiency of this design. Demonstration of commercial scale CO_2 transportation for sequestration will provide valuable insights around trucking efficiencies, transport, loading, and offloading. This will benefit future project development for CO_2 sources without immediate access to geological formation or other CO_2 transportation mechanisms.

How it will preserve existing jobs and create new ones

The completion of this project will help ensure North Dakota maintains access to high paying jobs. It helps ensure the existing HLCP workforce of around 160 employees has sustained employment. Construction of the compression plant, CO_2 transport solution, and the CO_2 stream unloading/receiving infrastructure will require several hundred contractors over the nearly two years required to complete the project. The construction phase will also provide apprenticeship opportunities Following completion, the operating assets will require additional labor, services and contractors to operate, maintain, monitor, inspect, and perform workover services. This will create new jobs for both skilled and unskilled labor. The trucking company selected to provide the logistics of CO_2 transport expects to create at least 25 new jobs to ensure adequate manpower to move the contracted volumes.

How it will otherwise satisfy the purposes established in the mission of the program

This project directly supports the CSEA purpose statement by advancing research, development, and commercialization of carbon capture and storage technologies that significantly reduce environmental impacts and enhance the sustainability of North Dakota's energy production. By serving as a blueprint for future ND Class VI permit modifications, the project encourages innovation and sets industry standards, fostering partnerships between public and private sectors to accelerate large-scale deployment of clean energy solutions.

The financial support provided through CSEA enables this project to leverage proven CCS infrastructure and technologies, positioning North Dakota as a leader in clean, sustainable energy. The project's focus on commercialization—particularly for non-pipeline CO_2 transport—opens new pathways for industries such as ethanol production and enhanced oil recovery, diversifying and growing the state's economy. Additionally, the creation and preservation of high-paying jobs, apprenticeship opportunities, and workforce development further contribute to economic growth and sustainability in rural communities, in alignment with CSEA's mission.

BACKGROUND/QUALIFICIATIONS

The applicant, **Harvestone Low Carbon Partners (HLCP)**, has direct and relevant experience developing and operating carbon capture and storage (CCS) projects in North Dakota. Most notably, Harvestone successfully built and for the past two years has safely operated the Blue Flint CCS facility. This site is a fully permitted and operational Class VI geologic storage project, making it one of the few active commercial CCS sites in the United States. Its performance has validated the viability of saline storage in the region.

The Blue Flint CCS site also serves as the designated storage location for the current project, and much of the capture and transport infrastructure will leverage the same proven technology and operational design already in use. This ensures a high level of technical readiness and project risk mitigation.

The CO_2 capture at Dakota Spirit Ag Energy (DSA) will utilize established fermentation-based capture systems, similar to those already deployed and integrated with Blue Flint, further demonstrating the continuity and reliability of the approach.

Key personnel at Harvestone bring deep expertise in CCS development, permitting, operations, and regulatory compliance:

- **Jeff Zueger –** Chief Executive Officer
- **Adam Dunlop** – Chief Development Officer
- **Zach Liu** – Director of Subsurface CCUS
- **Cathy Stevens** – Subsurface Regulatory Manager
- **Brian Markegard –** Senior Process Engineer
- **Jeff Martian** – Senior Process Engineer

Together, this team has successfully advanced CCS in North Dakota from concept to operation, making them uniquely qualified to deliver the proposed project safely, efficiently, and at commercial scale.

Additional technical expertise to the project will be provided by various contractors, service providers and prospective project partners. Organizational descriptions and expertise of key project partners and service providers can be found in the following appendices:

- APPENDIX A – Harvestone Low Carbon Partners
- APPENDIX B – McGough
- APPENDIX C – Salof LTD
- APPENDIX D – EERC
- APPENDIX E – ICT
- APPENDIX F – KLJ

MANAGEMENT

The project will be led and managed by **Adam Dunlop**, Chief Development Officer at Harvestone Low Carbon Partners. Mr. Dunlop and his team bring deep experience in low-carbon project development and operational expertise. They will oversee all aspects of execution, ensuring alignment with the project's technical, regulatory, and commercial goals.

Harvestone will use its proven project management structure, developed and refined through the successful development, construction, and operation of the Blue Flint CCS project. A dedicated project team, reporting to Mr. Dunlop, will coordinate all day-to-day activities, including CO_2 capture integration at Dakota Spirit Ag Energy, transportation logistics, and injection operations at the Blue Flint site.

Harvestone will follow a stage-gate project management framework, with clear milestones, deliverables, and risk assessments at each stage. Oversight will include regular internal reviews and coordination across engineering, operations, regulatory, and commercial teams. Contractors and vendors will be managed through performance-based metrics and regular progress checks.

Key Milestones throughout the project will include:

- Completion of engineering and procurement for key systems
- Construction and installation of capture, loading, and injection equipment
- System commissioning and start of CO_2 transport and injection
- Major Modification of the Class VI Geologic Sequestration Permit
- Executed Transportation Agreement
- Periodic safety and environmental audits

Project progress will be tracked against a detailed schedule, with frequent reporting and stakeholder updates to ensure transparency, accountability, and timely delivery of all objectives.

TIMETABLE

HLCP has assembled an overall project timeline based on schedules and proposals for the various tasks described in the Methodology and Project Description sections. This compilation has the project substantially complete and injection commencing in Q1 2027. We believe this to be a conservative and achievable timeline.

A Gantt chart indicating key tasks and timelines is provided in APPENDIX G.

BUDGET

Project Associated Expense	Total Cost	NDIC's Share Loan	Applicant Share (Cash)
Capture, Compression, & Loadout	$ 67,621,339	$ 20,000,000	$ 47,621,339
Class VI Permit Modification	600,000		600,000
Receiving & High Pressure Pumping	16,800,000		16,800,000
Legal	900,000		900,000
Contingency (10%)	8,592,134		8,592,134
Project Total	$ 94,513,473	$ 20,000,000	$ 74,513,473

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

Project costs are based on proposals, quotes, and estimates from strategic partners. The Capture, Compression, & Loadout cost covers the design and construction of the capture and loadout facilities at Dakota Spirit. Class VI Permit Modification includes expenses for a major permit modification to an existing Class VI storage facility. Receiving & High-Pressure Pumping costs pertain to new offloading infrastructure at Blue Flint Ethanol and the CO_2 injection flowline connection. Legal costs cover permit modification fees and execution of the Transportation Agreement. A 10% contingency is included to manage unexpected construction overruns and maintain financial targets.

HLCP's request for $20,000,000 through the CSEA Loan application represents approximately 20% of total project cost with the remaining balance funded other mechanisms and cash generated from HLCP operations.

CONFIDENTIAL INFORMATION

HLCP has included confidential information regarding the project business plan, containing historical company financial statements, and project budget projections, and investment returns in Appendix J. HLCP is a privately held entity. It is HLCP's policy to not release financial and other sensitive information to the public. The management of HLCP is responsible for complying with and maintaining this code of conduct as defined in the company's policy. An executed confidentiality agreement or non-disclosure agreement is required for third parties to view HLCP's confidential and sensitive information.

As part of the application, HLCP has also included technical drawings provided by our technology partner Salof in Appendix H. HLCP has also included a preliminary draft of the transportation agreement terms yet to be finalized with the transportation partner.

HLCP has completed and attached the confidentiality request template provided with the application and provided a separate Confidential Appendix.

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.

Not Applicable

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.

In the past 5 years, HLCP and its subsidiaries have participated in the following state programs and incentives:

- **NDIC LRC Grant to drill stratigraphic test well:** Awarded 2020-$3,388,000 plus up to $250,000 (Amend #1); $2,903,349 funded in March 2021
- **ERP Loan:** Funded on September 10, 2020. The proceeds were $10,000,000.
- **NDIC Renewable Energy Program Grant for Seismic Survey to Advance Potential CO_2 Storage in Eastern North Dakota**: Awarded $324,460 in 2021.
- **CSEA Loan:** Funded on December 1, 2022. The proceeds were $15,000,000.

Industrial Commission

Tax Liability Statement

Applicant: HLCP ProdCo, LLC

Application Title: Carbon Dioxide Capture, Transportation, and Storage for Dakota Spirit AgEnergy

Program:

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

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

Jeff Zueger
Signature

Chief Executive Officer
Title

October 15, 2025
Date

LETTERS OF SUPPORT

North Dakota Agriculture Commissioner

North Dakota Farmers Union

North Dakota State Senator Wanzek

North Dakota State Representative Satrom

Mayor of Jamestown

STATE OF NORTH DAKOTA
DEPARTMENT OF AGRICULTURE
600 E BOULEVARD AVE, DEPT 602
BISMARCK, ND 58505-0020

DOUG GOEHRING
COMMISSIONER

October 9, 2025

North Dakota Industrial Commission
600 East Boulevard Avenue
Bismarck, ND 58505

RE: Dakota Spirit AgEnergy Clean Sustainable Energy Application

Dear Members of the North Dakota Industrial Commission:

I am writing in support of Dakota Spirit AgEnergy's project of Commercial Deployment of Carbon Dioxide Capture, Transport, and Storage for the Clean Sustainable Energy loan request.

This initiative promotes innovation within North Dakota's agricultural and energy sectors while generating measurable economic benefits for the state. The project aims to advance carbon capture, develop non-pipeline transportation solutions, and enhance storage capabilities at ethanol facilities, creating new market opportunities and improving profitability for local corn producers. Integrating sustainable technologies into ethanol production strengthens long-term market access for agricultural commodities and supports the continued success of biorefineries and their supply networks across North Dakota. Additionally, this project leverages federal incentives such as the 45Q and 45Z tax credits, enhancing competitiveness in both domestic and international renewable fuel markets. The initiative advances environmental stewardship by producing lower-carbon fuels and promoting sustainable economic growth practices. Comprehensive due diligence has been conducted to ensure the project's safety and compliance with all applicable standards and regulations.

I recommend approval of Dakota Spirit AgEnergy's Commercial Deployment of Carbon Dioxide Capture, Transport, and Storage project for the Clean Sustainable Energy loan. Thank you for your consideration of this application.

Sincerely,

Doug Goehring
Agriculture Commissioner

NORTH DAKOTA Farmers Union

PO Box 2136 • 1415 12th Ave SE
Jamestown, ND 58401
800-366-8331 • 701-252-2341
ndfu.org

October 10, 2025

North Dakota Industrial Commission
600 East Boulevard Avenue
Bismarck, ND 58505

RE: Support of *Dakota Spirit AgEnergy's Commercial Deployment of Carbon Dioxide Capture, Transport, and Storage Project*

Dear Industrial Commission Members,

North Dakota Farmers Union supports Dakota Spirit AgEnergy's Commercial Deployment of Carbon Dioxide Capture, Transport, and Storage project and its request for a Clean Sustainable Energy loan.

This initiative represents an investment in North Dakota agriculture, offering measurable economic stability and long-term sustainability for our state's farmers.

The success of our state's corn growers is fundamentally linked to the vitality of the ethanol industry. Dakota Spirit AgEnergy's project will directly benefit family farmers adding even more value to North Dakota's ethanol and inherently to its corn crop. This effort positions North Dakota ethanol as a leading lower-carbon fuel. It creates sustainable market advantages, by integrating advanced technologies and the pursuit of federal incentives like the 45Q and 45Z tax credits. This is crucial for securing long-term market access in an increasingly carbon-conscious global and domestic energy landscape.

This project is not just an investment in a single facility but a critical infrastructure asset that supports an entire supply chain. We urge you to approve the requested financing, recognizing that this is a strategic investment that aligns state economic development goals and profitability needs of North Dakota agriculture.

North Dakota Farmers Union recommends approval of a Clean Sustainable Energy Loan is support Dakota Spirit AgEnergy's Commercial Deployment of Carbon Dioxide Capture, Transport, and Storage Project.

Sincerely,
NORTH DAKOTA FARMERS UNION

Mark Watne

Mark Watne
President

Legislative Assembly

North Dakota Senate

STATE CAPITOL
600 EAST BOULEVARD
BISMARCK, ND 58505-0360

Senator Terry M. Wanzek
District 29
900 Seventh Avenue SW
Jamestown, ND 58401-4542
tmwanzek@ndlegis.gov

COMMITTEES:
Appropriations - Government Operations Division, Chairman

October 10, 2025

North Dakota Industrial Commission
600 East Boulevard Avenue
Bismarck, ND 58505

Dear Members of the North Dakota Industrial Commission,

My name is Terry Wanzek. I'm a ND State Senator and a ND Farmer from Jamestown. I represent District 29 in the ND Senate. Sitting in a combine day after day, with auto steer, harvesting soybeans and corn, affords me a lot of time to think and ponder on the challenges of today's business environment. I'm reminded of the importance of exploring, developing, enhancing and/or expanding our marketing potential in Agriculture and Energy industries in ND. It's vitally important that we keep up with the new innovative marketing opportunities and ideas that cross our paths.

I am writing in strong support of Dakota Spirit AgEnergy's project of Commercial Deployment of Carbon Dioxide Capture, Transport, and Storage for the Clean Sustainable Energy loan. This initiative promotes innovation within North Dakota's agricultural and energy sectors while generating measurable economic benefits for the state. The project aims to advance carbon capture, develop non-pipeline transportation solutions, and enhance storage capabilities at ethanol facilities, creating new market opportunities and improving profitability for local corn producers. Integrating sustainable technologies into ethanol production strengthens long-term market access for agricultural commodities and supports the continued success of biorefineries and their supply networks across North Dakota.

Additionally, this project leverages federal incentives such as the 45Q and 45Z tax credits, enhancing competitiveness in both domestic and international renewable fuel markets. The initiative advances environmental stewardship by producing lower-carbon fuels and promoting sustainable economic growth practices. Comprehensive due diligence has been conducted to ensure the project's safety and compliance with all applicable standards and regulations.

ND businesses, like Dakota Spirit AgEnergy, leaders in their industry, need our support in developing North Dakota's promising future economy. I strongly recommend approval of Dakota Spirit AgEnergy's Commercial Deployment of Carbon Dioxide Capture, Transport, and Storage project for the Clean Sustainable Energy loan.

Sincerely,

Terry Wanzek (Oct 10, 2025 09:01:55 CDT)

Senator Terry M Wanzek
ND Senate, District 29
Cell # 701–320-3303

October 7, 2025
North Dakota Industrial Commission
600 East Boulevard Avenue
Bismarck, ND 58505

Dear Members of the North Dakota Industrial Commission,

Ethanol is important component of our state's economy. For that reason I am writing in strong support of Dakota Spirit AgEnergy's project of Commercial Deployment of Carbon Dioxide Capture, Transport, and Storage for the Clean Sustainable Energy loan request.

This initiative promotes innovation within North Dakota's agricultural and energy sectors while generating measurable economic benefits for the state. The project aims to advance carbon capture, develop non-pipeline transportation solutions, and enhance storage capabilities at ethanol facilities, creating new market opportunities and improving profitability for local corn producers. Integrating sustainable technologies into ethanol production strengthens long-term market access for agricultural commodities and supports the continued success of biorefineries and their supply networks across North Dakota. Additionally, this project leverages federal incentives such as the 45Q and 45Z tax credits, enhancing competitiveness in both domestic and international renewable fuel markets. The initiative advances environmental stewardship by producing lower-carbon fuels and promoting sustainable economic growth practices. Comprehensive due diligence has been conducted to ensure the project's safety and compliance with all applicable standards and regulations.

I strongly recommend approval of Dakota Spirit AgEnergy's Commercial Deployment of Carbon Dioxide Capture, Transport, and Storage project for the Clean Sustainable Energy loan to build a brighter future.

Sincerely,

Rep. Bernie Satrom D12
PO Box 950
Jamestown, ND 58402
701 320 7239 Cell

DWAINE HEINRICH, MAYOR
102 THIRD AVENUE SOUTHEAST
JAMESTOWN, ND 58401

CITY OF
JAMESTOWN
NORTH DAKOTA

701-252-5900 CITY HALL
dheinrich@JamestownND.gov
www.JamestownND.gov

October 9, 2025

North Dakota Industrial Commission
600 East Boulevard Avenue
Bismarck, ND 58505

Dear Members of the North Dakota Industrial Commission:

As you are aware, the Dakota Spirit AgEnergy ethanol plant east of Jamestown contributes significantly to the economy of this region as well as the economy of North Dakota. The construction of Dakota Spirit AgEnergy was and continues to be a boon to North Dakota's ag and energy sector's impact upon all of North Dakota and is a significant contribution of our area's value added ag industry.

Dakota Spirit AgEnergy will be submitting a Clean Sustainable Energy Grant and Loan Application for the Commercial Deployment of Carbon Dioxide Capture, Transport, and Storage from Dakota Spirit AgEnergy.

I am writing to you today as Mayor of Jamestown to express my support for Dakota Spirit AgEnergy and their grant and loan application. In doing so I am confident that I am speaking for the vast majority of Jamestown as well as Stutsman County residents.

Your thoughtful consideration of and approval of the application from Dakota Spirit AgEnergy will go a long way to advance this important project.

Should you have any questions or concerns, please do not hesitate to contact me at any time.

Respectfully submitted,

Dwaine Heinrich

Dwaine Heinrich, Mayor
City of Jamestown, North Dakota

DAKOTA SPIRIT
A HARVESTONE COMPANY

APPENDIX SUMMARY

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Salof Overview

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EERC Overview

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ICT Overview

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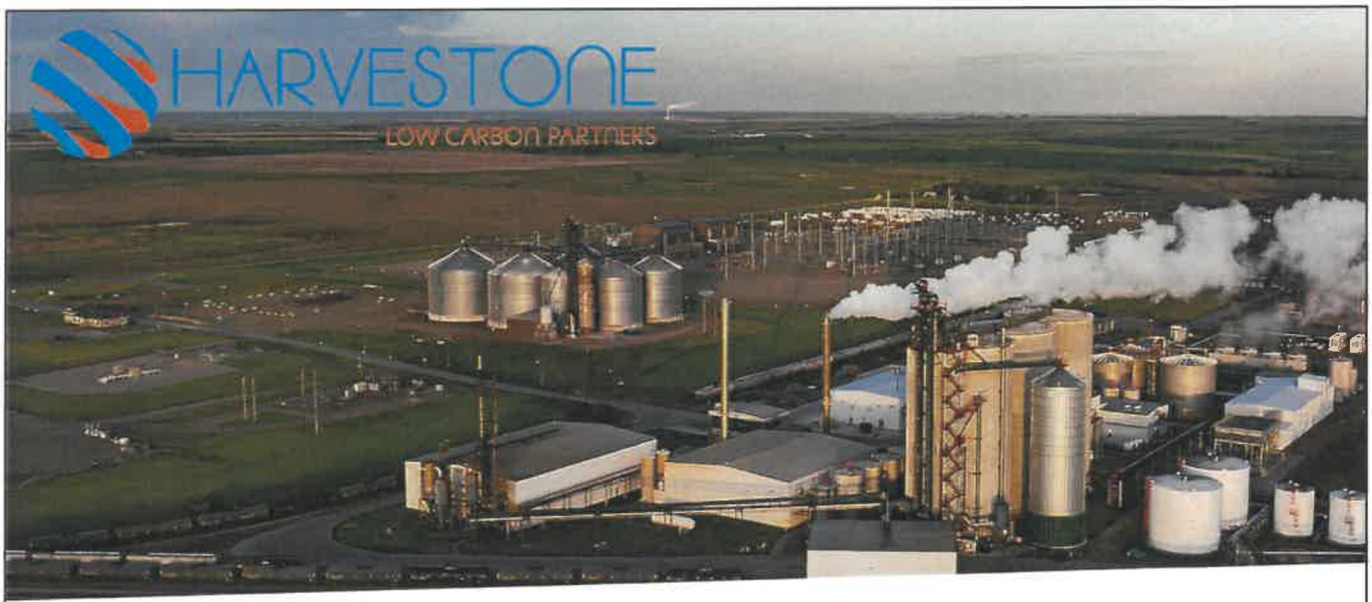
KLJ Overview

APPENDIX G

Project Schedule

APPENDIX A

HLCP OVERVIEW



HLCP Overview

October 2025

Confidential

Scaled Low-CI Bioethanol Platform with Attractive Visible Growth Through CCS Development

Key Highlights

Scaled Low-CI Bioethanol Production	▪ 3 **operating** top tier corn-based biorefineries ▪ **~220MM** gallons of bioethanol produced per year
In-Service Carbon Capture & Sequestration (CCS)	▪ **1 of only a few** operating bioethanol CCS plants in the world; strong operating history since COD in October 2023 ▪ **1 of only 8** Class VI permit holders in the U.S. ▪ **>200,000 metric tons (mt)** of current and future CO_2 captured per year at BFE ▪ With a post-CCS Carbon Intensity (CI) score of 0.4, **BFE is the lowest U.S. CI bioethanol provider in the market**
Vertical Integration	▪ Advantaged geology enables **on-site sequestration** and **vertically integrated** CCS operations ▪ Allows for **full capture** of low-CI economics and **zero dependence on third-party CO_2 pipeline infrastructure or sequestration solution**
LCFS Bioethanol Sales Agreements	▪ Low-CI bioethanol sold to **I-Grade counterparties located in premium LCFS markets**
Tax Equity Financing (TEF)	▪ Closed **first-of-its-kind** Tax Equity Financing in 2024 ▪ Enables monetization of **45Q and 45Z tax credits** earned in connection with ongoing CCS activities at BFE
CCS Growth Projects	▪ Projects under development at DSA and IBEC will capture an **additional ~400,000 mt of CO_2 / year** ▪ Land required for IBEC CCS already **owned** and **subsurface geology de-risked** from stratigraphic test well ▪ **Highly attractive** project returns

Asset Overview

Facility		Description	CCS
Blue Flint Ethanol (BFE)	 *Underwood, ND*	▪ 76MM gallons of bioethanol / year ▪ >200,000 mt of CO_2 / year ▪ Co-located combined heat and power drives lower cost and CI ▪ Actively shipping low-CI bioethanol into premium LCFS markets under long term offtakes	Active
Dakota Spirit AgEnergy (DSA)	 *Spiritwood, ND*	▪ 84MM gallons of bioethanol / year ▪ >235,000 mt of CO_2 / year ▪ Co-located combined heat and power drives lower cost and CI ▪ Access to multiple LCFS markets ▪ ND primacy will result in shortened Class VI permit timeline	Online 1Q 2027
Iroquois Bio-Energy Co. (IBEC)	 *Rensselaer, IN*	▪ 60MM gallons of bioethanol / year ▪ >165,000 mt of CO_2 / year ▪ Access to multiple LCFS markets ▪ Stratigraphic test well completed, pore space secured, permit developed	Online 1Q 2028

3 Top-Tier Bioethanol Production Facilities Driven by Operational Excellence, Strong Corn & Bioethanol Basis, and Proximity to Attractive CCS Geology

HARVESTONE

Source: Company Management
(1) HLCP unaudited financial statements for the year ending 12/31/2024.

Confidential

BFE – One-of-a-Kind Bioethanol Facility & CCS Asset

BFE Bioethanol Facility Key Stats

Underwood, ND

Plant Overview	Location	Underwood, ND
	Plant Technology	ICM / Fagen
	Plant Commissioned	2007
	Rail Service	Canadian Pacific
	LCFS Markets Served	Actively shipping low-CI bioethanol into premium LCFS markets
Capacity	Production Capacity (MM gal/year)	76.0
	Corn Consumption (MM bushels/year)	25.3
	DDGS Production (Tons/year)	150,774
	Corn Oil Production (MM lbs/year)	23.2
	CO_2 Production (mt/year)	>200,000
	Actual CCS Start-Up	Q4 2023

BFE Bioethanol Facility Overview

- Commissioned in February 2007 as a 50 MGY plant and located in Underwood, ND
- Co-located with Coal Creek Station (1,200 MW Power Plant)
  - BFE utilizes low grade steam from Coal Creek Station (CC Station) resulting in:
    - Favorable CI score in LCFS markets
    - Low-cost thermal energy
    - Redundant thermal energy supply – higher online time
- On-site, redundant combined heat & power back-up from natural gas commissioned in 2023 if CC Station is ever retired or service is interrupted
  - Enables access to LCFS markets, additional redundancy, and low energy input cost
- Total of 3.7MM bushels of corn storage
  - Including 2.2MM bushels at CC Drying & Storage, which is co-located with BFE
- 3 steam tube DDGS low temperature dryers
- Produces 76MM gallons of bioethanol / year
- Robust U.S. and Canadian market access via Canadian Pacific rail enables lowest shipping cost into Western Canada
  - Short line corn rail supply agreement as backstop to local corn via truck
- Blue Flint CCS assets commissioned in October 2023
  - Capturing and sequestering an annualized >210,000 mt of CO_2 per year
- Please click on the photo or link below to watch a video on CO_2 Carbon Capture & Storage at the Blue Flint Ethanol plant in North Dakota
  - CO_2 Carbon Capture & Storage at the Blue Flint Ethanol

HARVESTONE

Source: Company Management.

Confidential

DSA – Attractive Bioethanol Facility with CCS Development Underway

DSA Bioethanol Facility Key Stats

Spiritwood, ND

Plant Overview	Location	Spiritwood, ND
	Plant Technology	KFI / McGough
	Plant Commissioned	2015
	Rail Service	BNSF
	LCFS Markets Served	Access to multiple LCFS markets
Capacity	Production Capacity (MM gal/year)	84.0
	Corn Consumption (MM bushels/year)	28.0
	DDGS Production (Tons/year)	164,760
	Corn Oil Production (MM lbs/year)	35.4
	CO_2 Production (mt/year)	250,000
	Estimated CCS Start-Up	Q1 2026

DSA Bioethanol Facility Overview

- Commissioned in April 2015 and located in Spiritwood, North Dakota as a 65 MGY plant
- Co-located with Great River Energy's (GRE) Spiritwood Station, a 100MW power plant which provides low grade steam to DSA for thermal needs
  - GRE to pay for on-site CHP, if GRE ever decides to shut down Spiritwood Station
- Class VI filed in H2 2025 via a modification to the existing permit at BFE to accommodate DSA CO_2
  - CCS development capex includes truck loading / unloading to access BFE's existing Class VI well site
  - Estimated construction time is ~70 weeks from FID
- Actively developing plans to sequester CO_2 production
- Evaluating opportunities with multiple third-parties to sell CO_2 under long-term contracts for utilization in the manufacturing of Urea, Methanol and / or SAF
- 3 steam tube DDGS low temperature dryers
- 2.3MM bushels of corn storage on site with corn dryer
- Installed and commissioned Alpha Laval Oil Skimmer technology in late Q3 2024, which enhanced corn oil production to 1.3 lb/bushel
- Adjacent rail loop provides main line BNSF unit train service

HARVESTONE

Source: Company Management.

Confidential

IBEC – Premier Bioethanol Asset with Substantially Derisked CCS Development

IBEC Bioethanol Facility Key Stats

Rensselaer, IN

Plant Overview	**Location**	Rensselaer, IN
	Plant Technology	ICM / Fagen
	Plant Commissioned	2007
	Rail Service	CSX
	LCFS Markets Served	Access to multiple LCFS markets
Capacity	**Production Capacity (MM gal/year)**	60.0
	Corn Consumption (MM bushels/year)	20.2
	DDGS Production (Tons/year)	133,185
	Corn Oil Production (MM lbs/year)	18.5
	CO_2 Production (mt/year)	>165,000
	Estimated CCS Start-Up	Q1 2028

IBEC Bioethanol Facility Overview

- Commissioned in 2007 as a 40 MGY plant and located in Rensselaer, IN
  - Located 2 hours southeast of Chicago
  - Top three corn producing county in Indiana
  - 2MM bushels of corn storage on site
  - 3MM gallons of bioethanol storage on site
- ICM facility with advanced process control and selective milling technology
- Large wet feed market potential in local area
- CCS strategically located to capture emerging new Eastern LCFS markets
  - On-site stratigraphic test well drilled into Mt. Simon Formation in 2024 confirmed positive properties to utilize as geologic injection formation
  - Extensive 2D and stratigraphic testing completed, which will accelerate EPA review process
  - Secured necessary pore space rights in September 2024
  - Class VI permit filed with the EPA in August 2025
  - CCS development capex estimated to be $64MM and takes 70 weeks from initial equipment order

HARVESTONE

Source: Company Management.

APPENDIX B

MCGOUGH OVERVIEW

McGough

Building Our Critical Infrastructure

McGough is one of North America's largest and respected construction organizations. We routinely partner with clients to develop, plan and execute diverse and complex industrial construction projects within the markets we serve. We flourish via early involvement by influencing scope, budget, schedule and managing execution. We drive success by never settling for less.

Cenex Harvest States - Fairmont

Industry-Leading Expertise

At McGough, we're building America's future, tangible and intangible. We bring an unmatched team of construction professionals together and work relentlessly to understand and integrate complex equipment and systems, executing to specifications and standards that are second to none. We're responsible for delivering industrial facilities that help our clients and their communities thrive. Safe, efficient infrastructure is at the forefront of every project we pursue. Our responsibility is to build America's critical infrastructure, which is essential to the foundation of a flourishing society. We care, and it shows.

Dakota Spirit AgEnergy

THE EXPERIENCE YOU NEED:

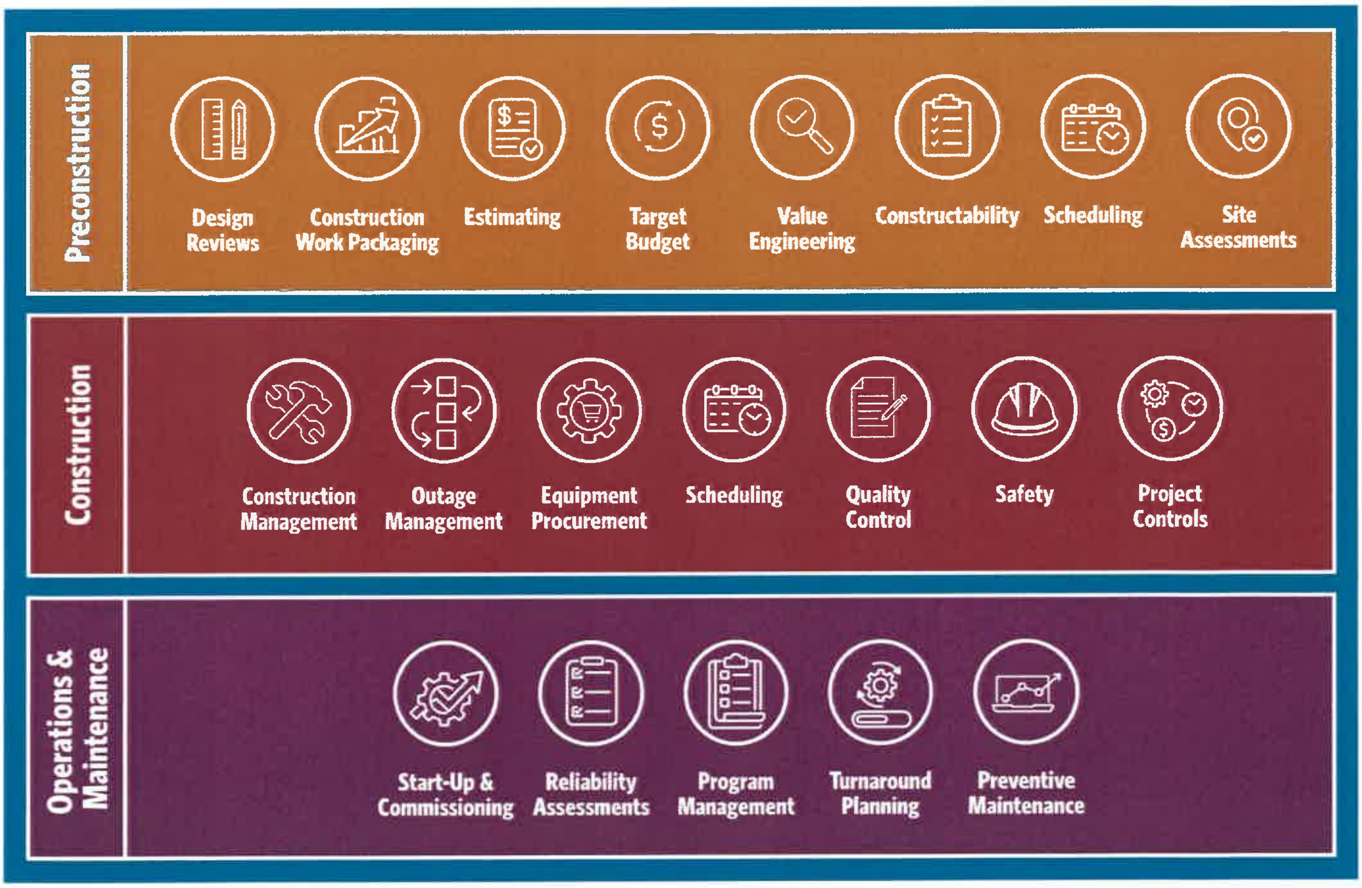
- Greenfield Development
- Shutdowns + Turnarounds
- Plant Expansions
- Start-Up Support

Industrial Markets We Serve

Oilseed Processing
Central Energy and Utilities
Chemical Production
Crude Oil Refining
Ethanol Production
Food and Beverage Manufacturing
Power Generation
Pipeline and Terminals
Renewables
Water/Wastewater

WE REGULARLY DELIVER PROJECTS OF ALL SIZES RANGING FROM $5,000 TO $500,000,000!

Industrial Services



Quick Facts!

McGough

About McGough

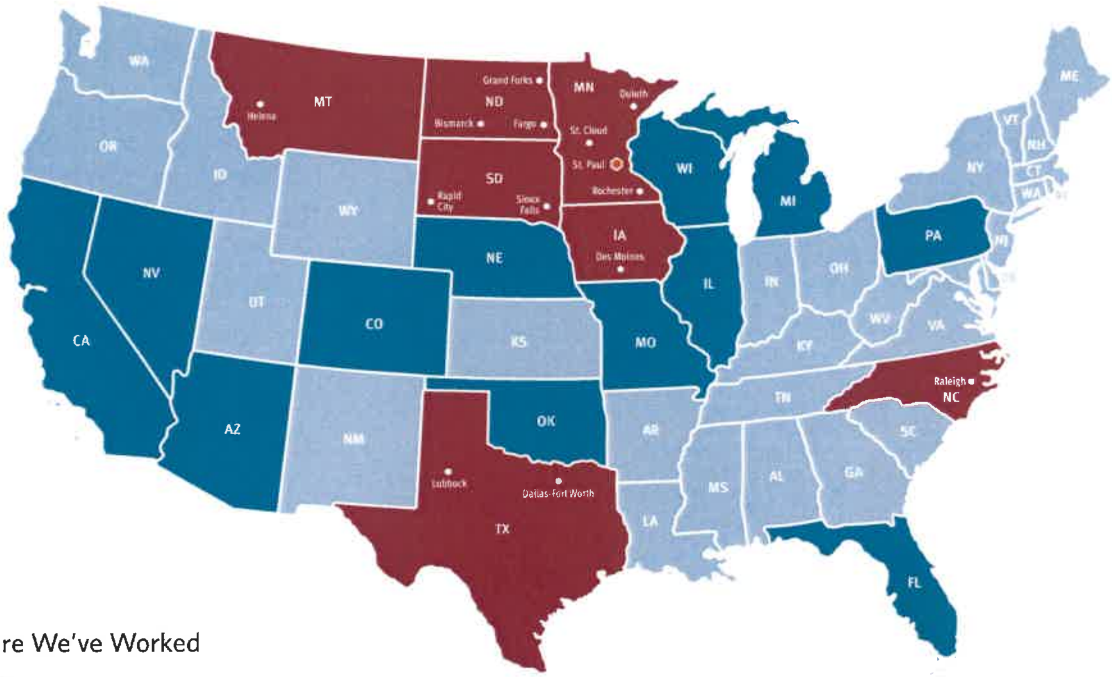
McGough is a premier construction firm with offices in key markets in the central and southern US and operate nationally. We have a history of thriving on jobs of all sizes, especially complex industrial projects spanning from power generation, ag and food processing, refineries, water/wastewater, manufacturing and more. We believe the things that set us apart are our down-to-earth, collaborative culture and our talented people. At every level, McGough employees do the right thing, are good stewards and act with integrity — the foundation of our reputation as exceptional partners who help elevate every project we touch.

HEADQUARTERS

Minneapolis-St. Paul, MN

OFFICES

Bismarck, ND
Dallas-Fort Worth, TX
Des Moines, IA
Duluth, MN
Fargo, ND
Grand Forks, ND
Helena, MT
Lubbock, TX
Raleigh, NC
Rapid City, SD
Rochester, MN
Sioux Falls, SD
St. Cloud, MN



- Office Locations
- Additional States Where We've Worked
- McGough Headquarters

www.mcgough.com

BUILDING FOR THE NEXT GENERATION

CHS

Canola Processing Plant

Greenfield canola processing and refining facility that processes up to 550,000 tons of canola seed annually. The project consists of the following areas: seed receiving, preparation, extraction, refining, utility building, cooling tower/fire protection, and unit train capable loop track with rail load-out facility and office and plant maintenance facility.

With a total value of over $125M, this complex agricultural processing plant was developed on a greenfield site along Highway 75, just south of Hallock, Minnesota. Design-build work included electrical and controls, pre-engineered metal buildings, fire protection, grain handling structures and associated equipment, grain storage, and field erected tanks.

PROJECT HIGHLIGHTS

- Civil / Sitework / Utilities
- Piling
- Construction of Preparation / Extraction / Refinery
- Grains Facility
- Rail
- Tank Farm
- Expansion to 1500 Tons per Day

LOCATION	SIZE	SERVICES
HALLOCK, MN	1500 TONS/DAY PROCESSING PLANT	PRECONSTRUCTION GENERAL CONTRACTOR

Standard Project Profile

LOCATION
Casselton, ND

COST
Confidential Contract Value

COMPLETION
October 2024

OWNER
CGB Enterprises and Minnesota Soybean Processors

North Dakota Soybean Processors

Soybean Processing Plant

MCGOUGH'S ROLE ON PROJECT: Construction Manager At Risk

Greenfield development of a soybean processing plant that focuses on outbound products such as refined soybean oil, soybean meal, and soybean hull pellets. Ability to receive 50,000 bushels per hour, and process 125,000 bushels per day, or approximately 42 million bushels per year. Project includes (3) main processing buildings, Prep, Solvent Extraction and Crude Oil Refinery. (2) main storage bins that store 1.1 million bushels each, an oil tank farm holding more than 4 million gallons of crude oil and a utility plant providing both steam and chilled water supply for process needs.

Total project cost of approximately $400,000,000 with construction completed in 24 months. Peak manpower reached over 360 construction employees on site per day. Total pieces of installed process equipment exceeded 2,000 and process piping installed in excess of 77,000lf.

APPENDIX C

SALOF OVERVIEW

5141 IH 35 South
New Braunfels, TX 78132
830-225-1744

COMPANY DOSSIER

Company Structure:	Salof LTD., Inc., is a Sub S Corporation, incorporated in the state of Texas on March 13, 2017.
Company Goal:	To provide the CO_2, LNG, and Industrial Refrigeration markets with World Class Process Systems that: • Have cost competitive designs, • Have minimal construction times, • Are easy to install with shop fabricated, pre-wired, and tested modules, • Can be commissioned in the shortest possible time, and • Are Safe and Economical to Operate Salof's design theory is based on a "Plug and Play" philosophy. To the fullest extent possible, fabricated modules, including interconnecting piping, is test fit and control wiring is completed and tested at our facility to greatly reduce site installation time. The PLC/HMI programming is executed by Salof Engineers and functionally tested to insure safe and efficient operation. As added quality control, a database of all components used in the manufacturing of a facility is maintained to insure we provide the correct equipment parts in the event parts are needed.
Total Employees:	98 personnel including contractors – Salof has the ability to easily ramp up shop labor through agreements with local resourcing agencies, and additionally through the reputation of the company as an excellent environment to work in and a company focused on the needs of the employee. The benefit of this alliance and reputation is it allows for operation cost to remain low and returns this value to the customer through cost savings in plant fabrication.
Primary Business:	Manufacturer of Modular CO_2, LPG, and LNG Liquefaction Plants, including complete integration of PLC and HMI for safe plant operation.
Background:	Salof LTD. was started in 2017. The company is a startup based on the history and knowledge of a core group of former Salof Refrigeration CO. Inc's, personnel. Salof Refrigeration completed multiple projects around the world and delivered systems specifically in the CO_2, LNG, NG, LPG, Conditioning and Industrial Refrigeration markets before being purchased by GE OIL & Gas in May 2013.

Salof LTD. is dedicated to continuing the philosophy of providing a facility to the customer that is fully operational and backed by the Salof name.

Services: Salof LTD. provides the following services; engineering, drafting, procurement, manufacturing, startup, commissioning, parts and services. Salof can also provide aftermarket technical support, plant monitoring, controls system upgrades, as well as equipment maintenance and package refurbishing. With the ability to design, procure, and manufacture facilities in house, Salof can produce a quality product in a controlled environment on a continual basis for all customers.

Key Process: Salof incorporates the latest technology and manufacturing processes to provide a facility designed to the customer specifications. Guarantees can be provided on capacity, power consumption, and schedule. With the ability to perform a large majority of the commissioning testing in house through the use of a plug and play design Salof can provide these guarantees knowing that when the product ships it has already been tested for functionality and ability to the extinct possible without introducing gas to the systems. This allows for a high-quality product to be delivered each time.

Key Personnel: Salof's Key Personnel represent a combined experience of over 200 years in design, manufacturing, installation, commissioning, operation, and parts supply for:

- 155 - CO2 Liquefaction Plants,
- 71 - Acid Recovery Plants,
- 20 - LNG Liquefaction Plants
- 8 – LPG, HHR Plants
- 50 - Ammonia Refrigeration Systems

Additionally, most of the Key Personnel were formally associated with Salof Refrigeration Co., Inc., before being purchased by GE Oil and Gas in June of 2013.

Location: Salof LTD., Inc., is located in the original Salof Companies facility in New Braunfels, Texas. The facility sits on a 9-acre tract with 40,000 sq./ft of manufacturing space under crane, 6,000 sq./ft of office space and 8,000 sq./ft of parts storage space.

The site is situated along Interstate 35 in New Braunfels, Texas allowing easy access to transport completed modules throughout the United States, Canada, and Mexico. For International Shipping, the Port of Houston is 190 miles from our facility.

Current Client list:

- Airgas/Air Liquide
- Air Products
- Matheson / Continental Carbonic Products., Inc.
- Linde / Praxair
- Messer
- Pennsylvania Grain

- Poet Ethanol
- Polar Ice
- Mustang Gas Products LLC.
- SME
- Red Trail Energy(GEVO)
- Blue Flint Ethanol(Harvestone)
- Shell
- Midrex
- Hartree
- White Energy
- SMS

APPENDIX D

EERC OVERVIEW

EERC Background/Overview with Oil and Gas and CO2 Storage Focus

The Energy & Environmental Research Center (EERC) is a research, development, demonstration, and commercialization organization recognized as one of the world's leading developers of cleaner, more efficient energy and environmental technologies. The EERC has a proven track record working with industry to develop and deploy a wide range of innovative and synergistic technologies. Since the EERC became a part of the University of North Dakota (UND) in April 1983, it has established working relationships with over 1300 different entities, including federal and state agencies such as the U.S. Department of Energy (DOE), universities, energy exploration and production companies, research and development firms, engineering firms, and other organizations, representing 53 countries. The EERC employs over 200 people and is expanding its staff. This staff includes a diverse multidisciplinary team of engineers, geologists, and other scientists with extensive research and operational experience and cross training. The EERC has expertise in data collection, management, and interpretation; petrophysical analysis; geostatistical analysis; geo cellular modeling at field and regional scales; geologic characterization and reservoir evaluation; conducting predictive numerical injection and production simulations; performing fossil fuel and CO2 storage resource assessments; and creating geographic information system (GIS) products. The EERC has a specialized technical group focused on the implementation of new approaches to the exploration, development, and production of oil and gas resources and geologic CO2 storage. Working closely with industry and government agencies, this group has developed tools and approaches specifically focused on resource assessment and optimization with a focus on commercial application of technology. Practicing under the long-standing EERC philosophy of collaboration with an interdisciplinary approach, the group's success is based on developing effective partnerships with energy and environmental industries and government agencies. The EERC has a proven track record of conducting small- and large-scale projects that meet the needs of its clients. Projects can range in size and scope from singularly focused, fast-tracked projects for individual clients, to multiyear, multimillion-dollar programs with multiple stakeholders. Projects successfully conducted in the past include studies focused on the Powder River, Denver–Julesburg, Williston, and Alberta Basins. Extensive databases of petroleum related characteristics for the basins have been created, including web-based decision support systems (DSSs) for CO2 storage and enhanced oil recovery (EOR) opportunities and the unconventional Bakken resource play. These web-based systems use GIS, are based on existing geological and engineering data sets, and are tailored to aid in the identification and, ultimately, development of new oil and gas exploitation and CO2 storage opportunities in the central interior of North America.

Carbon Capture, Utilization, and Storage

CCUS RESEARCH, DEVELOPMENT, AND DEPLOYMENT

EERC
UNIVERSITY OF NORTH DAKOTA

The Energy & Environmental Research Center (EERC) is working with key stakeholders to develop CO_2 mitigation solutions. Carbon capture, utilization, and storage (CCUS) can provide a proven option for utilities and other industries seeking to combine greenhouse gas (GHG) mitigation with operations, creating market advantages and opportunities for the use or sale of captured CO_2.

At the EERC, we conduct applied research for all stages of CO_2 capture and geologic storage projects, from technology demonstrations and regional assessments to detailed site appraisals in support of CCUS deployment. We successfully design and deploy CCUS technologies, including projects at the industrial scale, forming effective partnerships with industry.

Our expertise and extensive experience encompass associated storage incidental to enhanced oil recovery (EOR) operations and dedicated storage in deep saline formations. Capabilities also extend to potential storage in unconventional oil and gas reservoirs and other subsurface scenarios, such as deep unminable coal seams.

CARBON CAPTURE

We have the equipment and expertise to evaluate and develop CO_2 capture systems. Several of our highly adaptable pilot-scale systems can produce combustion flue gas and gasification syngas from virtually any fuel (all coal ranks, liquids, and gases) for testing of postcombustion and precombustion CO_2 capture and separation technologies.

Capture and separation have been successfully demonstrated at Minnkota Power Cooperative's Milton R. Young Station near Center, North Dakota, as part of Project Tundra. The project has received additional federal and state funding and is moving ahead to a front-end engineering and design (FEED) study.

CARBON UTILIZATION

We conduct multidisciplinary research to demonstrate the potential for CO_2-based EOR and associated storage in the unconventional tight Bakken petroleum system, which has the potential to produce over 600 billion barrels of oil. We developed an innovative method to determine the ability of CO_2 to permeate the Bakken's tight formation and mobilize oil, yielding new insight into the chemical and physical mechanisms of CO_2 storage and EOR in these types of formations.

North Dakota CarbonSAFE research has proven the feasibility of CO_2 use for EOR in both conventional and unconventional oil fields. The EERC has shared involvement in other states' CarbonSAFE studies as well, yielding positive results in multiple types of geologic formations.

CARBON STORAGE

We have investigated CO_2 geologic storage at all levels, from regional assessments to detailed site appraisals, in support of CCUS deployment. CO_2 storage due to EOR operations and dedicated storage of CO_2 in deep saline formations are both valued EERC skillsets.

The Red Trail Energy Carbon Capture and Storage Project is assessing the ability to inject captured CO_2 from its ethanol plant into two potential sandstone layers for permanent storage.

CRITICAL CHALLENGES | **PRACTICAL SOLUTIONS**

SERVICES AND SOLUTIONS

- Pilot-scale testing and evaluation of capture technology:
  - System is portable and can be installed on-site.
- Long-term demonstration of solvent performance and impurity management.
- Modeling and assessment of integration approaches.
- Techno-economic evaluations of capture technologies.
- Technical support for large-scale capture demonstration.
- Proven adaptive management approach for deployment of storage, both in deep saline formations and associated with EOR.
- Implementation of field services: vendor identification and selection, project planning, data acquisition and support, and fully integrated interpretation of data and results.
- Life cycle analysis of CCUS projects, including CO_2 EOR.
- Expertise to develop cost-effective technical programs:
  - Site characterization including field and laboratory testing and evaluation of geologic, geophysical, geomechanical, and petrophysical data.
  - Design and implementation of site-specific, cost-effective MVA (monitoring, verification, and accounting) plans to ensure that business case and regulatory requirements of a CO_2 storage project are met.
  - Development of new cost-effective geophysical monitoring technologies.
  - Reservoir and process chemistry modeling and simulation.
  - Risk assessment and risk management.

PCOR PARTNERSHIP INITIATIVE

The PCOR Partnership Initiative addresses regional capture, transport, use, and storage challenges facing commercial CCUS deployment by focusing on:

- Strengthening the technical foundation for geologic CO_2 storage and enhanced oil recovery.
- Advancing capture technology.
- Improving application of monitoring technologies.
- Promoting integration between capture, transportation, use, and storage industries.
- Facilitating regulatory frameworks.
- Providing scientific support to policy makers.

PCO2R Partnership

The U.S. Department of Energy (DOE) National Energy Technology Laboratory (NETL) through its Regional Carbon Sequestration Partnerships Initiative, the North Dakota Industrial Commission (NDIC), and partner organizations are fostering the deployment of CCUS in the PCOR Partnership region. The EERC leads the PCOR Partnership Initiative, with support from the University of Wyoming and the University of Alaska at Fairbanks

PROJECT TUNDRA

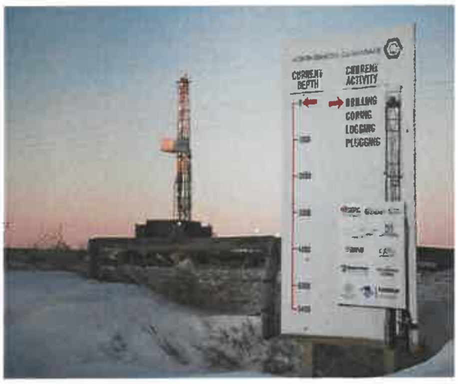
Our extensive work in CO_2 capture enables CCUS projects to move forward by determining the best capture technology options and system configurations for an existing lignite-fired system. Our research in CCUS informed Minnkota Power Cooperative's Project Tundra, which will assess the final barriers relating to efficiency and economics for implementation of postcombustion capture on the existing fleet of power systems. Project Tundra is led by Minnkota Power and supported by partnerships between the EERC, BNI Energy, NDIC, DOE, and Burns & McDonnell.

PROJECT TUNDRA

BEST

The North Dakota Brine Extraction and Storage Test (BEST) project is developing active reservoir management (ARM) techniques that have potential to improve the performance of geologic CO_2 storage. ARM uses the extraction of native brine from the same formation where CO_2 is being stored to manage reservoir pressure to improve injection and minimize a CCS project's risk and operating profile. Modeling suggests that ARM can theoretically reduce the size of the permitted area, the area of review, and the postinjection monitoring period for CCS projects by more than 90%. The ARM being conducted by the EERC through the BEST project is the first at-scale field pilot designed to validate ARM performance. The results will be valuable for determining the expected techno-economic performance of ARM for a range of potential implementation scenarios that could benefit CCS projects.

Treatment and handling of high-TDS (total dissolved solids) waters associated with energy production are challenging and not readily or economically accomplished using conventional water treatment techniques. Geologic injection is often required to effectively manage fluids associated with electrical power generation, oil and gas production, and active reservoir management for geologic CO_2 storage. As part of a public–private collaboration, the EERC constructed a facility in western North Dakota to pilot-test high-TDS water treatment technologies. These technologies can produce alternate sources of water for industrial or domestic use, produce salable products, and meaningfully reduce brine disposal volumes. The pilot testing conducted through the BEST project provides critical understanding of technology performance under field operating conditions.



NORTH DAKOTA CARBONSAFE, CARBONSAFE–WY, MIDCONTINENT

The North Dakota Carbon Storage Assurance Feasibility Enterprise—CarbonSAFE for short—is assessing the feasibility of commercial-scale geologic storage of CO_2 to manage CO_2 emissions captured from coal-based energy facilities. The project is part of an ongoing effort to ensure clean, affordable energy and the wise use of North Dakota's resources. The North Dakota project is one of 16 projects funded under DOE's CarbonSAFE Initiative. DOE's CarbonSAFE Initiative supports projects that address key research in the path toward the deployment of CCUS technologies, including the development of safe, commercial-scale geologic storage sites for CO_2.

RED TRAIL ENERGY CCS

Red Trail Energy (RTE), which owns an ethanol plant near Richardton, North Dakota, and the EERC began investigating CCUS to reduce the CO_2 emissions associated with ethanol production. Reducing emissions at an ethanol facility makes the produced fuel more valuable to states that have low-carbon fuel programs. It could also qualify the facilities for federal tax credits for capturing and storing CO_2 in deep geologic formations. In partnership with NDIC through the North Dakota Renewable Energy Program, and with DOE, research has been ongoing since 2016. Technical and economic feasibility of CCUS technology with ethanol production has been successfully demonstrated for the RTE site. Recent activities include construction and implementation following approval of the first North Dakota CO_2 storage facility permit in October 2021.

BELL CREEK AND CEDAR CREEK ANTICLINE PROJECTS

With the support of Denbury Resources Inc. (Denbury), the EERC successfully completed the integrated technical assessment of 5 million tons of associated storage at Denbury's Bell Creek Field as part of the PCOR Partnership. This collaboration has facilitated the ongoing field assessment of several innovative technologies through the PCOR Partnership and multiple separately funded projects. Denbury continues to support the PCOR Partnership in the advancement of EOR technology to foster CCUS deployment. Denbury is implementing a commercial project that injects approximately 1 million tons (0.9 million tonnes) of CO_2 a year into its Bell Creek oil field to rejuvenate oil production and permanently store anthropogenic CO_2 deep underground. The EERC is adding value to Denbury's project through additional characterization, monitoring, and modeling. This collaborative effort will result in a new standard for safe and practical long-term geologic storage of anthropogenic CO_2.

FEED AT COAL CREEK STATION

A FEED study is being conducted for full-scale carbon capture at the Coal Creek Station located 50 miles north of Bismarck, North Dakota. The EERC is leading the FEED, utilizing our experience in carbon capture and providing critical information learned during previous slipstream testing with our portable pilot-scale carbon capture system. The EERC is being supported by NDIC, Rainbow Energy, Mitsubishi Heavy Industries, and Burns & McDonnell.

PCO_2C

Beginning in 2008, the EERC worked with DOE and 30 private sector partners under the Partnership for CO_2 Capture (PCO_2C). The program began to develop, evaluate, and reduce the energy requirements and associated costs of promising carbon capture technologies. PCO_2C advanced technologies along the development pathway in preparation for scale-up and deployment. The EERC designed and fabricated world-class systems to test postcombustion and precombustion capture technologies on its existing solid fuel combustion and gasification test facilities.

Partnership for CO_2 Capture

Energy & Environmental Research Center
University of North Dakota
15 North 23rd Street, Stop 9018
Grand Forks, ND 58202-9018
www.undeerc.org

EERC
UND UNIVERSITY OF NORTH DAKOTA

APPENDIX E

ICT OVERVIEW

ICT

A Salas O'Brien Company

NASHVILLE, TN | KNOXVILLE , TN | TAMPA, FL | BROOKHAVEN, MS | SAN ANTONIO, TX | LOUISVILLE, KY

FIRM OVERVIEW

Established in 1942 and headquartered in Nashville, TN, I.C. Thomasson Associates, Inc. (ICT) has a strong local team of over 300 skilled professionals, including over 75 licensed engineers. We manage more than 1,200 projects annually, with construction costs often surpassing $500 million.

#2 BUILDING DESIGN +CONSTRUCTION TOP 70 ENGINEERING FIRMS 2024

MEP GIANTS 2024 #9

#81 2023 ENR TOP 500

Engineering service specialties include:

- Mechanical engineering
- Electrical Engineering
- Fire protection
- Instrumentation and controls
- HVAC design
- Plumbing design
- IT/Telecom design

Our clients work in diverse industries:

- Hospitality
- Multi-family
- Healthcare
- Industrial
- Manufacturing
- Commercial
- Institutional
- Aviation
- Education

HQ - Nashville, TN

EXPANDED CAPABILITIES

In Spring 2024, ICT became a Salas O'Brien company, significantly expanding our in-house service offerings to include civil, structural, acoustic design, and decarbonization. As a Salas O'Brien company, ICT has access to more than 4,100 team members, 900+ registered technical professionals with over 95 office locations. Together, we work in all 50 states and around the world in even more industries, including life sciences, mission-critical, and sports and entertainment. By collaborating and sharing expertise, we deliver exceptional solutions for our clients' most complex challenges.

COMMITMENT TO EXCELLENCE AND INNOVATION

We are dedicated to upholding the highest standards of quality and innovation in all of our projects. Our engineers are industry leaders who stay at the forefront of emerging technologies and industry best practices. With a rich history and a forward-looking vision, ICT is your trusted partner in engineering excellence.

APPENDIX F

KLJ OVERVIEW

KLJ

2025

OIL & GAS

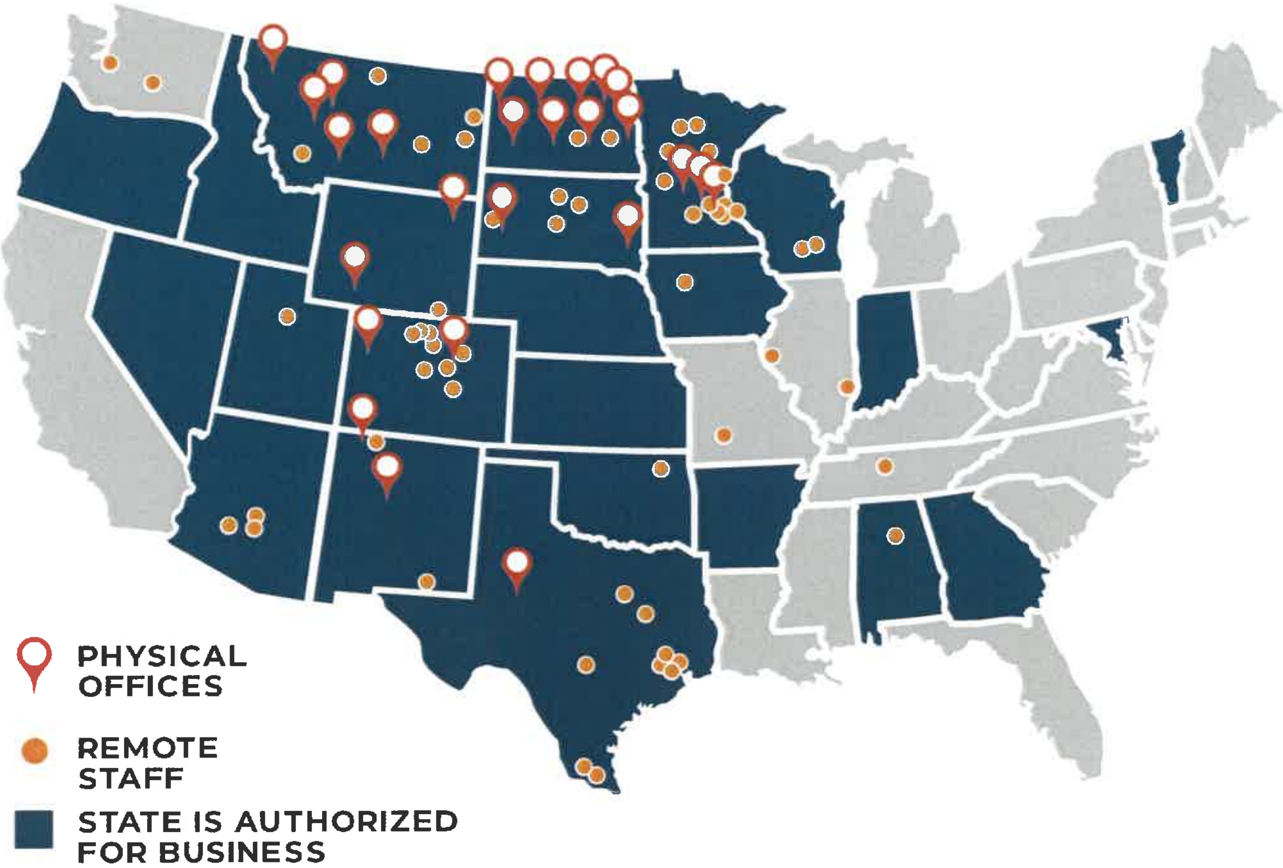
Since the 1930s, KLJ has focused on infrastructure of all types, and for the dynamic oil and gas industry, our full-service engineering company can help you plan, operate, and maintain your Oil & Gas infrastructure.

We bring experience and understanding to each project, developing a customized approach to deliver the services you need when you need them.

NATIONWIDE EXPERTISE
LOCALLY DELIVERED

At KLJ, our people are positioned to make a difference. With offices across multiple states and remote team members embedded in communities nationwide, we deliver high-quality engineering services rooted in regional knowledge. Our licensure in nearly every state enables us to be not only available—but authorized—to deliver wherever we're needed.

Below is a detailed map of KLJ's office locations and the cities where our remote employees reside—demonstrating not only where we are, but how effectively we can support your project anywhere it takes place.



OUR SURVEY SERVICES IN THE SOUTHWEST AND FOUR CORNERS REGIONS
have expanded with the addition of D.R. Griffin, Inc. and United Field Services in the following locations:
Grand Junction, CO | Flora Vista, New Mexico | Rock Springs, WY

OFFICE LOCATIONS

COLORADO
- Denver Metro/ Englewood
- Grand Junction

MINNESOTA
- Annandale
- Eagan
- Saint Louis Park

MONTANA
- Billings
- Bozeman
- Great Falls
- Helena
- Kalispell

NEW MEXICO
- Albuquerque
- Flora Vista

NORTH DAKOTA
- Bismarck
- Devils Lake
- Dickinson
- Grafton
- Grand Forks
- Minot
- Valley City
- West Fargo
- Williston

SOUTH DAKOTA
- Rapid City
- Sioux Falls

TEXAS
- Midland

WYOMING
- Gillette
- Rock Springs

REMOTE LOCATIONS

ALABAMA
- Ashville

ARIZONA
- Goodyear
- Surprise
- Wadell

COLORADO
- Brighton
- Littleton
- Lakewood
- Longmont
- Colorado Springs
- Westminster
- Broomfield
- Wheat Ridge

IOWA
- Pomeroy

ILLINOIS
- West Union
- Andalusia

MINNESOTA
- Golden Valley
- Waconia
- Bemidji
- Northome
- Farmington
- Osakis
- Duluth
- Fridley
- Deerwood
- Rochert
- Minneapolis

MISSOURI
- Springfield

MONTANA
- Glendive
- Sidney
- Miles City
- Butte
- Havre

NORTH DAKOTA
- Mandan
- Jamestown

NEW MEXICO
- Carlsbad
- Farmington

OKLAHOMA
- Collinsville

SOUTH DAKOTA
- Pierre
- Aberdeen
- Piedmont
- Selby

TENNESSEE
- Nashville

TEXAS
- Cypress
- Corsicana
- Harlingen
- Greenville
- La Porte
- Edinburg
- Wortham
- San Antonio
- Dickinson

UTAH
- Cedar Hills

WASHINGTON
- Tacoma

WISCONSIN
- Black Earth
- Hudson
- Deerfield

WYOMING
- Cheyenne

DESIGNING OUR NATION'S POWER INFRASTRUCTURE

The ups and downs of the oil and gas industry keep all of us on our toes and anticipating the next big move. New technologies lead to new opportunities, and we know that when the time is right you need a partner who can help transport, store, and handle your commodity. Partner with us for reliable oil and gas infrastructure.

UPSTREAM

- Pad and Road Design
- Engineered Well Pads
- Drilling Application for Permits to Drill (APDs)
- General Pad Arrangements
- Facility Design
- Survey, Environmental, and Right-of-Way (ROW) Services
- CO2 Flooding

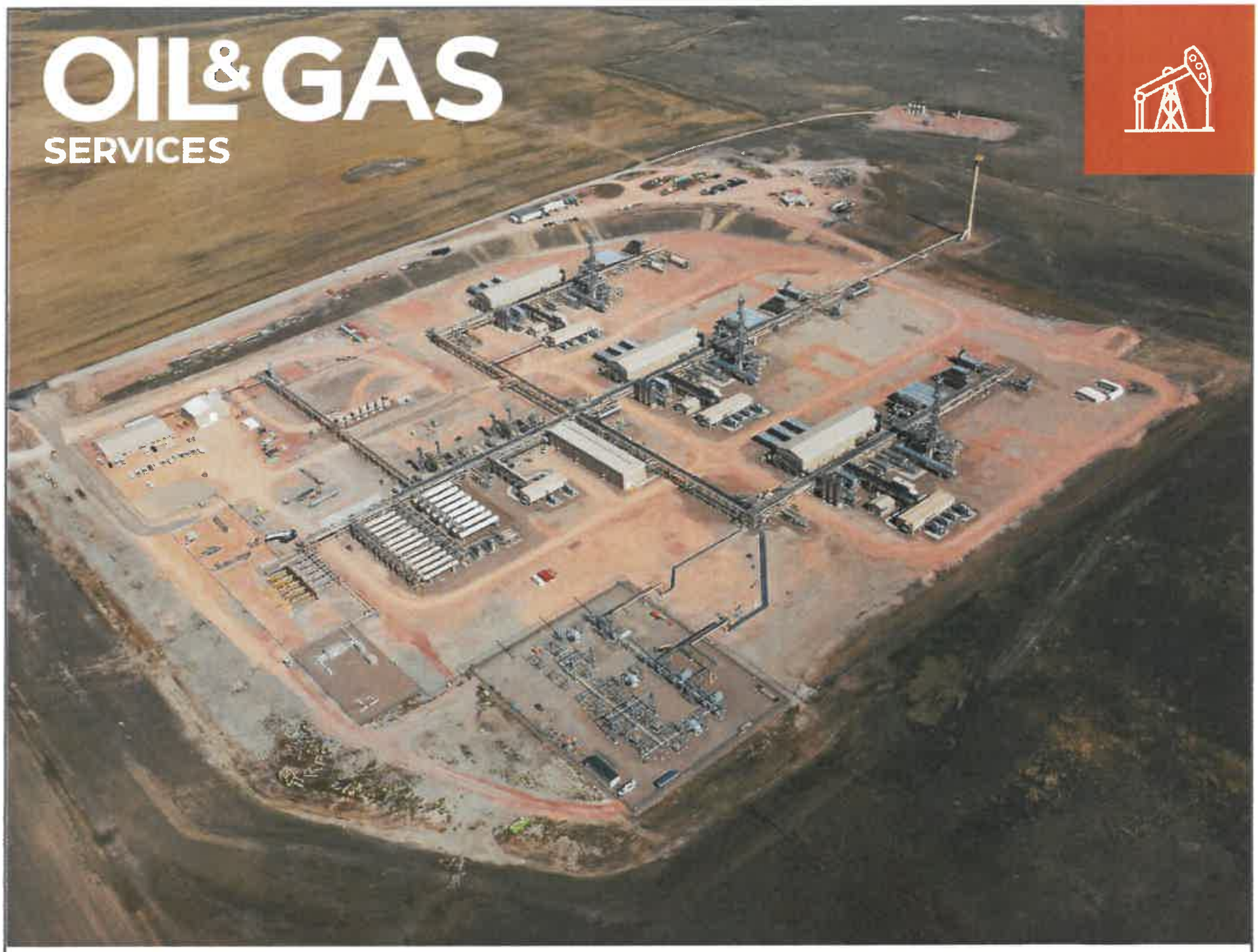
MIDSTREAM & PIPELINE

- Hydraulic Modeling
- Pipeline Design and Specification
- Engineered Horizontal Directional Drilling (HDD)/ Bore Profiles
- DOT 192/195, Pipeline and Hazardous Materials Safety Administration (PHMSA) Compliance
- GIS/CAD
- Alignment Sheet, and Development
- Pipeline Facilities
- Survey, Environmental, and ROW Services
- Route Selection
- Project Cost Estimating
- Materials Procurement
- Gas Plant Facilities
- Pipelines, Regulated and Non-Regulated: Gathering, Transmission, Chemical, Water
  - Natural Gas, Liquefied Petroleum Gas, Crude Oil, Refined Petroleum Products, and Chemicals
- Pipeline Facilities
  - Field Treating (H2S, CO2, H2O)
  - Saltwater Disposal
  - Well-Head Processing
  - Central Processing Facilities
  - Tank Farms and Batteries: Crude, Natural Gas and NGL Storage
  - Loading and Unloading Facilities/ Terminals: Crude, Natural Gas
  - Meter Stations/Tie-Ins
  - Compressor Stations
  - Pump Stations
  - MCCs
  - Analyzer Buildings
  - Control Rooms
- Gas Facilities: NGL, LPG, LNG
  - Compression
  - Expansion
  - Refrigeration
  - Distillation: TEG, Amine
  - Separation
  - Heating and Cooling Exchangers
  - Cryogenic Separation
  - Liquefaction/Gasification
  - MCCs
  - Control Rooms

DOWNSTREAM & FACILITIES

- Dehydration and Amine Treating Units
- Crude, FCC, Hydro processing, Reforming, Alkylation, Heavy Oil Processing Units
- Propylene and Butane Recovery
- Energy Management
- Cooling Water Systems and Utilities
- Tank Farms
- MCC
- Analyzer Buildings
- Control Rooms
- Railcar Loading/Unloading Facilities
- As-Builds, Walk Downs, Drone Data Collection
- Natural Gas Liquids Handling, Including Refrigerated and Cryogenic Units
- Small and Large Capital Project Implementation
- Management of Change
- Process Safety Management

OIL & GAS SERVICES



CONSTRUCTION MANAGEMENT

- Supply Acquisition
- Planning
- Capital Spending Budget
- Contractor Bid Packages
- Material Acquisition
- Planning and Scheduling
- Field Observation
- Construction Inspection Services
- As-Built Laser Scanning

CARBON CAPTURE

- Survey, Environmental, and Cultural Assessments
- Carbon Capture Equipment Design
- Plant Modification Design
- UAV Drone Flying, Video, Updated Visuals of Site and Pipeline Rout
- Sequestration Leakage and Vegetation Monitoring

LAND RECLAMATION & RESTORATION

- Oil Field Spill Assessments and Remediation
- Survey with optional UAV/ Drone Collection
- Archaeological Assessment
- Subsurface Analytics
- Design
- Construction Observation and Inspection
- Post Reclamation Site Assessment
- Release from Bond Services

SURVEY
SERVICES

SURVEY AND MAPPING/GIS

Accurate survey makes accurate projects. Whether it's a survey crew on the ground or a drone in the sky, we collect data quickly and accurately to provide the information you need to identify the lay of the land, and any physical features that may impact your project.

TOPOGRAPHIC DESIGN SURVEY
- Utilities
- Industrial
- Transmission/Distribution
- Route/Corridors
- Oil Wells
- GIS
- Remote Sensing
  - UAS Survey/Drone Survey
  - LiDAR
  - Aerial Photo Control
  - Terrestrial 3D Scanning

BOUNDARY SURVEY
- ALTA
- Residential Lots
- Subdivisions
- As-Builts
- Cadastral
- ROW

OIL & GAS SURVEY
- Well Pad Locations
- ROW
- Easement
- As-Builts

CONSTRUCTION SURVEY
- Transportation
- Municipal
- Civil Sites
- Airports
- Oil/Gas Pipelines
- Windfarms
- Utilities
- Industrial
- Transmission/Distribution Lines
- Oil Wells

ENVIRONMENTAL PLANNING AND SCIENCE

The environment is important to all of us, and sometimes building the infrastructure is the easy part. Down to the smallest details, we consider all environmental and cultural aspects that could impact your project. Effective environmental planning starts your project off right and keeps it moving forward. When you work with us, you get the experience you need with the recommendations you can trust.

ENVIRONMENTAL PLANNING

- Administrative/Project Record
- Agency Coordination
- Environmental Feasibility Studies/ Corridor Studies
- Environmental Reviews For Grant Applications
- Federal, State, and Local Permitting
- National Environmental Policy Act (NEPA) Compliance Analysis and Documentation Including:
  - Categorical Exclusion (CATEX)
  - Environmental Assessment (EA)
  - Environmental Impact Statement (EIS)
- Public and Stakeholder Engagement

NATURAL RESOURCES

- Avian/Bat/Raptor Studies and Monitoring
- Critical Habitat Surveys/ Threatened and Endangered Species Surveys
- Biological Assessments
  - Botanical Surveys
  - Wildlife Surveys
- Construction and Environmental Compliance
  - Storm Water Pollution Prevention Plan (SWPPP)
  - Aquatic Resource Monitoring
- Habitat Conservation Plans
- Wetland Delineations and Waters of the US Surveys
- Streambank Restoration
- Reclamation Plans

SITE INVESTIGATION & REMEDIATION

- American Society for Testing and Materials (ASTM) and Limited Phase I/II Environmental Site Assessments
- United States Environmental Protection Agency (USEPA) Brownfields Redevelopment
- Soil, Groundwater, Surface Water, Air Sampling
- Baseline Water Sampling
- Oilfield Spill Remediations
- Asbestos/Lead-Based Paint Inspections
- Spill Prevention, Control, and Countermeasure (SPCC) Inspections

CULTURAL RESOURCES

- Construction Monitoring
- History and Architectural History
- Tribal Consultation
- Paleontology
- Prehistoric and Historic Archaeology
- Report of Investigations
- Survey, Evaluative Testing, and MitigationSpecies Surveys

CULTURE ENHANCES COMMUNITIES

We believe in balance when combining opportunity, development, and culture. A deep history and tradition shape the future of each Tribe, and the right partnership between a Tribal Nation and a firm can help move visions forward. We offer a comprehensive range of planning and engineering services designed to support Tribal communities in their journey toward growth, development, economic diversification, affordable housing, connectivity, safety, sustainability, and resilience.

GRANT WRITING & ASSISTANCE

- Grant Advocation and Education
- Grant Identification
- Grant Writing
- Grant Negotiation, Administration, and Reporting

LAND USE PLANNING/SITE DEVELOPMENT

- Master Planning
- Economic Diversification
- Site Development
- Public Input and Tribal Outreach
- Feasibility Studies
- Transportation Access and Utilities Planning

RENEWABLE ENERGIES

- Microgrids
- Solar
- Wind
- Energy Storage
- Biomass
- Small-Scale Renewables

ECONOMIC DEVELOPMENT/ TOURISM

- Comprehensive Economic Development Strategies (CEDS)
- Tourism Development
- SWOT Analysis
- Economic Resiliency
- Economic Feasibility Studies
- Strategic Direction and Diversification
- Implementation Plans

UTILITIES & RENEWABLE ENERGIES

- Utilities
  - Broadband
  - Power
  - Solid Waste
  - Water
  - Wastewater
- Renewable Energies
  - Microgrids
  - Solar
  - Wind
  - Energy Storage
  - Biomass
  - Small-Scale Renewables

ENVIRONMENTAL& CULTURAL RESOURCES

- Environmental Resources
  - Construction Monitoring
  - History and Architectural History
  - Tribal Consultation
  - Paleontology
  - Prehistoric and Historic Archaeology
  - Report of Investigations
  - Survey, Evaluative Testing, and Mitigation
- Cultural Resources
  - Biological Assessments
  - Botanical Surveys
  - Wildlife Surveys
  - Wetland Delineations and Riparian Surveys
  - Phase I/II Environmental Site Assessment
  - NEPA Compliance
  - Construction Monitoring

CONSTRUCTION SERVICES

CONSTRUCTION ADMINISTRATION

KLJ's construction services and management will turn your projects into reality. Each project is delivered with the quality you expect, on schedule and budget, and follows the defined scope for a successful outcome.

PROJECT CONTROLS

- Program Management
- Project Management
- Procurement Support

CONSTRUCTION ADMINISTRATION & MANAGEMENT

- As-Built Drawings
- Stakeholder Communication
- Quantity Documentation
- Punch List Management
- Critical Path Method (CPM) Schedule Development and Review
- Constructability Review
- Resident Engineer
- Staff Augmentation
- State/Federal Documentation
- Project Close Out

MATERIAL TESTING

- Aggregate Testing and Sampling
- Bituminous Testing and Sampling
- Concrete Testing and Sampling
- Soil Testing and Sampling
- Laboratory Testing
- Bituminous Coring

CONSTRUCTION OBSERVATION

- Field Engineering
- Field Observation
- Survey and Staking Coordination
- Materials Testing Coordination

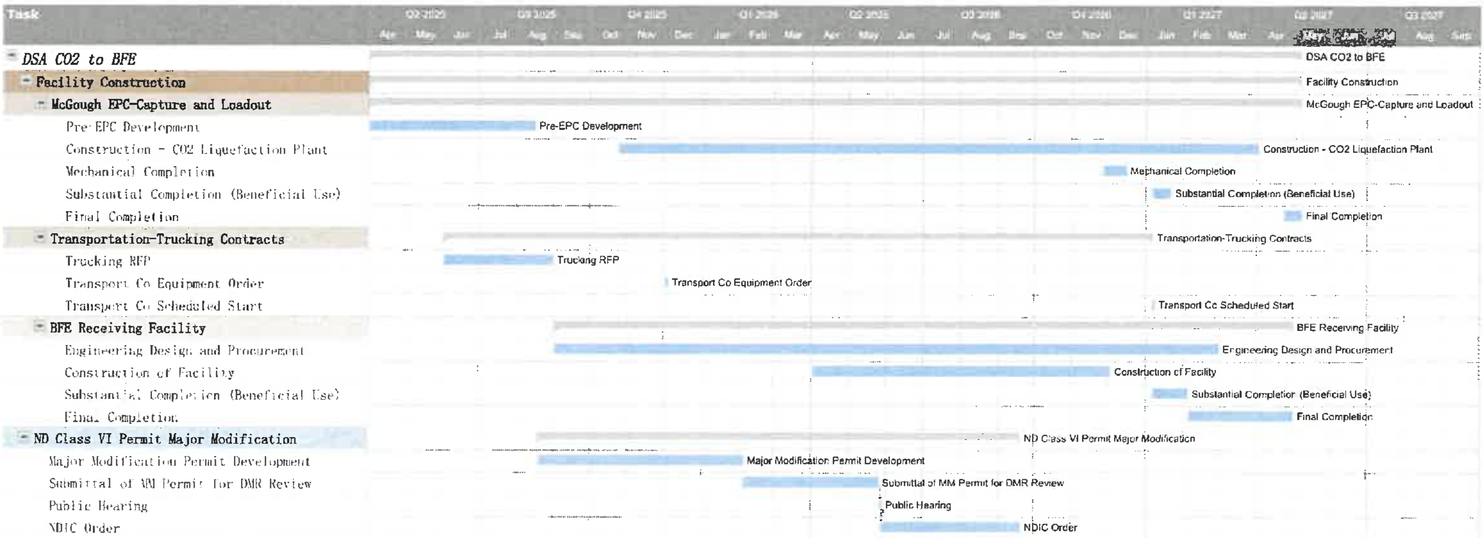
CONTRACTOR SERVICES

- Critical Path Method Scheduling
- Time Impact Analysis
- Claims Support
- Surface Modeling
- Maintenance of Traffic Design

ALTERNATIVE DELIVERY

- Design-Build
- Progressive Design-Build
- Construction Manager/General Contractor (CM/GC)
- Owner Support Services

APPENDIX G
PROJECT SCHEDULE



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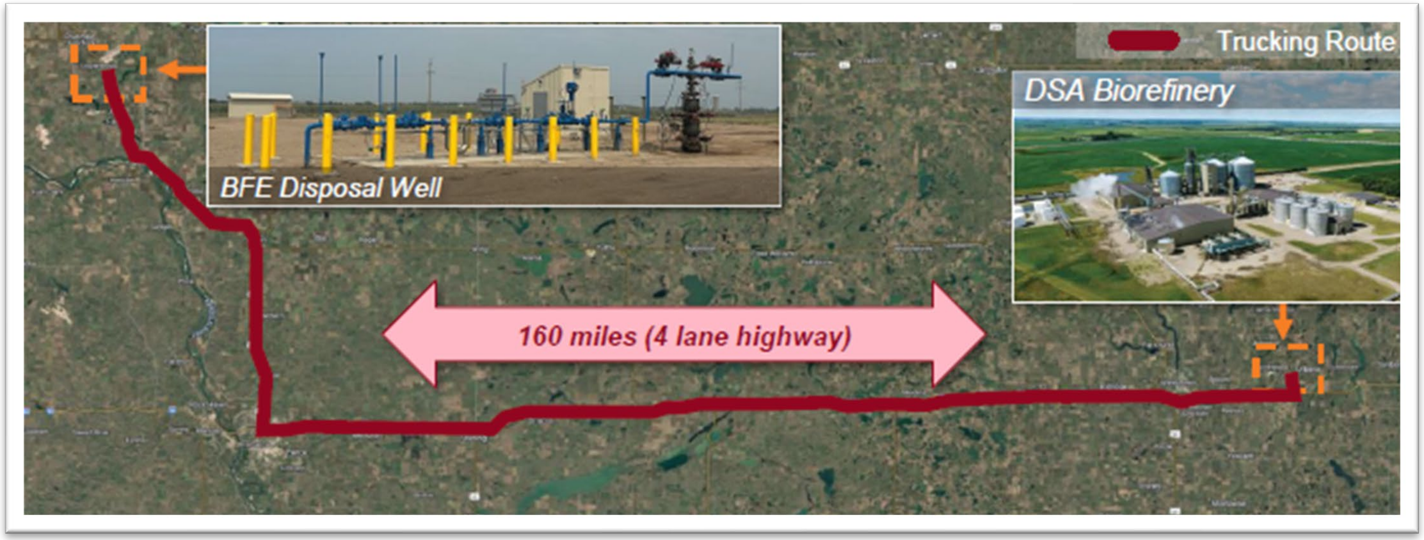
Commercial Deployment of Carbon Dioxide Capture, Transport, and Storage

Presented by:
Adam Dunlop
Chief Development Officer
HLCP Prodco, LLC on behalf of Dakota Spirit AgEnergy, LLC

HARVESTONE
LOW CARBON PARTNERS

Commercial Deployment of CO_2 Capture, Transport & Storage for Dakota Spirit AgEnergy



- Capture CO_2 from DSA ethanol facility using proven liquefaction technology
- Transport liquefied CO_2 using dedicated trucking fleet to offloading station at BFE
- Receive, store, increase pressure and meter high pressure CO_2 into existing flow line
- Permanently sequester CO_2 in an operational Class VI well
- Improve viability of ethanol production; providing jobs and financial stability
- Demonstrate novel CO_2 transportation methodology potentially unlocking future value to ND

Harvestone Overview

Mission – We provide clean energy for better world

Who We are:

- North Dakota–based bioenergy and carbon management company
- HLCP is owned by ECP, a leading energy private equity investor with over $31 billion in capital commitments, focused on energy transition, electrification and decarbonization infrastructure assets
- Employ 160 team members in three small communities
- Contribute to over 3000 indirect jobs
- Active members in the communities we conduct business
- Advancing or operating CCS projects at all three of our locations
  - Key to long term sustainably of our facilities
- Significant long-term commitment to safe operations and ongoing monitoring and reporting
- Our success ensures our ability to continue to be a preferred solution for corn marketing

Proven Track Record

- Nearly 20 years of ethanol production experience focusing on continuous improvement
- HLCP successfully developed and operates Blue Flint Carbon Capture Project
- First-of-its-kind CCS tax equity financing closed in 2024
- Strong regulatory compliance history in North Dakota
- Experienced leadership and technical teams
- Previous CSEA Loan recipient making scheduled repayments and demonstrating benefits of program to State of ND

Harvestone Low Carbon Partners Facilities

HarvestoneLCP.com

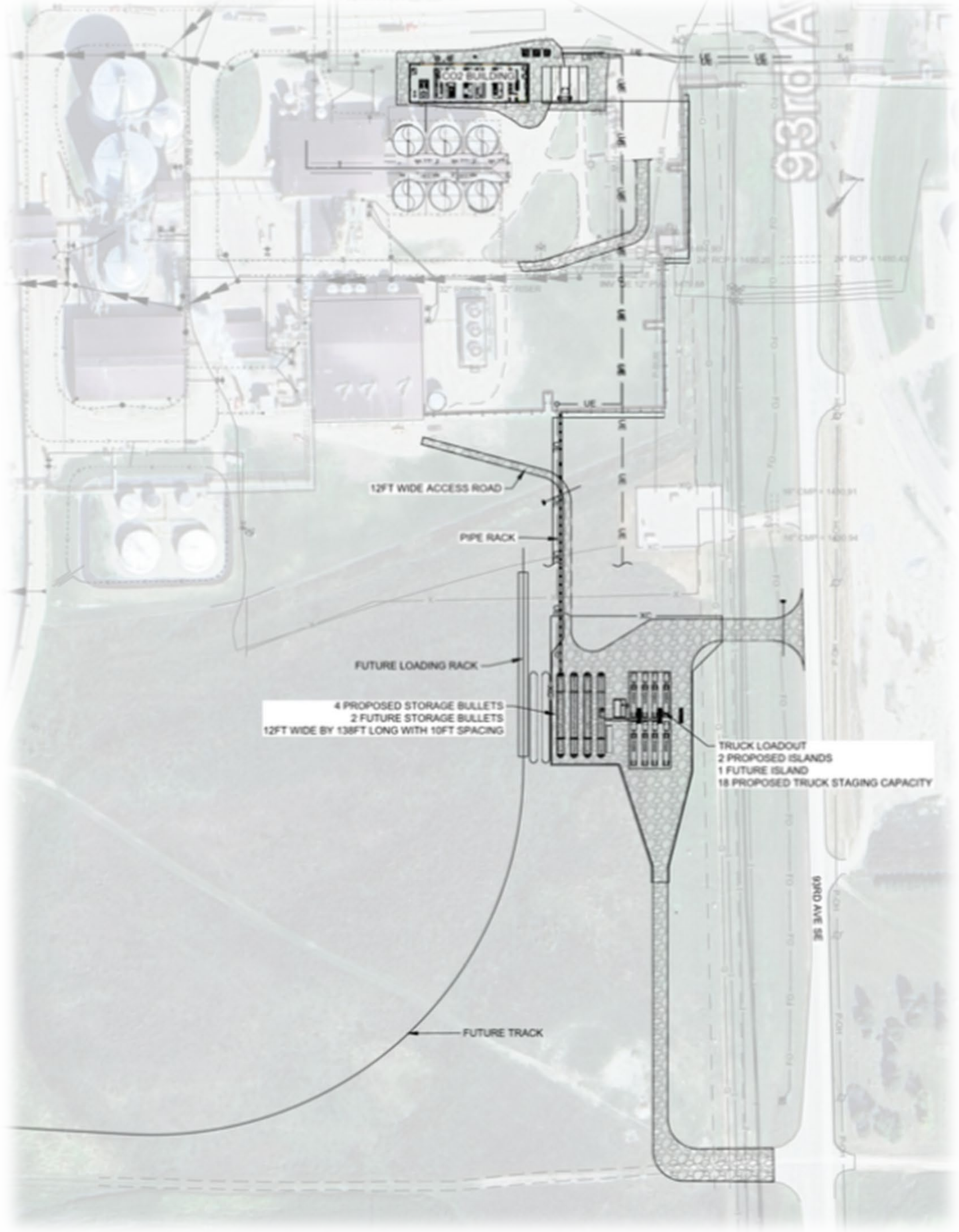
Blue Flint Ethanol
ICM/Fagen – 2007
74 MGY Ethanol; 25 M Bu Corn
200 K Tons of CO_2

Dakota Spirit AgEnergy
KFI/McGough – 2015
80 MGY Ethanol; 27 M Bu Corn
230 K Tons of CO_2

Iroquois Bio-Energy Company
ICM/Fagen – 2005
57 MGY Ethanol; 19 M Bu Corn
165 K Tons of CO_2

Project Description

- Salof Technology- CO_2 capture and liquefaction plant sized for 785 tonnes/day
- Pressurized liquid CO_2 storage in 4 horizontal vessel capacity of 113,000 gallons
- Loadout pump skid system capable of loading 4 trailers at 400 gpm
- Dedicated fleet of semi-trailers to be custom built for project
- Receiving location with 4 skids capable of offloading at 400gpm
- Liquid CO_2 storage in 2 horizontal pressure vessel capacity of 113,000 gallons
- High pressure pumping system to push through meter into ~3 mile of flow line into permitted Class VI Storage Well



Project Impacts – Environmental Sustainability

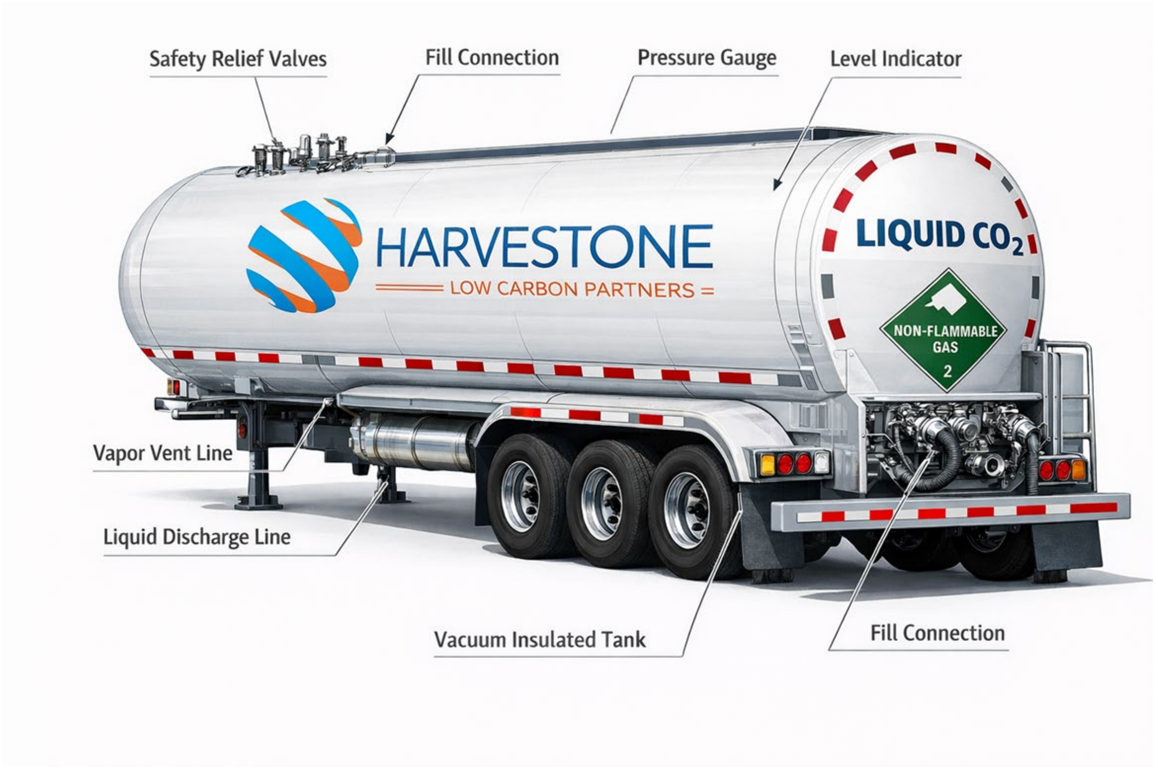
- Sequesters approximately 250,000 metric tons of CO_2 per year
- Over 3 million metric tons of CO_2 permanently stored over project life - Equivalent to removing ~50,000 cars from the road annually
- Lifecycle modeling of entire project scope shows nearly 88% CI reduction in the renewable fuel produced at DSA:
  - Pre Project CI of 37.5 kg CO_2e/MMBtu
  - Post Project CI of 4.6 kg CO_2e/MMBtu
  - Trucking emissions = 0.8 kg CO_2e/MMBtu OR 1.7% of sequester volume
- Supports North Dakota's carbon reduction and sustainability goals

Project Impacts – Technology Deployment

- Established- Capture Compression & Dehydration Facility – Salof
- Novel- Loadout and Receiving
- Logistics- first of kind integrated truck transport
    - Custom built trailer for size and transport efficiency
    - Integration of smart design and communications between trailer and loadout/offload pump and meter systems

Truck-Based CO_2 Transport

- Many ethanol facilities lack access to CO_2 pipelines
- Truck transport is a proven method for industrial and beverage CO_2
- Provides flexibility, scalability, and near-term deployment
- Enables CO_2 offload location pivot with relative ease



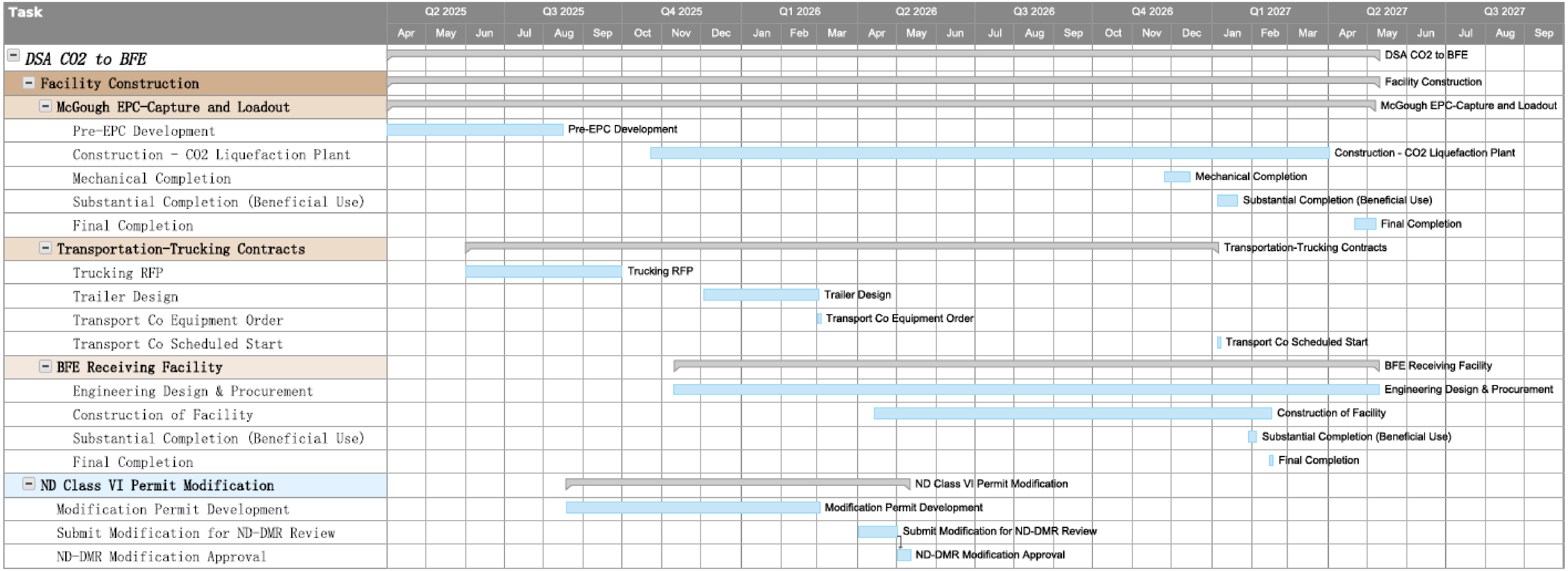
Budget and Financial Impacts

- Requesting $20 million Loan -roughly 1/5 of project capital costs
- Leverages significant private capital investment
- Reduces project risk and financing costs
- Anticipate 15-18 months until principal repayments begin

Project Associated Expense	Total Cost	NDIC's Share Loan	Applicant Share (Cash)
Capture, Compression, & Loadout	$ 67,621,339	$ 20,000,000	$ 47,621,339
Class VI Permit Modification	600,000		600,000
Receiving & High Pressure Pumping	16,800,000		16,800,000
Legal	900,000		900,000
Contingency (10%)	8,592,134		8,592,134
Project Total	$ 94,513,473	$ 20,000,000	$ 74,513,473

- Protects existing HLCP jobs
- Creates hundreds of construction jobs
- Adds ~25 permanent third-party trucking jobs & several HLCP positions
- Generates new tax revenue for state and local governments

Project Schedule



Conclusion

Clean Sustainable Energy Authority

- *Established to support research, development, and technological advancement through partnerships and financial support for the large-scale development and commercialization of projects, processes, activities, and technologies that reduce environmental impacts and increase the sustainability of energy production and delivery.*

Purpose of Financial Support

- Enhance clean, sustainable energy production
- Position the state as a world leader in clean, sustainable energy
- Diversify and grow the state's economy

Project Benefits & Impact

- Dramatically reduces fuel carbon intensity, keeping North Dakota ethanol competitive in low-carbon fuel markets
- Delivers immediate, measurable results at commercial scale
- Demonstrates first-of-its-kind commercial truck-based CO_2 transport
- Creates a scalable model for CO_2 producers without pipeline access
- Paves the way for CO_2 Enhanced Oil Recovery transportation
- Creates new jobs and protects existing plants and corn suppliers
- Strong, low-risk loan counterparty with reliable partners, proven technology, and experienced leadership—strengthening North Dakota's leadership in CCS

Questions?

Memo to: Clean Sustainable Energy Authority
From: Cerilon GTL ND Inc.
Date: January 27, 2026

The following shows existing loan or grant terms with CSEA, for which Cerilon GTL ND Inc. is requesting variation or accommodation:

CSEA Financing Arrangements – Current Terms	**Requested changes**
1. CSEA Loan #1 – Dated May 12, 2023	
a. latest draw date currently March 31, 2026 following First amendment (was originally Nov 18, 2025 - ie 30 months from date of the first loan agreement- May, 2023).	Extend to December 31, 2026
b. Principal repayments are required to start on June 30, 2026 in equal instalments over the next 10 years.	Shift to start September 30, 2028 (NDDF also approved in fall 2025 an extension to June 3, '27, and will be requested to extend further).
	No change in interest reserve total already calculated, notwithstanding any change in principal repayment start date
2. CSEA Loan #2 – $8.5mm dated Oct 8, 2024	
a. There does not appear to be any limitation date in the Loan Agreement on when draws must begin on this CSEA loan #2. All funds must be drawn on CSEA Loan #1 and Grant #2 (other than 10% holdback) before CSEA Loan #2 funds can be drawn. We note that the commitment letter contained a provision regarding commitment expiration which was not carried into the loan agreement (ie if not initially drawn by January 24, 2025, BND had an option to terminate).	No amendment needed to the 2024 Loan Agreement
b. Monthly Interest payments start at the end of the month of the first draw. Principal repayment (p& i, 12 yr amortization) starts 24 months following the first draw under the CSEA loan #2	No change to the interest reserve total already calculated, notwithstanding any change in principal repayment start date

CSEA Financing Arrangements – Current Terms	**Requested changes**
3. CSEA Grant #2 - $9.5mm dated Sept 26, 2024	
a. Draws can only begin once the CSEA loan #1 is fully drawn down	
b. Commission certifies that sufficient funds were available and authorized for expenditure to finance costs of this Agreement within the Commission's current appropriation or limitation to June 30, 2025. – Per Nov. 20, 2025 email from BND (Courtney Heiser), this appropriation has been extended to at least Mar 31, 2026. Need to confirm if any further action needed to extend same to June 30, 2027	If needed, extend appropriation to June 30, 2027
c. Latest date for all draws under this Grant agreement is Dec 31, 2025, by virtue of the term of the agreement supposedly expiring on December 31, 2025.	Extend to June 30, 2027