

MEETING MINUTES
LIGNITE RESEARCH COUNCIL – GRANT ROUND 96
Thursday, May 13, 2021 - 1:30 p.m. (CT) via WebEx

LRC VOTING MEMBERS (or their authorized alternates) PRESENT:

Jason Bohrer – Lignite Research Council, Chairman John Bauer –
Great River Energy Wade Boeshans – BNI Coal, Ltd.
Randy Christmann – North Dakota Public Service Commission Rita
Faut – ND Farm Bureau
Ed Steadman - Energy & Environmental Research Center (EERC) Jay
Kost – Falkirk Mining Company
Don Hochhalter - North Dakota Department of Commerce Gavin
McCollam – Basin Electric Power Cooperative
Ned Kruger – North Dakota Geological Survey
Gerry Pfau – Minnkota Power Cooperative
John Phillips – Coal Conversion Counties Jay
Skabo – Montana-Dakota Utilities Co.
Brad Zimmerman – Otter Tail Power Company
Rich Southwick – Great Northern Properties LP Al
Rudeck – ALLETE Energy
Dale Johnson – Basin Electric Power Cooperative, Dakota Gas Dave
Glatt – ND Dept of Environmental Quality
Randy Bartsch – IBEW 11th District ND

OTHERS PRESENT:

Karlene Fine – North Dakota Industrial Commission
Andrea Pfennig – North Dakota Industrial Commission Angie
Hegre - Lignite Energy Council
Mike Holmes – Lignite Research Council
Jonathan Fortner – Lignite Energy Council Steve
Van Dyke – Lignite Energy Council

GUESTS:

Tom Erickson, EERC (presenter)
Josh Stanislawski, EERC (presenter)
Daba Gedafa, UND Dept of Civil Engineering (presenter)
Ted Aulick, EERC (presenter)
Mike Mann, UND Bruce
Dockter

I. CALL TO ORDER

Meeting called to order:

Lignite Research Council (LRC) Chairman, Jason Bohrer, called the LRC meeting to order at 1:36 p.m. (CT) on May 13, 2021, via WebEx conferencing.

II. APPROVAL OF MINUTES

Approval of March 11, 2021, LRC Meeting Minutes:

Bohrer asked for a motion to approve the minutes from the March LRC Meeting. Randy Christmann so moved; seconded by Wade Boeshans. Motion carried.

III. PROGRAM FINANCIAL SUMMARY

Program Financial Summary:

Karlene Fine shared the financial summary regarding the Lignite Research, Development and Marketing Program. (A copy of the financial summary is available in the Lignite Research Program files.)

Fine shared the 2019-2021 budget spreadsheet with the group. She stated the cash balance, as we begin the biennium, is \$29.9 million. She shared the revenues total \$17.8 million and expenditures total \$14.8 million with a cash balance as of March 31, 2021, of \$32.8 million. She stated that we have outstanding commitments of \$28.5 so non-committed cash funding available is \$4.27 million. She shared we estimated to receive \$19.8 million. To date we have received \$17 million of that amount and things have slowed down and she is unsure if we will reach the \$19.8 million estimate.

Fine shared the remaining un-committed balance between the two categories of Small Research/Education/Demonstration Projects (\$4.6 million) and Advanced Energy Technology Projects (\$2.1 million). Fine stated that three of the projects being reviewed at this LRC meeting fall under the Small Research/Education/Demonstration Projects line item. Those projects are A, B and C. Project D, the confidential marketing program project, would fall in the next biennium.

Angie Hegre emailed the financial spreadsheet one week prior to the meeting to the LRC members so the group saw all the details provided by Karlene Fine.

IV. PROGRAM UPDATES

Emerging Markets and Value-Added Opportunities – Mike Holmes

Holmes touched on LRC research priorities of emerging markets and value-added opportunities for using our lignite resource in the state. He shared some of the projects currently in place to include the following.

- Resource Recovery from a Coal Fired Power Plant to Enhance Agricultural Production in Open Field and Greenhouse Facilities –NA Coal (completed, pursuing commercial opportunities)
- Laboratory-Scale Coal-Derived Graphene Process – EERC
- Systematically Applied Research to Develop High Value Products from coal – Semplastics
- Lignite-Derived Carbon Materials for Lithium-Ion Battery Anodes – UND IES
- Naptha and Tar Oil Overhead Refining Project - DGC

Rare Earth Elements - Mike Holmes

Holmes shared the value of Rare Earth Elements (REE). He shared that high-value REEs and other critical minerals identified by the U.S. Interior Department as “...vital to the Nation’s security and economic prosperity.” According to the USGS 2021 Mineral Commodity Summary report, the U.S. is 100% import reliant on REEs and other critical metals, with the bulk of imports coming from China. He also stated that the global rare earth metals market shows an increase of 8.6% compound annual growth rate from 2019 to 2025. Holmes shared that REEs are unique because they are useful in numerous applications: magnets, batteries, electronics, computers, hybrid electric vehicles, renewable energy, medical, military defense, hybrid technology, etc. Holmes stated REEs make possible \$7 trillion in value-added products globally.

UND Institute for Energy Studies - Rare Earth Element Extraction and Concentration at Pilot-Scale from ND Coal-Related Feedstocks. All tasks for the first phase of the project were completed October 30, 2020. Holmes shared the accomplishments and planning of Phase 2 which includes the procurement and construction of the pilot facility by July 30, 2021. Phase 2 includes: Perform bench-scale experiments to calibrate the process to the new coal blend by June 30, 2021. Utilize the pilot to process at least 100 tons of the coal blend and have samples of this separated into individually pure REOs. Then update economics to a pre-FEED level study of a commercial facility of the process.

Williston Basin CORE-CM

The DOE has a relatively new program area termed CORE-CM (Carbon Ore Rare Earth and Critical Minerals). The EERC and a team of nearly 30 members has received an award from DOE in this program area focused on producing rare-earth elements (REEs), critical minerals (CMs), and nonfuel carbon-based products (CBPs) from Williston Basin coals. The goal of the Williston Basin CORE-CM Initiative is to lay the foundation for new industry, as well as drive the expansion and transformation of the existing coal and coal-based resources industry in the Williston Basin to produce REEs, CMs, and CBPs. The initial phase is being proposed for NDIC funding in LRC grant round 96 and is focused on gathering and assessing the existing available data for REEs, CMs, and CBPs in the Williston Basin, identifying data gaps that need to be filled, and developing the strategies necessary to move forward with demonstrations along the entire supply chain.

Microbeam Technologies, Inc. - Development of Low-Cost REE Analysis and Sorting Methods

- Develop novel REE fingerprinting algorithms via x-ray fluorescence (pXRF)/prompt gamma neutron activation analysis (PGNAA)
 - Low-cost field/mine identification of REE-rich coals/sediments
 - Selective mining and/or on-belt sorting to isolate REE-rich coals/sediments
 - Now moving on to a resource directed project teaming with Great Northern Properties

CARBON MANAGEMENT

Project Tundra Update

- Project Tundra is well into the FEED study.
- Economic evaluations continue with focus on reducing economic risks.
- Storage evaluations continue and include increased focus on storage adjacent to the mine and plant.
- Work continues on the policy and financing challenges with an eye on determining commercial viability.

Project Tundra Road Map

- FEED for full project and agreements for offtake and sequestration
- Final federal and state support

- Permit corridor for CO₂ pipeline and infrastructure for EOR and sequestration

Preliminary Front End Engineering and Design (pre-feed) Study for a full-scale carbon dioxide capture system at Coal Creek Station (CCS2)

- Pre-FEED study is progressing well.
- All pilot system testing completed, and data analysis is ongoing.
- HAZOP review scheduled for May.
- Economic Evaluations have been initiated.
- Geologic storage evaluated separately under Midwest Ag project.

Carbon Utilization and Storage

- PCOR continues as one of four regional partnerships in the U.S. - PCOR Initiative to Accelerate CCUS Deployment
- Project Tundra includes the continuation of the Carbon SAFE work with a focus on storage adjacent to the plant.
- Midwest AgEnergy storage project nearing completion - Drill Stratigraphic Test Well & Determine Feasibility of Central ND Geology to Safely and Permanently Store Carbon Dioxide
- Found 84 ft. of Broom Creek Formation

V. GRANT ROUND XCVI (96) APPLICATION

LRC-XCVI (96) A: “Williston Basin CORE-CM Initiative”

Submitted by: UND EERC

Request for: \$750,000

Total Project Costs: \$2,450,000

Principal Investigator: Thomas Erickson Project

Duration: 20 months

Holmes shared that the EERC is proposing to lead a team of nearly 30 members focused on producing rareearth elements (REEs), critical minerals (CMs), and nonfuel carbon-based products (CBPs) from Williston Basin coals. The EERC has received word of award from the DOE, providing a strong leveraging of NDIC project funding. The goal of the Williston Basin CORE-CM Initiative is to lay the foundation for new industry, as well as drive the expansion and transformation of the existing coal and coal-based resources industry in the Williston Basin to produce REEs, CMs, and CBPs. The initial phase that is currently proposed, is focused on gathering and assessing the existing available data for REEs, CMs, and CBPs in the Williston Basin, identifying data gaps that need to be filled, and developing the strategies necessary to move forward with demonstrations along the entire supply chain.

Holmes said the three technical peer reviewers gave the proposal an average weighted score of 224.3 out of 250 points. The weighted score was 241 out of 250 points from reviewer 26-01, 232 out of 250 points from reviewer 26-02, and 200 out of 250 points from reviewer 26-03. All Technical peer reviewers recommended to **fund**.

As the Technical Advisor for this project, Holmes recommended **fund** based on all three of the technical reviewers’ feedback to fund and the proposed effort fitting well with the priorities of the Lignite Research

Program. Holmes stated that he felt the proposed project is a great fit for the Lignite Research Program, as part of the pursuit of emerging markets for North Dakota lignite. The project provides a strong leverage of state funding by obtaining funding from the DOE.

Holmes recommended that funding be subject to the Technical Advisor participating in project reviews, discuss standards of success and reviewing the project management plan with the project team including details of industry cost share.

Holmes stated conflicts of interest include EERC, North American Coal, BNI Energy Ltd, Minnkota Power Cooperative, Inc., Basin Electric Power Cooperative.

Thomas Erickson, UND EERC, presented on behalf of the applicant. (A copy of their Power Point presentation is available in the LRP files.)

LRC-XCVI (96) B: “Ammonia-Based Energy Storage Technology (NH3-BEST)”

Submitted by: UND EERC

Request for: \$101,390

Total Project Costs: \$426,390

Principal Investigator: Ted Aulich Project

Duration: 12 months

Holmes shared that the EERC led team is proposing the project to model, validate, and define a commercialization strategy for an ammonia-based energy storage technology (NH3-BEST) tailored for North Dakota lignite-fired power plants. NH3-BEST encompasses the three integrated unit operations of low-pressure electrolytic ammonia production, ammonia storage, and ammonia conversion to electricity in a direct ammonia fuel cell (DAFC). Refined and optimally deployed, NH3-BEST could strengthen and expand the lignite power industry. By enabling accommodation of power demand fluctuations while steadily operating within an optimal-performance baseline power output range, NH3-BEST would ensure maximum plant operational efficiency and minimum degradation of materials, equipment, and performance due to load cycling-driven stresses. In addition, NH3-BEST deployment at North Dakota lignite power plants would open opportunities for expanding lignite utilization to include powering production of ammonia for regional agricultural markets. Primary project objectives are to define operational and performance targets, develop a dynamic model of the NH3-BEST subsystem, and utilize the model to evaluate and optimize NH3-BEST performance and economics.

Holmes said the three technical peer reviewers gave the proposal an average weighted score of 213.6 out of 250 points. The weighted score was 232 out of 250 points from reviewer 26-04, 210 out of 250 points from reviewer 26-05, and 199 out of 250 points from reviewer 26-06. All Technical peer reviewers recommended to **fund**.

As the Technical Advisor for this project, Holmes recommended **fund**. He shared that the proposed project is a good fit for the Lignite Research Program. Emerging markets for North Dakota lignite are a key focus of the roadmap, and while there is interest in the energy storage aspects, ammonia is a key commodity in our region. The project provides a strong leverage of state funding, at 23.8 percent of the total budget.

Holmes recommended that funding be subject to the Technical Advisor participating in project reviews and reviewing the project management plan with the project team.

Holmes stated conflicts of interest include EERC, Minnkota Power Cooperative, Inc, Basin Electric Power Cooperative, Otter Tail Power Company.

Josh Stanislawski, UND EERC, presented on behalf of the applicant. (A copy of their Power Point presentation is available in the LRP files.)

LRC-XCVI (96) C: “Determining Optimum Coal Bottom Ash Content for Sustainable Concrete Infrastructure”

Submitted by: UND Department of Civil Engineering

Request for: \$118,614

Total Project Costs: \$289,271

Principal Investigator: Daba Gedafa Project

Duration: 15 months

Holmes shared that The University of North Dakota Department of Civil Engineering proposal focuses on the use of coal bottom ash (CBA) in concrete to reduce cost, conserve energy and resources, reduce environmental impact, and enhance workability and durability. The main objective of this project is to test the hypothesis that there is an optimum content of CBA as a fine aggregate and cement replacement. Tests will be performed with and without nanoclay to create concrete that is either similar or higher quality in terms of mechanical properties and durability compared to pure Portland cement-based concrete, which will be used as a control. They anticipate that CBA and nanoclay use in concrete will improve workability and reduce water demand, the corrosion of the reinforced steel, segregation, bleeding, heat evolution, and permeability. The use of these materials will also inhibit alkali-aggregate reactions and enhance sulfate resistance, in addition to increasing economic and environmental benefits.

Holmes said the three technical peer reviewers gave the proposal an average weighted score of 177 out of 250 points. The weighted score was 158 out of 250 points from reviewer 26-07, 221 out of 250 points from reviewer 26-08, and 152 out of 250 points from reviewer 26-09. Two technical peer reviewers recommended **funding may be considered** and one technical reviewer recommended to **fund**.

As the Technical Advisor for this project, Holmes recommended **funding may be considered** based on the proposed project fitting well into the industry roadmap, as pursuit of increased concrete applications for lignite ash (bottom ash) and has strong industry participation. The budget was a focus of the reviews with most of the cost share from UND salaries.

Holmes recommended that funding be subject to the Technical Advisor participating in project reviews and reviewing the project management plan with the project team including review cost share commitments.

Holmes stated conflicts of interest include Great River Energy, Montana Dakota Utilities Company, Basin Electric Power Cooperative, Minnkota Power Cooperative, Inc, Otter Tail Power Company.

Daba Gedafa, UND Department of Civil Engineering, presented on behalf of the applicant. (A copy of their Power Point presentation is available in the LRP files.)

VI. 2021 CALENDAR

Bohrer announced that the next NDIC meeting is scheduled for June 9, 2021. Bohrer reminded the group that the upcoming grant application deadline is October 1, 2021 and the next LRC meeting is scheduled for November 10, 2021.

VII. OTHER BUSINESS Legislative

Actions

During the legislative session that recently completed in ND, one of the things targeted for approval was the Clean Sustainable Energy Authority (CSEA). Bohrer explained that this is an energy council that would examine and potentially fund next generational technologies and will help fill the hole of commercial demonstration funding to make the deployment of those clean, sustainable, low carbon energy projects a reality. The CSEA is broadly based and considers all types of energy generation. The voting members have been distributed between the relative research councils. Lignite Research Council - 2 members, Petroleum Research Council - 2 members, Renewable Research Council - 2 members. With the timing of our next LRC meeting not until November and the response to the emergency declaration from the Governor, Bohrer wanted to present an opportunity to consider a couple names for the LRC delegates for the CSEA. Bohrer sent the resumes of two possible delegates from the LRC to the committee via email prior to the meeting for their consideration with the expectation that they would be voted on and sent as representatives to the CSEA. Bohrer asked for an open discussion on the matter. Al Rudeck recommended to facilitate discussion amongst the membership, to try and understand the skills, knowledge, abilities, that LRC wanted on this new CSEA. Rudeck suggested taking that information, call for nominations from the committee and have a vote as a special meeting process from a good governance standpoint.

During the discussion a reluctance developed to take action on the names put forth by Bohrer, but instead take a step back and direct Mike Holmes and Jason Bohr to come up with a KSA (knowledge, skills, abilities). Wade Boeshans supported Al Rudeck's suggestion and echoed the good governance and process. He reminded the group of the fiduciary obligation to the state as the CSEA has the authority to make recommendations of nearly \$300 million in the next biennium and linked the magnitude of that obligation to the relatively thin process that had resulted in two names being considered at the meeting, restating the groups feeling that the individuals Bohrer had submitted were quality applicants. Bohrer asked Karlene Fine for information on what the other groups are doing and what the NDIC is looking for to ensure that the State's timelines would not be interrupted if the LRC delayed in appointing its representatives. Fine shared that the Commission has not had the opportunity yet to discuss what they are looking for, this will likely come up at their June meeting. She shared the other entities will be meeting over the next 6-8 weeks. The naming of the Chair of this group will likely be named by July 1. The Renewable Energy Council will meet the first to mid-July, the Oil and Gas Research Council is having a special meeting to name their representatives. Fine shared the goal is to have the names of the members by July 1 and suggested a first meeting July/August. Bohrer wanted the Lignite Research Council members to be comfortable with their decision and opened the discussion to everyone. The general consensus was to take a step back and come up with a process. The group agreed that the two suggested people could very well be the right people for the job but were concerned that without a transparent, consistent process to appoint them the objectives and governance of the CSEA could be undermined.

Chairman Jason Bohrer requested a motion to table the appointment of the Lignite Research Council representatives to the Clean Sustainable Energy Authority. Gavin McCollam so moved; seconded by Al Rudeck.

Roll call vote: Yay - Dale Johnson, Wade Boeshans, Ed Steadman, Rita Faut, Rich Southwick, John Bauer, Gerry Pfau, Randy Bartsch, Jay Skabo, Bryan Walther, Don Hochhalter, Ned Krueger, Randy Christmann, Brad Zimmerman, John Phillips, Jay Kost, Gavin McCollam, Al Rudeck, Jason Bohrer. Motion passes.

Chairman Bohrer requested another motion to come up with a knowledge, skills and abilities that we are looking for to fill the CSEA Representative position and to direct Jason Bohrer and Mike Holmes to set the meeting to consider the appointment of individuals to the CSEA. Jay Kost so moved; seconded by John Phillips.

It was moved by Rita Faut and seconded by Ed Steadman that under the authority of North Dakota Century Code Sections 44-04-17.1, and 44-04-19.2 the Lignite Research Council close the meeting to the public and enter executive session for the purpose of considering the following application that the applicant has requested confidentiality pursuant to N.D.C.C. 54-17.5-06 and N.D.C.C. 44-04- 18.4(2)(c)(5):

Continued Funding for Regional Lignite Energy Public Affairs Program

The Council will enter into executive session at 3:53 p.m.

Voting: Due to the meeting being done in a WebEx format and not in person, there were two options for voting. A confidential email sent from a third-party voting site called Simply Voting was sent to the present voting members. The group also had the option to email Karlene Fine, ND Industrial Commission directly with their vote.

Adjournment: There being no further business, Jason Bohrer requested a motion for adjournment of the LRC meeting. Wade Boeshans so moved; seconded Dale Johnson. Motion carried.

GRANT ROUND XCVI (96) Ballot Results: Jason Bohrer announced (via email) following the meeting the results of the ballots concerning the LRC's recommendations to the NDIC for the Grant Round XCVI (96) proposals as follows...

LRC-XCVI (96) A Williston Basin CORE-CM Initiative

Submitted by: UND EERC

Principal Investigator: Thomas Erickson Project

Duration: 20 months

Request for: \$750,000

Total Project Costs: \$2,450,000

FUND: 18

DO NOT FUND: 0

ABSTAIN: 2

LRC-XCVI (96) B Ammonia-Based Energy Storage Technology (NH3-BEST)

Submitted by: UND EERC Principal Investigator: Ted Aulich Project
Duration: 12 months Request for: \$101,390
Total Project Costs: \$426,390
FUND: 18 DO NOT FUND: 0 ABSTAIN: 2

LRC-XCVI (96) C Determining Optimum Coal Bottom Ash Content for Sustainable Concrete Infrastructure

Submitted by: UND Department of Civil Engineering Principal Investigator: Daba Gedafa Project
Duration: 15 months Request for: \$118,614
Total Project Costs: \$289,271
FUND: 15 DO NOT FUND: 2 ABSTAIN: 3

LRC-XCVI (96) D Continued Funding for Regional Lignite Energy Public Affairs Program

Submitted by: Lignite Energy Council Principal Investigator: Steve Van Dyke
Project Duration: 3 years Request for: \$1,800,000
Total Project Costs: \$3,600,000
FUND: 19 DO NOT FUND: 1 ABSTAIN: 0

The North Dakota Industrial Commission meeting, when these recommendations will be considered, will be held on June 9, 2021.

Angie Hegre, recording secretary