State of Iowa
Iowa Energy Center Board
Meeting Minutes of May 13, 2021
IEDA, 1963 Bell Avenue, Suite 200
Des Moines, Iowa

Call to order 1:00 p.m.

Board Members Present

Joel Schmidt, Board Chairperson*
Dan Nickey, Board Vice Chair
Stuart Anderson*
Jennifer Johnson
Gul Kremer*
Jenae Jenison
Debi Durham
Geri Huser**
Troy DeJoode**
Timothy Whipple
Valerie Newhouse*
Rick Olesen

Board Member Absent

Nathan Young

Iowa Economic Development Authority Staff Present

Brian Selinger
Amber Buckingham*
Stephanie Weisenbach*
Ryan Young*
MK Anderson*
Terry Roberson*
Lisa Connell*
Rob Christensen
Betty Hessing
Emily Hockins*
Derek Folden*
Vicky Clinkscales*
Deanna Triplett*
Megan Andrew*

Others Present

Chaz Allen, Executive Director, Iowa Utility Association
Maison Bleam, Legislative Liaison, Iowa Utilities Board
Troy Van Beek, Founder/CEO, Ideal Energy Solar
Amy Van Beek, Co-Founder CMO, Ideal Energy Solar*
Dr. Gregory M. Wilson, Ideal Energy Solar*
Steve Guyer, Iowa Environmental Council*
Erin Jordan, The Cedar Rapids Gazette*
Karl Theis, Happy Pork, Inc.*
Representative Charles Isenhart*

*Participated via teleconference
**Arrived after roll call was taken.

Welcome & Introductions by Board Chairperson Joel Schmidt
Joel Schmidt welcomed everyone to the May 13th IEC Board meeting.

Roll Call by Betty Hessing, Administrative Assistant
A quorum was established**.**

Consideration of February 11, 2021 Meeting Minutes

Motion by	Dan Nickey
Motion	I move approval of the February 11, 2021 minutes.
Second	Timothy Whipple
Voice Vote	All ayes in favor. Motion approved.

Public Comment Period – No comments.

Fiscal Update – Attachment A
Presentation provided by Terry Roberson. Terry Roberson stated the Financial Report for this meeting reflects cash expenditures paid through April 30th for State fiscal year 2021. On the administrative side you have just over $200,000 in expenses, with $195,000 of that in salaries. You currently have at April 30th on the main account for the grants, just under $9M available and on the loan account, just over $15.5M available. Terry Roberson answered questions from Board members.

Grant Program
Grant Program Status Report – Attachment B - Amber Buckingham reviewed the Iowa Energy Center's Grant Status Report. Amber Buckingham stated that at the February meeting, she would be doing some desktop monitoring visits with all of our Grantees that received awards in the first round of grants in 2019. As a recap, most of those did not get underway until Spring to Summer of 2020 so we wanted to give them around a year before we met with them to see how things were going. Overall, the grants are doing very well, and they are on-budget. We have a couple of requests for time extensions and budget modifications that came out of those meetings. The PI's are very excited about the work that they are doing and most of them are very interested in presenting to the Board the progress that they have made. So, we are trying to schedule those for future Board meetings so they can tell you in-person about all of the great work and success they have had.

Amber Buckingham asked if there were any questions regarding the Status Report and no questions were asked. Debi Durham thanked the Grant Committee for all the work they do, and she thinks we are getting much better projects because of the review process.

Amber Buckingham commended the Grant Committee for the great amount of work they did for this last round of pre-applications. Amber Buckingham stated we received 75 pre-applications this round, which is about 20% more than what we typically see. Those 75 pre-applications did represent over $21M in funding requests. Fifty percent of them were from academic institutions and it took the Grant Committee three days to review the pre-applications. Forty pre-

applications were selected for the full application round and that's about $11M in funding requests. We had to whittle that down to four because that's how much we have to award this round. The Grant Committee will be meeting in late July to review those. Forty percent of those applications are from private or non-profit sector. All three regent institutions are represented in this round and we have several private colleges that are named as partners on the grants. Amber asked if there were any questions regarding those pre-applications and there were none.

Joel Schmidt stated that Brian Selinger had given him a briefing on all the hours and efforts that were put in by staff and Board members on the Grant Committee so thank you.

Grant Modification – Attachment C
20-IEC-001 – Utility Workforce Assessment & Strategy Planning
Amber Buckingham stated this is a second no-cost extension request from The University of Northern Iowa for their Utility Workforce Assessment & Strategy Planning project. They are looking for an additional 6-month no cost extension for a new project end date of 12/31/2021. They are still having some issues with COVID, scheduling interviews, and the polar vortex also impacted their ability to meet with some of the utilities. They believe they will be finished before the end of the year but wanted to make sure they had ample time to finish. The extension does not impact the scope of the project or the budget. It is our recommendation that the Board approve the second no cost extension with a new project end date of 12/31/2021.

Motion by	Debi Durham
Motion	I move to approve the second no cost extension with a new project end date of 12/31/2021.
Second	Rick Olesen
Roll Call	Yes: 12 Abstain: 0 Motion approved.

20-IEC-010 – Development of Low Cost, Safe and High-Performance Sodium Batteries for Wind Energy Storage – Attachment D
Amber Buckingham explained this request is from Iowa State University. It's for the development of low cost, safe and high-performance sodium batteries for wind energy storage. They have asked to create a new budget line item within the budget—moving some funds from salaries and wages, fringe benefits and indirect costs to a newly created equipment category, which was not there previously. Staff felt that this modification would warrant Board approval since we would be creating a new budget line item. It does not impact the overall budget; they will stay with what they originally applied for. They just need the additional funding to buy additional channels to test the batteries because they are having more success than they thought they would. Staff recommendation is to approve the amendments and move the requested funds from salaries and wages, fringe benefits and indirect costs to the newly created equipment category.

Motion by	Rick Olesen
Motion	I move to approve the amendment to 20-IEC-010.
Second	Dan Nickey
Roll Call	Yes: 12 Abstain: 0 Motion approved.

20-IEC-009 – Shared PMUs for Data-driven Real-time Distribution Monitoring, Modeling and Analysis – Attachment E

Amber Buckingham explained this grant modification is from Iowa State University. This is for Grant #20-IEC-009, which is the shared PMUs for data-driven real-time distribution monitoring, modeling and analysis. When Amber Buckingham was meeting with this particular PI and their project team, they let her know that the research team had originally felt that they could purchase a single microPMU unit for $3,600 and they intended to purchase twenty of these to complete their project. During the procurement phase of the project, they found they had to actually purchase a package rather than a single unit in order to maximize the benefits to the utilities. This unit has a package price of $12,950 per unit. The PI also found that the manufacturer did not provide a database to receive and store the data that is transmitted from the microPMU, so they have had to establish a communication channel and develop the database to do that and that has a system cost of $2,000 per unit per year. The increased costs means that the project team can only buy four fully packaged units instead of 20 single µPMUs. That's just in order to stay within the originally applied for budget of $72,000 for this particular line item.

ISU is also seeking to extend some individual deliverable dates, but not seeking an overall extension to the project. They are also seeking to add additional utility partners to the project.

IEDA staff felt that this change was substantial and any substantive changes within the grant application need approval by the Board. Our recommendation is to approve the amendment to 20-IEC-009, updating the scope of work, deliverable dates and utility partners.

Motion by	Rick Olesen
Motion	I move to approve the amendment to 20-IEC-009.
Second	Jennifer Johnson
Roll Call	Yes: 10 Abstain: 2 (Timothy Whipple & Troy DeJoode) Motion approved.

Alternate Energy Revolving Loan Program (AERLP)

Loan Program Update – Stephanie Weisenbach stated we received three applications and had about a month to review those. We are also eagerly waiting the results of the legislative session this year to see if the program changes are being made and we will plan to convene the Loan Committee in addition to the special subcommittee appointed by the Board for this particular program change, to bring everybody together to talk about our next steps. We will wait to hear more, but we are not actively promoting any other loan cycles under the AERLP until we have resolution and clarity and presumably some next steps for a new program which will be on the near-term horizon.

Stephanie Weisenbach noted for each of these loan projects, we may have members abstaining.

Ryan Wangsness – 36 kW Solar Project - Attachment F

Stephanie Weisenbach explained for the Ryan Wangsness project, this is an individual requesting a loan of $38,887.50. Ryan Wangsness farms 279 acres in

Winneshiek County and the solar project would run a cooler for the eggs, fans to cool chickens, motors to run the feed chain and egg belt and power the well and lights for the barn.

The funding sources for this are typical; they are requesting a loan for 50% of the project cost and a bank loan is the other 50% which has been secured with verification from that lender. For the incentives of the project, that will be the Federal Investment Tax Credit and the State Solar Energy System Tax Credit.

The applicant requested a loan term of nine years. Our staff team analyzed the cash flow factors with the various data points for savings and other figures and the Loan Committee is looking at recommending a five-year loan term and the collateral being provided by the applicant is an irrevocable letter of credit, which is the preference of the program and assures that the bank will pay the loan if the borrower fails to pay. We have been working with Farm Credit Services on some of these and they are working on this project as well.

Stephanie Weisenbach stated the Loan Commmittee's recommendation is to approve this for a five-year loan term.

Motion by	Timothy Whipple
Motion	I move to accept the Loan Committee's recommendation for the Ryan Wangsness project and approve this for a five-year loan term.
Second	Debi Durham
Roll Call	Yes: 11 Abstain: 1 (Rick Olesen) Motion approved.

Dan Nickey was the Chairperson until item V.E. as Joel Schmidt abstained from Sievers Family Farms, LLC and the Todd Eggert loan projects.

Sievers Family Farms, LLC – 155 kW Solar Project – Attachment G
Stephanie Weisenbach explained for the Sievers Family Farms LLC, the loan request was for $149,200. They intend to install a solar array at their farm which raises agricultural beef cattle and grain.

Similar typical financing sources here is the Iowa Energy Center loan request for 50% of the project and the applicant is pledging the other half as cash towards their half of the project. The incentives are the State and Federal Tax Credits.

The applicant requested a loan term of twenty years and after further analysis of the cash flow factors and discussing with the Loan Committee, it was decided to recommend a four-year loan term for this particular loan. The applicant also has an irrevocable letter of credit as collateral pledged with the application, which eliminates the risk to the Iowa Energy Center.

Stephanie Weisenbach stated the Loan Committee's recommendation is to approve this for a four-year loan term.

Motion by	Debi Durham
Motion	I move to accept the Loan Committee's recommendation for the Sievers Family Farms, LLC and approve this for a four-year loan term.

Second	Timothy Whipple
Roll Call	Yes: 11 Abstain: 1 (Joel Schmidt) Motion approved.

Todd Eggert – 24 kW Solar Project – Attachment H
Stephanie Weisenbach explained this loan request was from Todd Eggert, an individual requesting a loan for $25,750. This is for a rural residence on five acres in Wilton, Iowa.

The financing sources are typical to what we have seen for the bank loan and the loan request; same federal and state tax credits for the applicable percentages.

The applicant requested a loan term of seven years and they are pledging a mortgage on their property as collateral. The applicant wasn't able to get the irrevocable letter of credit. The mortgage itself would not be in the first position on the property, as there are two other mortgages on it and the Loan Committee would only want to consider for those that are in the first position, which would mean the property owner would need to own the property and so the recommendation from the Loan Committee is to deny this loan request.

Motion by	Rick Olesen
Motion	I move to accept the recommendation of the Loan Committee and deny this loan request.
Second	Timothy Whipple
Roll Call	Yes: 11 Abstain: 1 (Joel Schmidt) Motion approved.

Joel Schmidt returned as Chairperson.

AERLP Legislative Update
Deanna Triplett stated that the legislature is in overtime. Leadership is currently working on a deal to wrap-up this session. The Energy Infrastructure Revolving Loan Fund is in numerous Bills that are part of the final discussions. It is in both versions of the Compromised Tax Bill (SF 619 & HF 893). It is also in the House Economic Development Budget Bill (HF 871). It is well situated to be part of the final deal.

Deanna Triplett asked if anyone had any questions, but no questions were asked. Joel Schmidt thanked everyone for their efforts in preparing that Bill.

Appointments to Committees and Election of Board Chair/Vice Chair – Attachment I
Lisa Connell stated she would talk about these collectively and then the Board could act on each individually. First up, would be to reappoint the Grant Committee. As it is now, it's a five-person Grant Committee with members being Jenae Jenison, Jennifer Johnson, Gul Kremer, Dan Nickey and Rick Olesen. That would be for a term that starts July 1, 2021 and would go through June 30, 2022.

Next up would be to reappoint the Loan Committee. As it stands, this is a four-person committee with members being Stuart Anderson, Troy DeJoode, Valerie Newhouse and Timothy Whipple.

Last up would be to elect Troy DeJoode as Board Chair and Dan Nickey as Vice Chair of the Iowa Energy Center Board.

All of those are proposed and if you have any comments or suggestions, now is the time to make them. No comments or suggestions were made.

Appointments to the Grant Committee.

Motion by	Debi Durham
Motion	I move to approve the reappoint of Jenae Jenison, Jennifer Johnson, Gul Kremer, Dan Nickey, and Rick Olesen to a five-person Grant Committee for a term from July 1, 2021 to June 30, 2022.
Second	Rick Olesen
Roll Call	Yes: 12 Abstain: 0 Motion approved.

Appointments to the Loan Committee

Motion by	Geri Huser
Motion	I move to approve the reappoint of Stuart Anderson, Troy DeJoode, Valerie Newhouse, and Timothy Whipple to a four-person Loan Committee for a term from July 1, 2021 to June 30, 2022.
Second	Dan Nickey
Roll Call	Yes: 12 Abstain: 0 Motion approved.

Election of Chair & Vice Chair

Motion by	Rick Olesen
Motion	I move to elect Troy DeJoode as Board Chair and Dan Nickey as Vice Chair of the Iowa Energy Center Board for a term from July 1, 2021 to June 30, 2022.
Second	Geri Huser
Roll Call	Yes: 12 Abstain: 0 Motion approved.

Brian Selinger introduced our guests from Ideal Energy, Troy Van Beek and Greg Wilson. Troy has been with us in the past to talk about battery energy storage projects. As Mr. Schmidt said, we thought this would be well timed for a couple different reasons. The IEC provided grant funds to Ideal Energy to investigate the potential of renewable hydrogen in Iowa—what that looks like—what type of sector opportunities and at IEDA, we are always encouraging pilot projects. We want to get to actual development of projects, so they are working at a feverish pace to get to that point. We thought it would be good for the Board to get a better sense of what they are working on and what the next steps are, but also how it relates to our revolving loan fund and our hopeful legislative changes. Innovative projects/innovative infrastructure projects, like renewable hydrogen, could be something that the Board could consider so we thought it would be good to educate you more on what that is and what that holds.

Renewable Hydrogen Potential for Iowa – Attachment J
Troy Van Beek and Greg Wilson with Ideal Energy gave their presentation.

Other Business
Joel Schmidt thanked everyone for all their efforts and stated how different the energy landscape is in the ten plus years that he has been involved here. Lots of good stuff and I appreciate this group's collaboration, hard work on the grants and other things.

Energy Office Updates
Brian Selinger thanked Joel Schmidt for his time and effort serving on the Iowa Energy Center Board and as Board Chair. Brian Selinger thanked Troy DeJoode and Dan Nickey for continuing on. It's nice to see faces in-person and see faces on the screen. We have a couple folks whose terms are expiring the end of June, but we are pleased that they are applying again to continue on this Board. They are Debi Durham and Timothy Whipple. Brian thanked them both for being on the Board and wanting to continue being on the Board. Thank you also to Troy DeJoode for being the upcoming Chair of this Board. Brian also stated he wished Nate Young, with the University of Iowa, could have been here to thank in-person, as he will be stepping-off the Board. Brian has talked to the University of Iowa and he thinks they have a couple people they are putting forward through the IGOV process.

Brian Selinger stated that we will be in touch this summer. There is Grant Committee work to be done and legislative updates. We will also be working on doing some tweaks to the Loan Program and other things Brian will keep you apprised of.

Thank you to Board members and to our team for all the work they do.

Next Quarterly Board Meeting August 5, 2021 at 1:00 p.m.

Chairperson Schmidt asked for a motion to adjourn.

Motion by	Timothy Whipple
Motion	I move to adjourn.
Second	Rick Olesen

Adjournment 2:11 p.m.

Respectfully Submitted,
Betty Hessing, Administrative Assistant

ATTACHMENT A

INFO

REPORT
IOWA ENERGY CENTER BOARD
MAY 2021

From: Administrative Division

Subject: FY21 Financial Report as of April 30, 2021

Financial reports for the Iowa Energy Center Main account and the Loan Program.

Proposed Motion: **No Action Required**

Submitted By: Terry Roberson

Attachments: IEC Financial Reports

IEDA									
Financial Report									
Iowa Energy Center									
Fiscal Year 2021									
April 30, 2021									
		IEC MAIN ACCT				IEC/AEL LOAN ACCT			
				Total				Total	
		Admin	Projects	Fund		Admin	Projects	Fund	IEDA NOTES REC	OCT 1 2017 NOTES REC
Revenue										
Cash Balance Forward		350,000	14,732,026	15,082,026		0	14,014,255	14,014,255	1,374,816	3,483,264
FY20 IUB Transfer		0	0	0		0	0	0		0
Principal Repayments YTD		0	0	0		0	1,629,282	1,629,282	(114,443)	(1,514,839)
Interest Revenue		0	30,194	30,194		13,425	13,425	26,850		0
Other Revenue YTD		0	0	0		0	0	0		0
Deappropriations		0	0	0		0		0		0
Transfers		0	0	0		0	0	0		0
Total Revenue YTD		350,000	14,762,220	15,112,220		13,425	15,656,962	15,670,387	1,260,373	1,968,425
Expenses										
Administration YTD		(200,331)	0	(200,331)		(10,291)	0	(10,291)		
Project Payouts YTD		0	(480,992)	(480,992)		0	0	0		
Leg Auth Transfers				0				0		
(18 Acts Ch 1172 Sec 91)										
Total Expense YTD		(200,331)	(480,992)	(681,323)		(10,291)	0	(10,291)		
Obligations										
Obligations C/F		0	3,076,832	3,076,832		0	1,600,091	1,600,091		
Current Year Obligations		0	2,721,102	2,721,102		0	77,158	77,158		
Current Year Rescissions				0			(64,375)	(64,375)		
Current Year Payouts		0	(480,992)	(480,992)		0	(1,499,803)	(1,499,803)		
Balance of Current Year Admin		149,669	0	149,669		3,134	0	3,134		
Net Obligations YTD		149,669	5,316,942	5,466,611		3,134	113,071	116,205		
Balance Available		0	8,964,286	8,964,286		0	15,543,891	15,543,891		

Iowa Energy Center Grant Program
Obligation Log
FY2020

	Project Name	Amount Awarded	Amount Recaptured		Balance
Jul-19	Iowa State University	263,070			263,070
Jul-19	Baldrige Environmental Services LLC	140,000			140,000
Jul-19	Iowa State University	244,367			244,367
Jul-19	Iowa State University	280,000			280,000
Jul-19	Iowa State University	303,587			303,587
Jul-19	Iowa State University	480,656			480,656
Jul-19	University of Northern Iowa	129,293			129,293
Jul-19	Iowa State University	287,354			287,354
Jul-19	Iowa State University	243,036			243,036
Jul-19	Iowa State University	290,400			290,400
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Iowa Energy Center Grant Program
Obligation Log
FY2021

	Project Name	Amount Awarded	Amount Recaptured		Balance
Jul-20	UNI	395,680			395,680
Jul-20	ISU	156,000			156,000
Jul-20	UNI	418,696			418,696
Jul-20	ISU	450,436			450,436
Jul-20	ISU	266,720			266,720
Jul-20	The Energy Group	69,000			69,000
Jul-20	Energy Assoc of Iowa Schools	190,000			190,000
Jul-20	ISU	239,227			239,227
Jul-20	ISU	280,070			280,070
Jul-20	ISU	244,698			244,698
Jul-20	Building Enc Council of Iow	10,575			10,575
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Iowa Energy Center Loan Program
Obligation Log
FY2020

	Project Name	Amount Awarded	Amount Recaptured		Balance
Nov-19	Brent Johnson	25,512	25,512		0
Nov-19	KP Pork LLC	25,000			25,000
Nov-19	Marathon Power Partners	160,900			160,900
Feb-20	KSB Solar LLC	173,601			173,601
Feb-20	Nova Properties LLC	950,000			950,000
Feb-20	RNR Solar LLC	172,215			172,215
Apr-20	Hickman Storage	54,000			54,000
Apr-20	Loree & David Mills	64,375	64,375		0
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		1,625,603	**0**		**1,535,716**

Iowa Energy Center Loan Program
Obligation Log
FY2021

	Project Name	Amount Awarded	Amount Recaptured		Balance
Jul-20	Keaton Martin	77,158			77,158
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ATTACHMENT B

INFORMATION

REPORT
IOWA ENERGY CENTER BOARD
MAY 2021

From: Iowa Energy Center

Subject: Grant Status Report

Background: The Iowa Energy Center Board approved 10 grants at the July 2019 Board meeting for a total of $2,661,763 in funding. Nine of the grants were awarded to academic institutions and one was awarded to a private business. Agreements were executed in between February and May 2020, with most grants beginning work in April. The Policies and Procedures Handbook requires monthly reporting via IowaGrants. These monthly reports are reviewed by the program manager to evaluate the overall project progress and compliance with the stated deliverables.

In April 2021, the program manager conducted desktop monitoring sessions with each principal investigator and the appropriate members of their research teams. This report contains updates for each project based on the submitted monthly reports and meetings with the project teams.

Submitted By: Amber Buckingham, Program Manager

Attachments: Grant Status Report First Round 2021

Iowa Energy Center Grant Status Report

Introduction

The Iowa Energy Center Board approved 10 grants at the July 2019 Board meeting for a total of $2,661,763 in funding. Nine of the grants were awarded to academic institutions and one was awarded to a private business Agreements were executed in between February and May 2020, with most grants starting work in April. The Policies and Procedures Handbook requires monthly reporting via IowaGrants. These monthly uploads are reviewed by the program manager to evaluate the overall progress of the project and compliance with the project deliverables.

In April 2021, the program manager conducted desktop monitoring sessions with each principal investigator and the appropriate members of their research teams. This status report contains updates for each project based on the submitted monthly reports and meetings with the project teams

Grant Status Reports

Grant Name: Utility Workforce Assessment and Strategy Planning
Grant Recipient: University of Northern Iowa
Award Amount: $129,293
Project Description: The project will identify issues and develop a plan to impact current and future talent pipeline.
Project Completion Date (projected): 06/30/2021
Project Progress: 55%
Description of Work Completed: The first phase of the project, which included surveys completed by utilities, has been completed. The second phase of the project, which includes phone interviews with recruited participants is currently wrapping up. The third phase of the project will begin in May and will result in a final Workforce Strategy Plan, Implementation Plan and Governance Plan. The PI intends to include water utilities in this portion of the project as well, as they have unique workforce needs. The final materials will be provided to the Iowa Energy Center Board and disseminated to the appropriate stakeholders for implementation. The PI has indicated that an additional no-cost extension is necessary, as both COVID-19 and various natural disasters have impacted the ability of utilities to participate in surveys and interviews The no-cost extension is on the agenda for the May Board meeting, and will extend the project to 12/31/2021, but will not impact the budget.

Grant Name: Wastewater Case Studies to Prove Ratepayer Benefits in Underserved Iowa Communities
Grant Recipient: Baldridge Environmental Services
Award Amount: $140,000
Project Description: The objective is to prove the affordability of meeting the DNR regulations with civil engineers' oversight while saving money.
Project Completion Date (projected): 08/15/2021
Project Progress: 84%
Description of Work Completed: Water treatment systems have been installed and are running in four Iowa towns. Sampling and monitoring of water quality requirements is occurring with the assistance of several engineering firms and the University of Iowa Monitoring activities include determining oxygen levels in lagoons, observing dual aeration systems for comparative results, observing and collecting water samples during cold weather conditions, and tracking the performance of cells and the proper flow of the lagoon. The project remains on budget. The project managers are closely monitoring progress and may file for a No Cost Extension at a later date as COVID-19 delayed the installation of the systems in some towns. This delay means they may need an extension to ensure they can analyze an appropriate amount of summer water data

Grant Name: Wind Turbines in Cold Winter: Icing Physics and Novel Strategies for Wind Turbine Icing Mitigation
Grant Recipient: Iowa State University
Award Amount: $303,587
Project Description: *We propose to study wind turbine icing physics and develop novel anti-/de-icing strategies to* protect Iowa wind turbines in cold winter.
Project Completion Date (projected): 02/28/2023
Project Progress: 33%
Description of Work Completed: The PI and their team have successfully designed wind turbine blade models, set up a test rig, studied the transient behavior of dynamic ice accretion and water runback and designed a special vertical wind tunnel to study the physics of wind turbine blade icing. The have also started investigating the application of SLIPS (Slippery-Liquid-Infused-Porous-Surfaces) on turbine blades. The studies indicate that ice accretion was much easier to remove on blades that have been treated with SLIPS. The team also tested superhydrophobic surface treatments such as Hydrobead, which mitigates ice adhesion according to results. Most recently, the team has developed a Digital Image Project Sensing (DIPS) technique which will be used to quantify the behavior of surface water on the blades. The project is currently ahead of schedule.

Grant Name: Toolkit for Identification, Characterization, and Energy Evaluation of Low-Efficiency Rural Housing
Grant Recipient: Iowa State University
Award Amount: $287,354
Project Description: Toolkit to identify least energy efficient homes motivations for efficiency investments.
Project Completion Date (projected): 02/28/2023
Project Progress: 33%
Description of Work Completed: Throughout the first year of this grant, the team met and worked with multiple utility companies to discuss this project. Through these discussions and collaborations, they completed data-sharing agreements with all utilities and then received multiple years of residential energy consumption data (monthly billing data) from Cedar Falls Utilities, the City of Ames, and Bloomfield, as well as assessor's data and a range of other data. The team is in the process of reviewing various metrics in the literature which will inform the development of an improved/new metric to evaluate building efficiency. The PIs also continue to identify interview participants and set up interviews. They are aiming for a total of 50 interviews with rural residents and have completed 14 at the time of this report. The team has also developed two coding frameworks for the toolkit in order to answer the questions, "What factors influence rural homeowners to invest in energy-efficient strategies?' and "What are rural homeowners' understanding and perception on energy efficiency?"

Grant Name: A New Paradigm to Solve Unit Commitment and Optimal Power Flow Problems
Grant Recipient: Iowa State University
Award Amount: $244,367
Project Description: Dispatch schedules optimized with realistic constraints will lower the cost of a reliable grid.
Project Completion Date (projected): 05/31/2023
Project Progress: 25%
Description of Work Completed: The project team has completed three of their 12 deliverable tasks and are on pace to complete the project on time Based on the comprehensive literature review on the unit commitment problems at the core of electric grid market, they have identified modeling elements, decision variables and constraints that need to be considered for the analysis These elements provide an accurate representation of real-world problems solved at energy producers. To model these components through a mixed integer program, binary decision variables are defined to represent the commitment of each generation unit at each time period over the planning horizon. The PI has been modeling the logical relation between binary and continuous variables. The project team is also working on a set of constraints which are needed to ensure that the combination of power amounts generated by all units would satisfy the realized demand at each time unit

Grant Name: Smart Peak Power Avoidance for Reducing Grid Demand in Poultry Facilities
Grant Recipient: Iowa State University
Award Amount: $263,070
Project Description: Optimize the operation of management of energy intensive in-barn manure drying systems.
Project Completion Date (projected): 09/30/2021
Project Progress: 50%
Description of Work Completed: The PI and their research team developed and disseminated an online survey of manure drying systems in Iowa. The survey was developed in Qualtrics and the Iowa Poultry Association assisted in dissemination. The team received 23 responses, which represents 86% of Iowa hens. The project team has received rate structures from all north-central Iowa RECs at tabulated a list of rate structures from all 43 RECs The project team compiled and procured the equipment and sensor list for the build and control of monitoring systems and site installation. The majority of the sensors have been installed, and the team is currently testing the monitoring and drying equipment. The project team has thus far been unable to complete their on-farm monitoring tasks but feel that with the easing of some COVID-19 restrictions, they will be back on track to finish the project in the allotted time.

Grant Name: Strategies for Building Soil Carbon and Generating Carbon Negative Energy in Iowa counties
Grant Recipient: Iowa State University
Award Amount: $280,000
Project Description: The project advances renewable natural gas and power production using Iowa waste resources.
Project Completion Date (projected): 03/31/2022
Project Progress: 50%
Description of Work Completed: The project team has developed a process model, which will be modified with biochar integration, which involves documenting sources and availability of biochar. The team also completed a literature review to explore the integration of biochar. Techno-economic analysis has been performed to investigate the impact of biochar integration on RNG production via anaerobic digestion of dairy manure, based on the preliminary simulation results Minimum fuel-selling prices are evaluated for two cases: RNG produced from anaerobic digestion of manure and from Biochar integrated manure. Techno-economic results showed manure requirement decreases to produce a similar amount of Renewable Natural Gas (RNG) with biochar integration. However, from further investigation, the team has found that reducing manure input for the anaerobic digestion (AD) process might not provide an economic benefit as the manure costs are very low. Therefore, the team has modified the economic analysis to evaluate the RNG production for the same amount of manure "without biochar "and "with biochar" scenarios. The team has also investigated the potential market for the main product (RNG) and by-products (Digestate, CO_2), including pipeline injections, vehicle fuel, electricity, space heating, digestate, and the CO_2 market. The team presented their work at the C-Change conference in March and worked to enhance the feedstock availability database. They are currently working on integrating everything they have learned into a business plan

Grant Name: Distributed Solar and Wind Power Generation Planning in Rural and Underserved Areas
Grant Recipient: Iowa State University
Award Amount: $243,036
Project Description: Plan for distributed, rural solar and wind units with economics, efficiency, and sustainability
Project Completion Date (projected): 03/31/2022
Project Progress: 50%
Description of Work Completed: The project team has conducted work on an optimal power flow model, as well as a locational marginal pricing model. The team has also created algebraic formulas for the gain and loss analysis, which they then mathematically connected to the locational marginal costs with generation addition and transmission expansion. The team then began working on economic consequences, with the levelized comparison being looked at from a life cycle costing perspective. In December 2020, the team created a new and novel Option Valuation Model, which will assist decision makers when considering the addition of a Renewable Energy Power Generator or a Transmission Line. The focus of the first quarter of 2021 has been on the production of papers, with two papers finished. The team also continued to work on the integration of their models. The project team created and continues to maintain a project website, which can be accessed at: https://www.imse.iastate.edu/sweeet/

Grant Name: Share μPMUs for Data-Driven Real-Time Distribution Monitoring, Modeling and Analysis
Grant Recipient: Iowa State University
Award Amount: $290,400
Project Description: Demonstrate the usefulness of μPMUs in MidAmerican systems and provide big data tools for analysis.
Project Completion Date (projected): 08/31/2022
Project Progress: 20%
Description of Work Completed: The project team has purchased two μPMUs for initial experimentation. Once the project team began discussions with the supplier, they came to realization that the packages they originally intended to purchase did not contain all of the components necessary to provide necessary two-way communication. The project team has had to decrease the number of μPMUs purchased in order to stay within the budget. They have also been working to create a communication system that will allow the microphasers to communicate with the data analysis system. The team has also increased the number of partners participating in the project The list now includes MidAmerican, Algona Municipal Utilities, Alliant Energy, and Cedar Falls Municipal Utilities. This expansion of partners will allow the team to analyze how the μPMUs work within different utility structures. The PI continues to work with the utilities to identify the best location for the units, with installation set for Q1 2022

Grant Name: Development of Low Cost, Safe, and High-Performance Sodium Batteries for Wind Energy Storage
Grant Recipient: Iowa State University
Award Amount: $480,656
Project Description: Sodium batteries will be developed to cheaply and safely store wind energy to reduce cost and increase the reliability of electricity.
Project Completion Date (projected): 02/28/2023
Project Progress: 27%
Description of Work Completed: The project team has prepared lab scale quantities of glassy solid electrolytes (GSE) to assist them in understanding effects of oxygen, nitrogen, and iodine on the chemical stability of glass when it comes into contact with sodium metal. The effect of precursor materials was investigated on select glasses to understand how different manufacturers/ purities of starting materials effect the glass forming character, liquid behavior, and relevant material properties. Testing has identified Composition B as a promising GSE composition for preform scale up due to its electrochemical and atmospheric stability. In addition to this, the composition was found to be a very strong glass former in that it forms bulk glasses, those thicker than 1 cm, upon slow cooling. The strong glass forming character is a key signature of the glass being strongly resistant to crystallization and this is very critical for a successful preform. Additionally, the team found that $NaPO_3$ is the preferred source of oxygen based on its greater stability and resistance to water absorption than the very reactive, yet higher oxygen concentration starting material. Having ensured the quality of the starting materials, the glasses are now being studied for the properties necessary for optimum battery performance

ATTACHMENT C

ACTION

REPORT
IOWA ENERGY CENTER BOARD
MAY 2021

From: Iowa Energy Center

Subject: 20-IEC-001 No Cost Extension Request

Background: The University of Northern Iowa has requested a second no cost extension for award 20-IEC-001 *Utility Workforce Assessment & Strategy Planning.* The PI reports that the project has been delayed by COVID. They have completed Phase 2 of the project and request a 6-month No Cost Extension through 12/31/21 to ensure that they have proper time for Phase 3. Making some of the adjustments for virtual only data collection has taken more time than the team originally predicted, and they anticipate virtual meetings will also be necessary for Phase 3 of the project. The project team is requesting the extension to ensure they have ample time for advisory committee meetings, work sessions, and reporting. An extension through 12/31/21 would allow for additional delays or complications in completing this phase of the project. This extension will not impact the scope of the project, or the budget.

This is the second no-cost extension request for this grant award. Administrative Rule 261 *IAC* 404.7(7)(b)(1) provides that staff may approve one no-cost extension provided that the extension complies with subrule 404.5(5). Additional no-cost extensions shall be presented to the board for approval.

Proposed Motion: **Approve the No Cost Extension with a new project end date of 12/31/2021.**

Submitted By: Amber Buckingham, Program Manager

Attachments: No Cost Extension Request

UNI University of Northern Iowa

Office of Research & Sponsored Programs

April 8, 2021

Ms. Amber Buckingham
Iowa Economic Development Authority 1963
Bell Avenue, Suite 200
Des Moines, Iowa 50315

Re: No Cost Extension Request for Grant #20-IEC-001, *Utility Workforce Assessment & Strategy Planning Grant*

Dear Ms. Buckingham,

We are writing to request a No Cost Extension for the above referenced IEDA Grant # 20-IEC-001 through December 31, 2021. The project timeline needs to be extended due to some implementation delays caused by the COVID-19 pandemic.

Project Task	Year	Dates	Deliverables	Verification Model
Phase I: Quantitative Research – Online Survey	2020	March - Nov 2020	A final report including an exec summary and aggregated findings.	Receipt/acceptance of final report.
Phase II: Qualitative Research – In-depth interviews	2020 - 2021	Dec 2020 – Apr 2021	A final report including an exec summary and aggregated findings.	Receipt/acceptance of final report.
Workforce Strategy Plan Development	2020	Apr/May – Dec 2021	Final Workforce Strategy Plan, Implementation plan & Governance plan	Receipt/acceptance of Workforce Strategy Plan

As you are aware, the project has been delayed by COVID. We a have essentially completed Phase 2 and request a 6-month No Cost Extension through 12/31/21 to ensure we have proper time for Phase 3. Making some of the adjustments for virtual only data collection has taken more time and we anticipate virtual meetings will also be necessary for Phase 3. Basically, we want to have ample time for advisory committee meetings / work sessions and reporting. While we may be able to complete the project earlier, an extension through 12/31/21 would allow for additional delays or complications in completing this phase of the project.

There is no change in scope or budget.

If you have any technical/project content questions please reach out to Project Director Christy Ryken at Christy.ryken@uni.edu (319-273-7314). If you have any contractual or financial questions please contact me at britta.sandberg@uni.edu (319-273-4321).

Best regards,
Britta B. Sandberg
Britta B. Sandberg
Post-Award Support Services Coordinator

ATTACHMENT D

ACTION

REPORT
IOWA ENERGY CENTER BOARD
MAY 2021

From: Iowa Energy Center

Subject: Amendment to 20-IEC-010

Background: Iowa State University (ISU) has requested a budget modification amendment for award 20-IEC-010 *Development of Low Cost, Safe, and High-Performance Sodium Batteries for Wind Energy Storage.*

The PI has indicated that they need to buy additional channels to test the batteries they are assembling as part of the project. In order to accommodate this purchase, ISU is requesting the creation of a new budget line item for "equipment". ISU plans to move a total $5,000 from salaries and wages, fringe benefits and indirect costs to the new line item to cover the expenses. This change will not impact the scope of work or the overall project budget.

Administrative Rule 261 *IAC* 404.7(7)(a) provides that any substantive change to a funded IEC project, including time extensions, budget revisions, and alterations to proposed activities, will be considered an agreement amendment. As this request requires the creation of a new budget line item, IEDA Staff felt Board approval was necessary.

Recommendation: Staff recommends approving the amendment to 20-IEC-010; moving the requested funds from salaries and wages, fringe benefits and indirect costs to the newly created equipment category.

Proposed Motion: **Approve the Amendment to 20-IEC-010**

Submitted By: Amber Buckingham, Program Manager

Attachments: Rebudget Request from Iowa State University

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

Office of Sponsored
Programs Administration
1138 Pearson Hall
505 Morrill Road
Ames, Iowa 50011-2103
Phone: 515 294-5225
Fax: 515 294-8000

April 15, 2021

Amber Buckingham
Amber.Buckingham@IowaEDA.com

SUBJECT: Revised Budget Request
Award Title: "Development of high energy, density safe, low cost, all solid state sodium batteries for wind energy storage in Iowa";
Award ID: 20-ICE-010
ISU Account: 022372 **ISU ID: 145693**
ISU PI: Steve Martin

Dear Amber Buckingham:

The above referenced grant was made to Iowa State University in the amount of $480,656 under the direction of Dr. Steve Martin. I am in receipt of a request from Dr. Steve Martin to rebudget this project in the following manner:

Increase:		**Decrease:**	
Equipment	$ 5000	Salary/hourly	$3,869
Total	**$5,000**	Payroll/Benefits	$ 298
		Indirect cost	$ 833
		Total	**$5,000**

We need the instrument to test batteries we are assembling on the project; we have run out of channels on our current instrument and need the additional channels to test all of the batteries that we are assembling on the project.

We at Iowa State University have reviewed Dr. Martin's request and concur therein. Therefore, we request approval for the revised budget. If I can provide you with additional information or be of further assistance, please do not hesitate to contact me.

Sincerely,

Supriya Mathur Digitally signed by Supriya Mathur Date: 2021.04.15 09:00:07 -05'00'

Supriya Parshad
Award Administrator
Office of Sponsored Programs Administration

cc: Steve Martin

ATTACHMENT E

ACTION

REPORT
IOWA ENERGY CENTER BOARD
May 2021

From: Iowa Energy Center

Subject: Amendment to 20-IEC-009

Background: Iowa State University has requested a modification to the scope of work for project 20-IEC-009 *Shared PMUs for data-driven real-time distribution monitoring, modeling and analysis* Originally the research team felt they could purchase a single microPMU unit for $3,600. During the procurement phase of the project, the PI and their research team found that they had to purchase a package rather than a single unit in order to maximize the benefits to utilities, which has a total cost of $12,950 per unit. The PI also found that the manufacturer did not provide a communication or storage solution, which means the recipient will have to develop this system. This new R&D effort includes establishing the communication channel and developing a database to receive and store the data that is transmitted. This type of system is not currently available on the marketplace and has a cost of $2,000/unit/year. The increased costs means that the project team can only buy four fully packaged units instead of 20 single μPMUs. None of these changes will impact the overall project budget.

ISU is also seeking to extend individual deliverable dates but is not seeking an extension for the overall project timeline. They are also seeking to add additional utility partners to the project. The project team feels they can still create the data platform and achieve the project goals even with the reduced number of units. In addition, the team believes that the additional utility partners with improve the overall quality of the project.

Administrative Rule 261 *IAC* 404.7(7)(a) provides that any substantive change to a funded IEC project, including time extensions, budget revisions, and alterations to proposed activities, will be considered an agreement amendment. IEDA Staff considers the requested changes to the scope of work to be substantial enough to require Board approval.

Recommendation: Staff recommends approving the amendment to 20-IEC-009; updating the scope of work, deliverable dates, and utility partners.

Proposed Motion: **Approve the Amendment to 20-IEC-009**

Submitted By: Amber Buckingham, Program Manager

Attachments: Rebudget Request from Iowa State University

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

Office of Sponsored
Programs Administration
1138 Pearson Hall
505 Morrill Road
Ames, Iowa 50011-2103
Phone: 515 294-5225
Fax: 515 294-8000

May 6, 2021

Amber Buckingham
Amber.Buckingham@IowaEDA.com

SUBJECT: **Award Title: Shared PMUs for data-driven real-time distribution monitoring, modeling and analysis**
Request for approval on changes in award
ISU Account: 022417 ISU ID: 145710
ISU PI: Zhaoyu Wang

Dear Amber Buckingham:

The above referenced award was made to Iowa State University and has a current end date of 08/31/2022. I am in receipt of a letter from the Principal Investigator, Zhaoyu Wang and Anne Kimber requesting the following on this project:

In the table below, we compare the original project plan and new plan:

Table 1. Original Project Plan vs. New Plan

Project task	Year	Quarter	Deliverables	Verification Model	Target Complete Date
EPRC acquires a set of μPMUs from vendor and identify contractor	2021	Original Plan: Q1 **New Plan: Q3**	A set of μPMUs	Original Plan: Around 20 μPMUs and one contractor are set **New Plan:** Around 4 μPMUs are acquired or orders have been placed, we don't have to identify contractor because utility engineers can install.	Original Plan: 3/31/2021 **New Plan: 09/30/2021**
Original Plan: ISU works with MEC to identify locations to install μPMUs **New Plan: While we are**	2021	Original Plan: Q1 **New Plan: Q3**	Report documenting installation sites	At least 5 potential installation places are	Original Plan: 3/31/2021 **New Plan: 09/30/2021**

working with MEC, we will include more utility partners to have broader impacts, including Alliant, Iowa State Campus, and Algona Municipal Utilities				identified	
Original Plan. ISU works with MEC to install μPMUs **New Plan:** ISU works with utility partners to install μPMUs	2022	Original Plan: Q1 **New Plan: Q3**	Report documenting installation progress	Report showing devices are installed and measuring & reporting data	Original Plan: 3/31/2022 **New Plan: 08/31/2022**
Original Plan: ISU works with MEC to fine tune μPMUs **New Plan:** ISU works with utility partners to fine tune μPMUs	2022	Original Plan: Q1 **New Plan: Q3**	Report documenting μPMUs operating status	Report showing devices are fine-tuned and measurements are stable	Original Plan: 3/31/2022 **New Plan: 08/31/2022**
Original Plan: ISU works with MEC to collect μPMU data **New Plan:** ISU works with utility partners to collect μPMU data	2022	Q3	Report documenting the collected data	Devices have successfully recorded data	8/31/2022
Original Plan: ISU works with MEC to clean the data **New Plan:** ISU works with utility partners to clean the data	2022	Q3	Report documenting the data cleaning process	Data has been cleaned and ready for analysis	8/31/2022
Design a big data platform for μPMU data analytics	2022	Q3	An open-source platform	Platform can import, visualize, clean and statistically analyze data	08/31/2022
Analyze μPMU data	2022	Q3	Report documenting data analysis results	Reports information extracted from μPMU data	08/31/2022

Justifications for the changes to the project plan.

1. About the quantity of microPMUs to be purchased
   - We have to purchase the GridAnalyzer package rather than a single microPMU device.
     - A microPMU can only record voltage/current measurements; a PQube3 power quality analyzer can record all events. We need to buy both and let them work together to maximize the benefits to utilities.
     - Our hardware budget is $72k in total, where we thought we could buy a single microPMU at $3,600/unit, as shown in Fig 1. The quote of GridAnalyzer packages is shown in Fig. 2.
   - We haven't included data communication and storage costs

- We thought the vendor would provide the solution; it turns out that we have to develop it by ourselves. This is a good new R&D effort, which makes this project more challenging but also more interesting. We estimate this cost is $2,000/unit/year.
- The new R&D effort includes setting up wireless data plans and cradlepoint devices to establish the communication channel, and developing a database to receive and store the data streams transmitted through the wireless communication.

- Therefore, we cannot afford 20 units as we originally planned; we can afford 4 units with $72k hardware budget in total.

Supplies and Materials	Purchasing 20 PMUs	$36,000.00	$36,000.00	$0.00	$0.00	$0.00	$72,000.00	$72,000.00

Fig. 1 The original plan of purchasing 20 microPMUs

POWERSIDE

Powerside
850 Atlantic Ave.
Alameda, CA 94501
USA
TEL +1-510-522-4645
www.powerside.com

Created on April 6, 2021
Expires on May 6, 2021

Powerside Quote ISU-22900

Prepared For: Zhaoyu Wang
wzy@iastate.edu
Phone
Fax

Bill To: Iowa State University
Iowa State University
Ames, IA
50011 USA

Ship To: Iowa State University
Iowa State University
Ames, IA
50011 USA

Product Code	Product Description	Unit Price	Quantity	Discount	Subtotal
GridAnalyzer-Pole-000-0000-000-XXXX	Consists of • PQube3 power quality analyzer (Class A, 4MHz sampling, DC to 150kHz recording, revenue-grade accuracy Class 0.2) • microPMU synchrophasor instrument (120 synchrophasors per second, 0.001 degree and 0.002% resolution) • UPS battery backup 1 hour • GPS receiver and antenna • Ethernet Hub • Quick start manual	$12,950.00	2	10%	$23,310.00

TOTALS

SubTotal	$23,310.00
Tax	
Shipping and Handling	
Total	$23,310.00

Made in USA

Payment and Delivery Terms

Payment in advance
Standard delivery: Stock to 3 weeks.
Taxes, Freight, Insurance additional.
EXW Alameda, California

Submitted by: Kamron Tangney
Please send purchase orders to sales@powerside.com

Fig. 2 The new quote of GridAnalyzer package

2. About the deliverable dates

We originally planned to complete the purchase of microPMUs by March 31, 2021. Due to the delay caused by the pandemic and the multi-layer internal approval of ISU procurement process, we request changing this deliverable date to be September 30, 2021. This also causes the delay in installation and data collection, which is shown in Table 1.

3. About additional utility partners

We originally planned to work with MidAmerican Energy in deploying microPMUs. We have some email exchanges about this matter in February 2021. While we are still in talk with MidAmerican, we have included more utility partners, such as Alliant Energy, Iowa State campus utility service, and Algona Municipal Utilities. In particular, Alliant will purchase and install 3 microPMUs by themselves and ISU will provide data communication and analysis solution to them.

4. The above changes will not affect the original overall project goals which are:

- The first goal is to acquire μPMUs and create a data collection platform, making it possible to fashion a laboratory environment at any locations within a real large-scale power system.

- The second goal is to help utilities identify optimal numbers of μPMUs and best locations to install them
- The third goal is to develop big data analytic tools to help utilities unveil the useful information and take full advantage of the collected data

We can still create the data platform and unveil useful information to utilities with a reduced number of μPMUs. In addition, we believe we can better achieve these goals by adding more utility partners.

Iowa State University has carefully reviewed the request and concurs therein. All other terms and conditions remain unchanged. If I may provide you with additional information or be of further assistance, please do not hesitate to contact our office.

Sincerely,

Supriya Mathur
Digitally signed by Supriya Mathur
Date 2021 05 06 15 53 39 -05'00'

Supriya Parshad
Award Administrator

cc. Zhaoyu Wang

IOWA ENERGY CENTER LOANS
PROJECT REPORT

IOWA economic development

ATTACHMENT F

Applicant: **Ryan Wangsness**
Project Type: Solar
Project Size: 36 kW
Loan Request: $38,887.50
Recommendation: To Be Provided May 13
Board Decision: May 13, 2021

Summary

Ryan Wangsness is an individual that farms 279 acres and raises organic hens, corn, oats, rye, hay and soybeans in Decorah, Iowa. The solar project would run a cooler to cool eggs, fans to cool chickens, motors to run the feed chain and egg belt, and to power the well and lights for the barn.

Funding Sources

Financing

Source	Status	% of Eligible Project Cost	Amount
Iowa Energy Center AERLP	Loan request	50%	$38,887.50
Bank Loan	Secured	50%	$38,887.50
		Total	$77,775

Incentives

Name	Source	Estimate
Investment Tax Credit (ITC)	Federal	$20,254
Solar Energy System Tax Credit	State	$10,127
	Total	$30,381

Loan Term

The applicant requested a loan term of 9 years. Staff analysis of the cash flow factors in the project installation cost, incentives, estimated cost savings and other financing. The IEC Loan Committee will include a loan term as part of their recommendation if the project is recommended for approval by the board.

Collateral

An irrevocable letter of credit has been pledged as collateral. An irrevocable letter of credit is an official correspondence from a bank, requested by the applicant. It assures that the bank will pay the loan if the borrower fails to pay.

IOWA ENERGY CENTER LOANS
PROJECT REPORT

IOWA economic development

ATTACHMENT G

Applicant: **Sievers Family Farms**
Project Type: Solar
Project Size: 155 kW
Loan Request: $149,200
Recommendation: To Be Provided May 13
Board Decision: May 13, 2021

Summary

Sievers Family Farms intends to install a solar array at their farm which raises agricultural beef cattle and grain.

Funding Sources

Financing

Source	Status	% of Eligible Project Cost	Amount
Iowa Energy Center AERLP	Loan request	50%	$149,200
Cash	Pledged	50%	$149,200
		Total	$298,400

Incentives

Name	Source	Estimate
Investment Tax Credit (ITC)	Federal	$66,664
Solar Energy System Tax Credit	State	$20,000
	Total	$86,664

Loan Term

The applicant requested a loan term of 20 years. Staff analysis of the cash flow factors in the project installation cost, incentives, estimated cost savings and other financing. The IEC Loan Committee will include a loan term as part of their recommendation if the project is recommended for approval by the board.

Collateral

An irrevocable letter of credit has been pledged as collateral. An irrevocable letter of credit is an official correspondence from a bank, requested by the applicant. It assures that the bank will pay the loan if the borrower fails to pay.

IOWA ENERGY CENTER LOANS
PROJECT REPORT

IOWA economic development

ATTACHMENT H

Applicant: **Todd Eggert**
Project Type: Solar
Project Size: 24 kW
Loan Request: $25,750
Recommendation: To Be Provided May 13
Board Decision: May 13, 2021

Summary

Todd Eggert intends to install a solar array at his rural residence on five acres in Wilton, Iowa.

Funding Sources

Financing

Source	Status	% of Eligible Project Cost	Amount
Iowa Energy Center AERLP	Loan request	50%	$25,750
Bank Loan	Secured	50%	$26,237
		Total	$51,987

Incentives

Name	Source	Estimate
Investment Tax Credit (ITC)	Federal	$13,516
Solar Energy System Tax Credit	State	$5,000
	Total	$18,516

Loan Term

The applicant requested a loan term of 7 years. The IEC Loan Committee will include a loan term as part of their recommendation if the project is recommended for approval by the board.

Collateral

The applicant pledged a mortgage on their property as collateral. The Loan Committee reviewed the pledged collateral and will provide their recommendation to the IEC Board.

ATTACHMENT I

REPORT
IOWA ENERGY CENTER BOARD
May 2021

ACTION

From: IEDA Legal

Subject: Appointments to Committees and Election of Chair/Vice-Chair

1. Appointments to Grant Committee

   261 *IAC* 403.3(6)(a)(1) provides that, each year, the Board determines the size of the Grant Committee and appoints members to the committee.

   Proposed Motion:

   Reappoint Jenae Jenison, Jennifer Johnson, Gul Kremer, Dan Nickey, and Rick Olesen to a five-person Grant Committee for a term from July 1, 2021 to June 30, 2022.

2. Appointments to Loan Committee

   261 *IAC* 403.3(6)(b)(1) provides that, each year, the Board determines the size of the Loan Committee and appoints members to the committee.

   Proposed Motion:

   Reappoint Stuart Anderson, Troy DeJoode, Valerie Newhouse, and Timothy Whipple to a four-person Loan Committee for a term from July 1, 2021 to June 30, 2022.

3. Election of Chair and Vice Chair

   Proposed Motion:

   Elect Troy DeJoode to serve as Chair and Dan Nickey to serve as Vice Chair for a term from July 1, 2021 to June 30, 2022.

Submitted By: Lisa Connell, Assistant Legal Counsel

ATTACHMENT J

ideal ENERGY

A Renewable H_2 Economy in Iowa

With the support of the Iowa Economic Development Authority, Ideal Energy is charting the path to a green hydrogen economy. We're developing a new value chain that will bring the state's resources and infrastructure together to build a resilient and robust energy future.

IDEAL ENERGY, LLC

13 MAY 2021 | PROPRIETARY & CONFIDENTIAL

PREPARED FOR: IOWA ECONOMIC DEVELOPMENT AUTHORITY

PRESENTED BY:
Troy Van Beek, Founder & CEO
Aurelien Windenberger, Director of Design & Finance
Dr. Gregory Wilson, Consultant
Ideal Energy, LLC

Contents

- Introduction to Ideal Energy & Summary of IEDA Renewable H_2 Grant
- Renewable H_2 – How it Works
- H_2 Opportunities for Iowa
- Potential Pilot Projects & Partnerships

Introduction

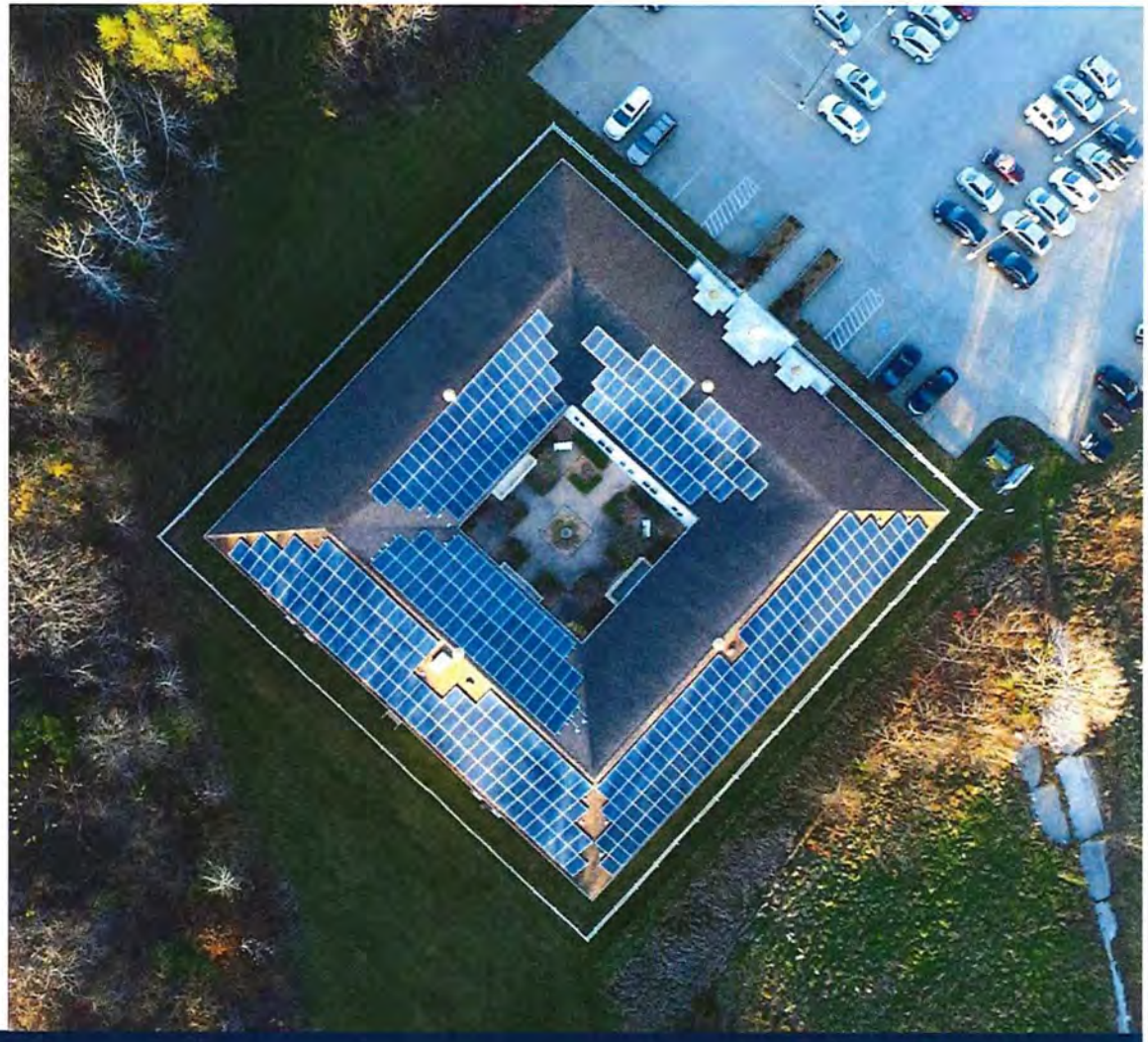
About

Ideal Energy is a Veteran-Owned, Iowa based energy company delivering quality solar and energy storage solutions to the Midwest & beyond.

Our mission is to increase the security, sustainability, and vitality of our planet with future-facing renewable energy technology.

NABCEP CERTIFIED
PV INSTALLATION PROFESSIONAL
CERT # 102451-011916

Service Disabled Veteran Owned Small Business
SDVOSB
cVE



We are building the next generation of energy solutions

Problems we address:

- High energy costs
- Peak Demand Management
- Resiliency
- Corporate Sustainability

Technologies we use:

- Solar
- Energy Storage
- Microgrids
- AI Optimized Energy Management
- Renewable H_2

BUSINESS INNOVATION
IOWA ENVIRONMENTAL COUNCIL
AGRI-INDUSTRIAL PLASTICS

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PROJECT OF THE YEAR
SOLAR BUILDER MAGAZINE
SCHOOL HOUSE APARTMENTS

PROJECT OF THE YEAR
1000 FRIENDS OF IOWA
STEFFENSMEIER WELDING

PROJECT OF THE YEAR
1000 FRIENDS OF IOWA
STUFF ETC

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IEDA Grant Overview

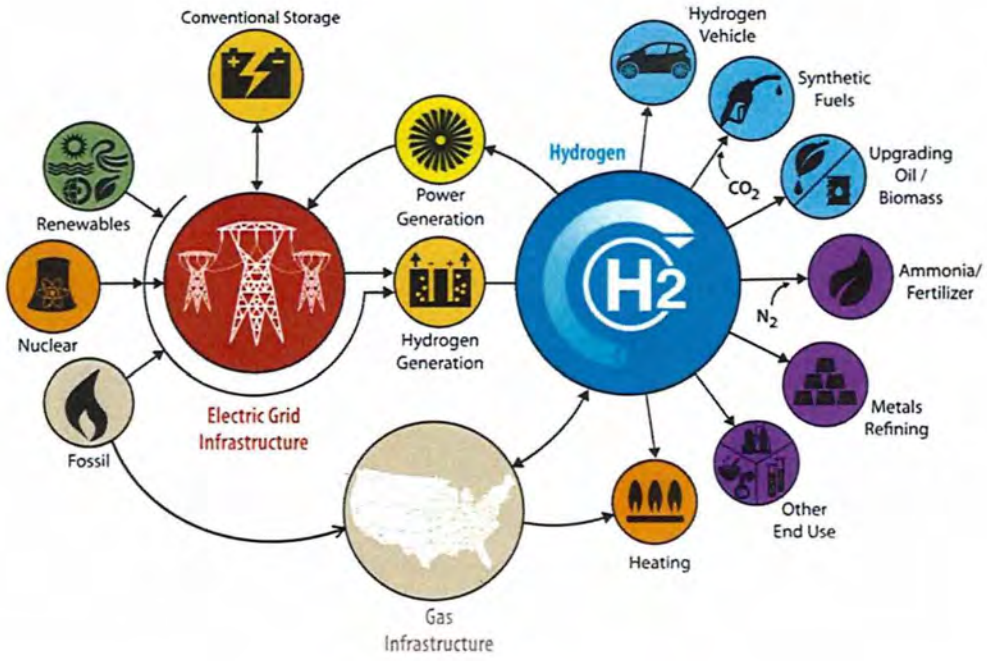
Laying the foundation for industrial-scale renewable hydrogen production in Iowa

KEY DELIVERABLES

- Developing relationships with key stake holders
- Producing wind and PV LCOE roadmaps for the state of Iowa; quantifying production losses due to periodic oversupply/curtailment events
- Developing a renewable H_2 capital equipment supplier matrix and document key cost model metrics and trends
- Producing a cost roadmap for production of renewable H_2 in Iowa
- Planning & launching a pilot project

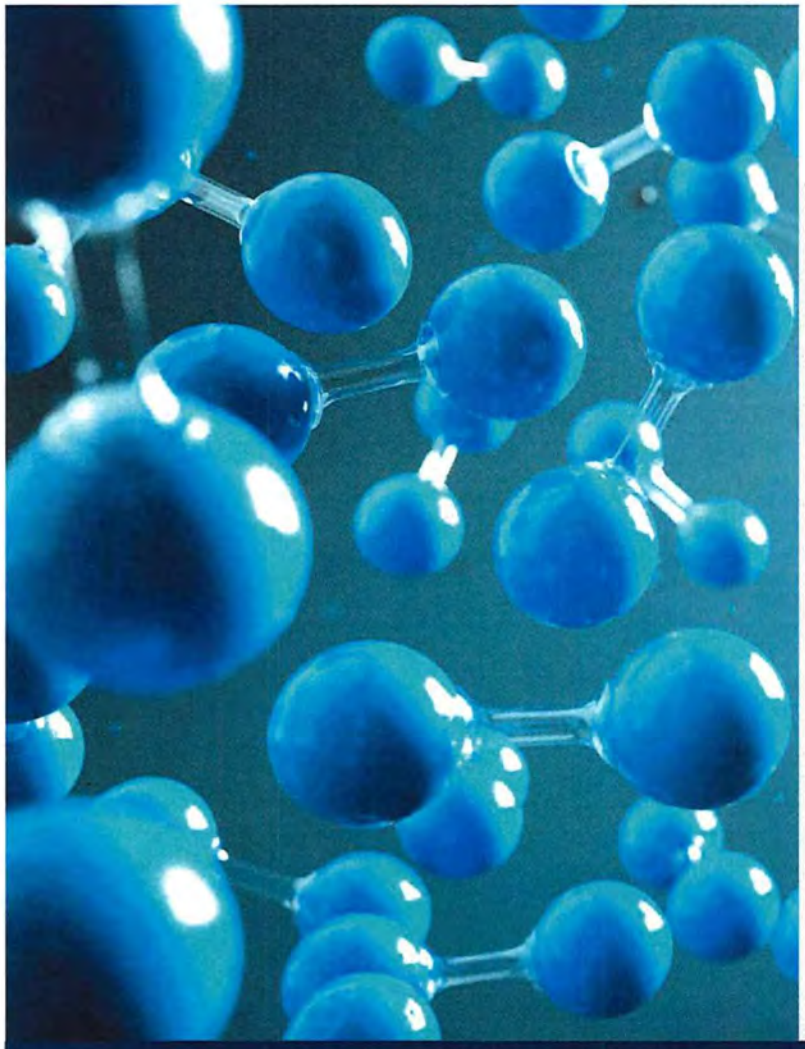
Renewable H_2 – How it works

H_2 and the new energy future



- The energy transition is driven by an urgent need to decarbonize the world's energy systems
- To achieve decarbonization generation, distribution, and storage of both zero-carbon electricity and a carbon-neutral chemical energy carrier are required
- H_2 is widely viewed as the best choice since it can be easily generated by splitting water molecules using renewable electricity

Source: https://www.energy.gov/eere/fuelcells/h2scale



H_2 – Key Facts

H_2 is a basic feedstock to produce commodities including:

- Petroleum-based fuels
- Ammonia
- Steel

Today, H_2 is produced almost entirely from fossil fuels but it can also be produced by splitting water with renewable electricity via electrolysis.

Water electrolysis was first demonstrated in 1789 and has been used to produce H_2 for over 100 years.

Today the U.S. produces >10 million tonnes (Mt) per year of H_2 from natural gas and has 1600 miles of H_2 pipeline. The CO_2 emitted from this process is one of our largest sources of CO_2 emissions.

https://www.woodmac.com/news/editorial/the-future-for-green-hydrogen/

Renewable H_2 is the key to decarbonizing many "hard to abate" sectors

A high-level overview of the H_2 Value Chain

PRODUCTION

METHANE ETHANOL PROPANE GASOLINE	→	STEAM REFORMATION (H_20, HEAT) PARTIAL OXIDATION (O_2)	→ SYNTHETIC GAS (H_2, CO, CO_2)
COAL & BIOMASS	→	PRESSURIZED GASIFICATION	→ SYNTHETIC GAS (H_2, CO)
WATER (H_20)	→	ELECTROLYSIS	→ HYDROGEN, OXYGEN (H_2, O_2)
BIOMASS	→	MICROBIAL FERMENTATION	→ HYDROGEN, CARBON DIOXIDE (H_2, CO_2)
WATER (H_20)	→	THERMOCHEMICAL WATER SPLITTING PHOTOBIOLOGICAL WATER SPLITTING PHOTOELECTROCHEMICAL WATER SPLITTING	→ HYDROGEN, OXYGEN (H_2, O_2)

PURIFIED H_2

STORAGE & DISTRIBUTION

- ONSITE CONSUMPTION
- PIPELINE
- HIGH-PRESSURE TUBE TRAILERS
- LIQUEFIED HYDROGEN TANKERS
- COMPRESSED & LIQUID STORAGE TANKS

END USE

CHEMICALS/AGRI BUSINESS
- Methanol
- Ammonia
- Final chemical products

INDUSTRY
- Refineries
- Steel
- Cement
- Other high heat processes

RESIDENTIAL/COMMERCIAL
- H2 blended into natural gas for distribution
- Retrofitting for pure H2 storage and transport
- Municipal and residential scale CHP

MOBILITY
- Fuel Cell EV (FCEV)
- Filling stations
- Marine transport

POWER
- Power gen via gas turbine
- Storage/grid balancing

Source: https://www.woodmac.com/our-expertise/focus/transition/2050---the-hydrogen-possibility/

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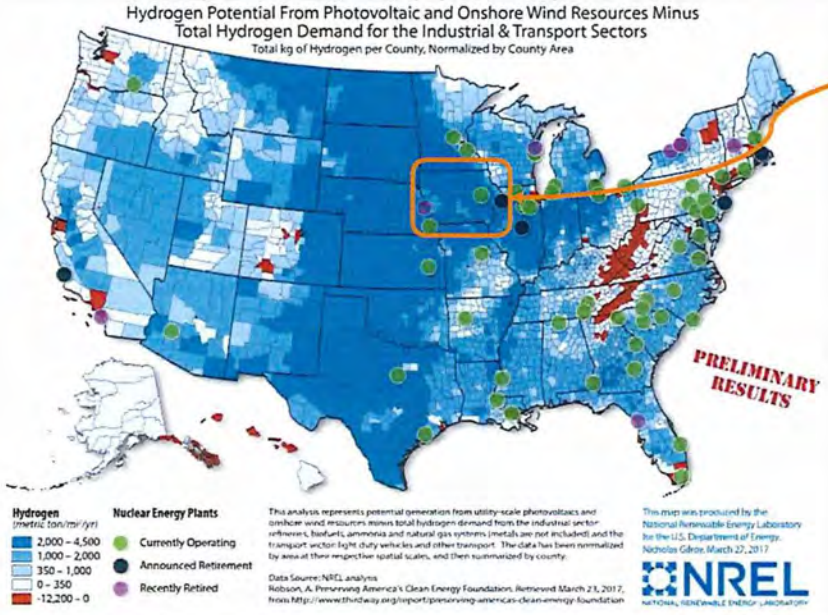
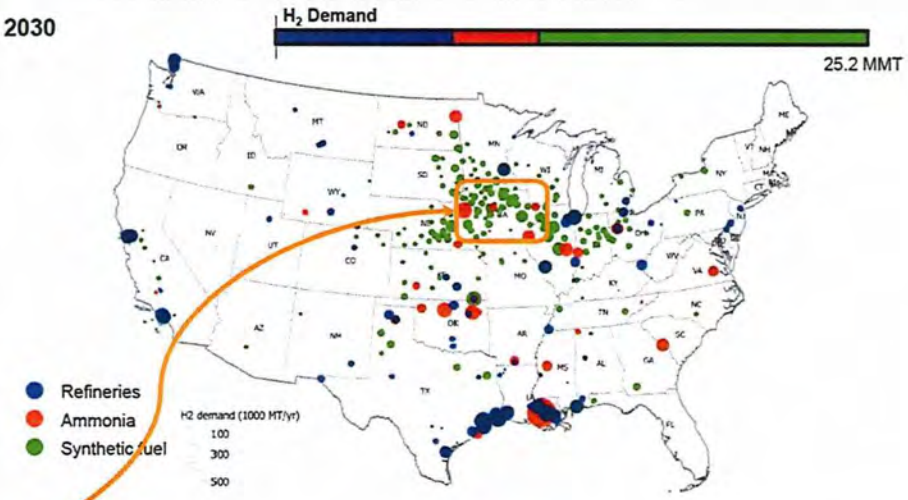
Why Renewable H_2 in Iowa?



Iowa is one of the best U.S. States in terms of renewable H_2 potential because of access to low-cost PV and wind power.



Source: Elgowainy, et al, ANL

And it is one of the best U.S. States in terms of future H_2 demand for renewable fuels and ammonia production.

Source: https://www.energy.gov/eere/fuelcells/h2-scale-rd-consortium-kick-meeting

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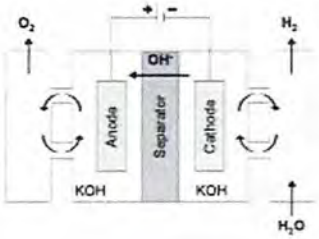
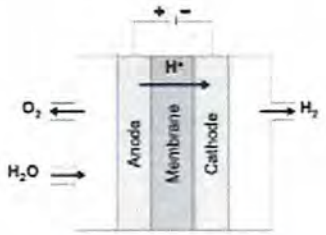
Electrolyzer Technology Brief



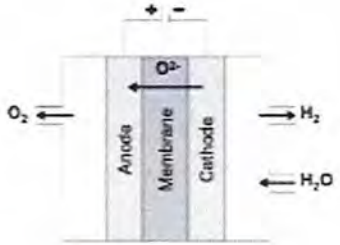
ALKALINE

- Mature technology (90+ years)
- Used for high volume, steady-state production



PROTON EXCHANGE MEMBRANE

- Most widely available technology
- Coated polymer membrane technology still maturing
- Flexible and current choice for intermittent operation



SOLID OXIDE

- Newest technology
- Ceramic materials operate at much high temperature
- More efficient and cheaper materials than PEM
- Can also be reversed for use as a fuel cell

Electrolyzer Manufacturers

- NEL (Norway). Oldest player, 90+ years. Alkaline and PEM systems
- Siemens (Germany). PEM electrolysis systems.
- Plug Power (U.S.) H_2 fuel cell business for 25 years. Entered the PEM electrolyzer business through acquisition of Giner ELX (Boston, ~50 years)
- Cummins (U.S.) Entered H_2 electrolyzer and fuel cell business through acquisition of Hydrogenics (Canada, ~35 years). PEM and alkaline systems
- ITM Power (UK). Both fuel cells and PEM electrolyzers for 20 years
- McPhy (France). Alkaline electrolyzers for ~10 years
- Haldor Topsoe (Denmark). 80+ year old provider of catalyst & chemical/refining process technology. Currently developing solid oxide electrolysis systems

Source: https://www.energy.gov/eere/fuelcells/h2-scale-rd-consortium-kick-meeting

Iowa: Becoming the New Persian Gulf of the USA

Renewable H_2 is currently cost competitive in select markets. Costs are expected to decline through 2025 as the industry scales.

12x growth is projected over the next five years, globally.

We've identified several use cases in Iowa where renewable H_2 is currently cost competitive.

CURRENT USE CASES:

- Co-locating H_2 production sites at wind farms to take advantage of energy at curtailment events
- Blending with natural gas to power transit buses
- Multi-day energy storage

FUTURE USE CASES:

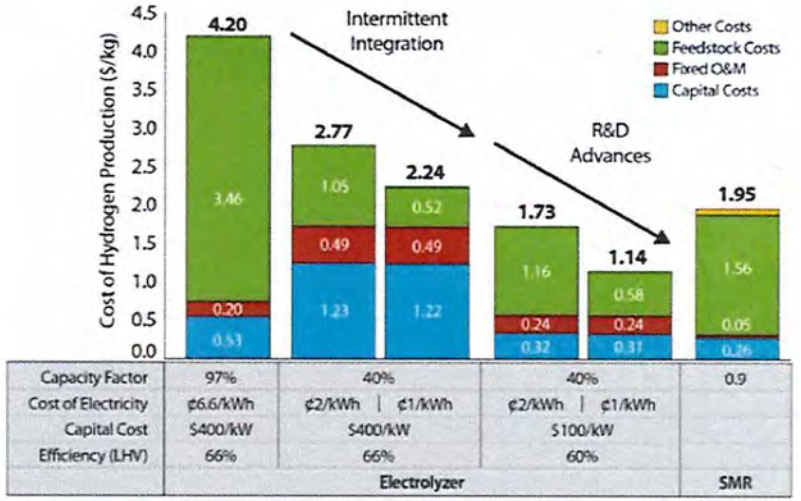
- Fueling medium & heavy-duty trucking
- Fueling maritime transit
- Aviation fuel-Iowa can produce up to 8% of US commercial jet fuel needs
- Decarbonizing fertilizer production

https://www.woodmac.com/news/editorial/the-future-for-green-hydrogen/

Making H_2 work in Iowa at scale

- Cost will be a function of input electricity cost, electrolyzer capital cost, and the plant's capacity factor.
- One kilogram of H_2 has nearly the same energy as one gallon of gasoline. For transport, the cost of renewable H_2 needs to be around $2 to $2.50 per kg.
- To compete with the traditional hydrocarbon-based source of H_2 – steam-methane reforming (SMR), renewable H_2 needs to be around $1.95 per kg.

DOE'S RENEWABLE H_2 COST ROADMAP



Lower costs for H_2 are achievable with R&D investment and industrial scaling

Source: *IEEE Interface*, Spring 2018

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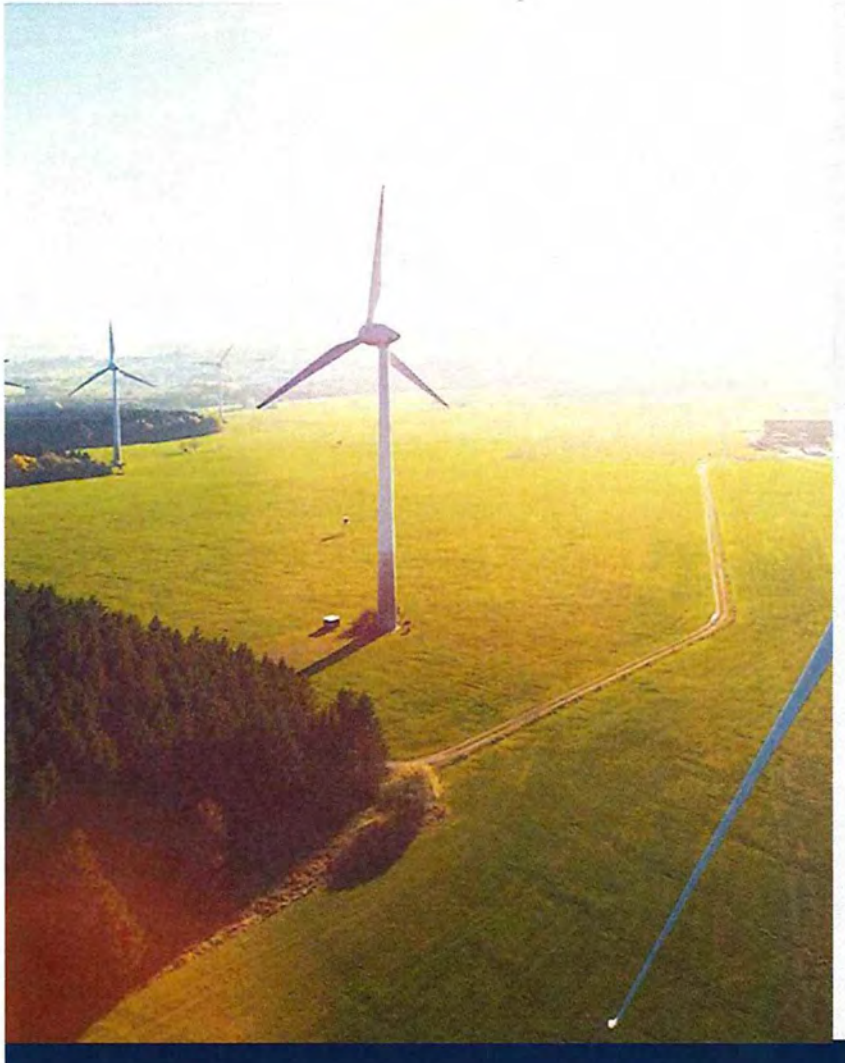
Opportunities for Iowa

- Utilities
- Fertilizer Manufacturers
- Renewable Fuel Manufacturers



Utilities

OPPORTUNITY

Produce renewable H_2 with MW-scale PEM electrolyzer systems powered by new MW-scale PV capacity & excess wind energy from captive wind farms

Utilities | Usage Case #1

SELF CONSUMPTION: Blend renewable H_2 with natural gas for retail & commercial customers

- 15 – 20% H_2 blended into Natural Gas presents low to no risk to the safety and integrity of the overall system.
- At just 5% H_2 in NG for the state of Iowa, the electrolysis market is hundreds of GWs.

POTENTIAL MARKET SIZE

Residential	525 GW
Commercial	426 GW
Industrial	1.8 TW

Assumptions:
- 5% H_2 blend
- Based on 2019 Iowa natural gas use reported at EIA.gov
- Electrolyzers are operating 24x7

Utilities | Usage Case #2

SELF CONSUMPTION: Blend renewable H_2 with natural gas for decarbonizing electricity generation from combined cycle & peaker turbines

Blending H_2 in natural gas for the purpose of power generation is the focus of several projects in the U.S. and globally. These projects are motivated by:

- Utility R&D with partial funding from the government
- Preemptive decarbonization efforts in relation to natural gas

Blend ratios below 15% are considered low risk for existing power stations, 5% is considered to no risk.

POTENTIAL MARKET SIZE

Electric Power from 24x7 electrolyzer operation	380 GW

Assumptions:
- 5% H_2 blend
- Based on 2019 Iowa natural gas use reported at EIA.gov

Utilities | Usage Case #3

TRANSIT SYSTEM PARTNERSHIPS: Selling renewable H_2 as a new fuel for H_2 powered transit buses

Des Moines transit (DART) has 173 medium, heavy duty and articulated buses. Assuming the total inventory transit class in the entire state is 250, and the H_2 needs if each were a 56 passenger H_2 electric bus with a range of 260 miles/day then the transit sector water electrolyzer market size estimate is:

POTENTIAL MARKET SIZE

Qty.1 H_2 Electric Bus	0.39 MW
Qty. 250 H_2 Electric Buses	97.5 MW

Utilities | Usage Case #4

NON-REGULATED NEW BUSINESS: Sell renewable H_2 as fuel into emerging medium and heavy duty H_2 vehicle fueling network

H_2 fueling for medium and heavy-duty vehicles is an emerging business opportunity and companies are already positioning to serve the H_2 refueling market. In 2015, a trucking industry study reported that 29 billion gallons of diesel fuel was consumed by heavy duty trucks classified as "combination vehicles" (i.e., tractors pulling trailers).

POTENTIAL MARKET SIZE

U.S. HD Truck Annual Demand - Electrolyzer powered 24x7	162 TW

Fertilizer Manufacturers

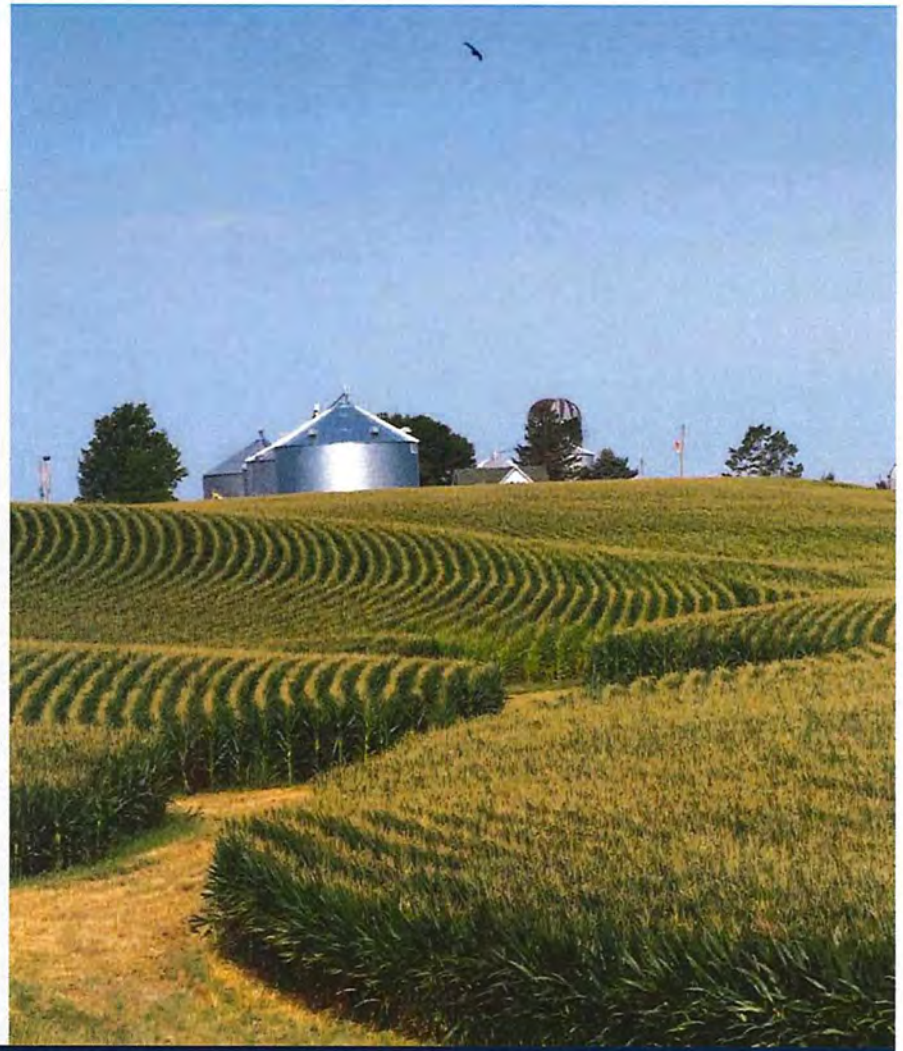
OPPORTUNITY

Produce renewable H_2 with MW-scale PEM electrolyzer systems powered by onsite PV plus wind power purchase agreements

Fertilizer Manufacturers | Usage Cases

GREEN AMMONIA: Building new capacity to enter the emerging green NH_3 fuel business. Export via rail and pipeline to other states and possibly other countries for electricity generation and marine bunker fuel.

TURQUIOS METHANOL: Build new capacity to enter the emerging MeOH fuel and petrochemical/refining feedstock business using renewable H_2 plus captured CO_2 from the plant's legacy steam methane reforming units. Export to other states by truck and by rail.



Fertilizer Manufacturers | Electrolyzer Production Capacity

ESTIMATES FOR THE ELECTROLYZER CAPACITY REQUIRED TO POWER ALL OF IOWA'S NH3 PLANTS				
PLANT LOCATION	OWNER	NH_3 ANNUAL PRODUCTION	DAILY H_2 FEED REQUIREMENT	CONTINUOUS ELECTROLYZER FEED
Port Neal Complex Sergeant Bluff, IA	CF Industries	1.23M tons/year	313,200 kg/day	728 MW
Wever, IA	OCI NV	885K tons/year	235,000 kg/day	548 MW
Fort Dodge, IA	Koch Industries	385K tons/year	102,7000 kg/day	239 MW
Creston, IA	Green Valley Chemical	35K tons/year	9,344 kg/day	21.7 MW

*Assumed 55.8 kWh/kg H_2 electrolyzer efficiency

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Renewable Fuel Manufacturers

OPPORTUNITY

Produce renewable H_2 with MW-scale PEM electrolyzer systems powered by onsite PV plus wind power purchase agreements

Renewable Fuel Manufacturing | Usage Cases

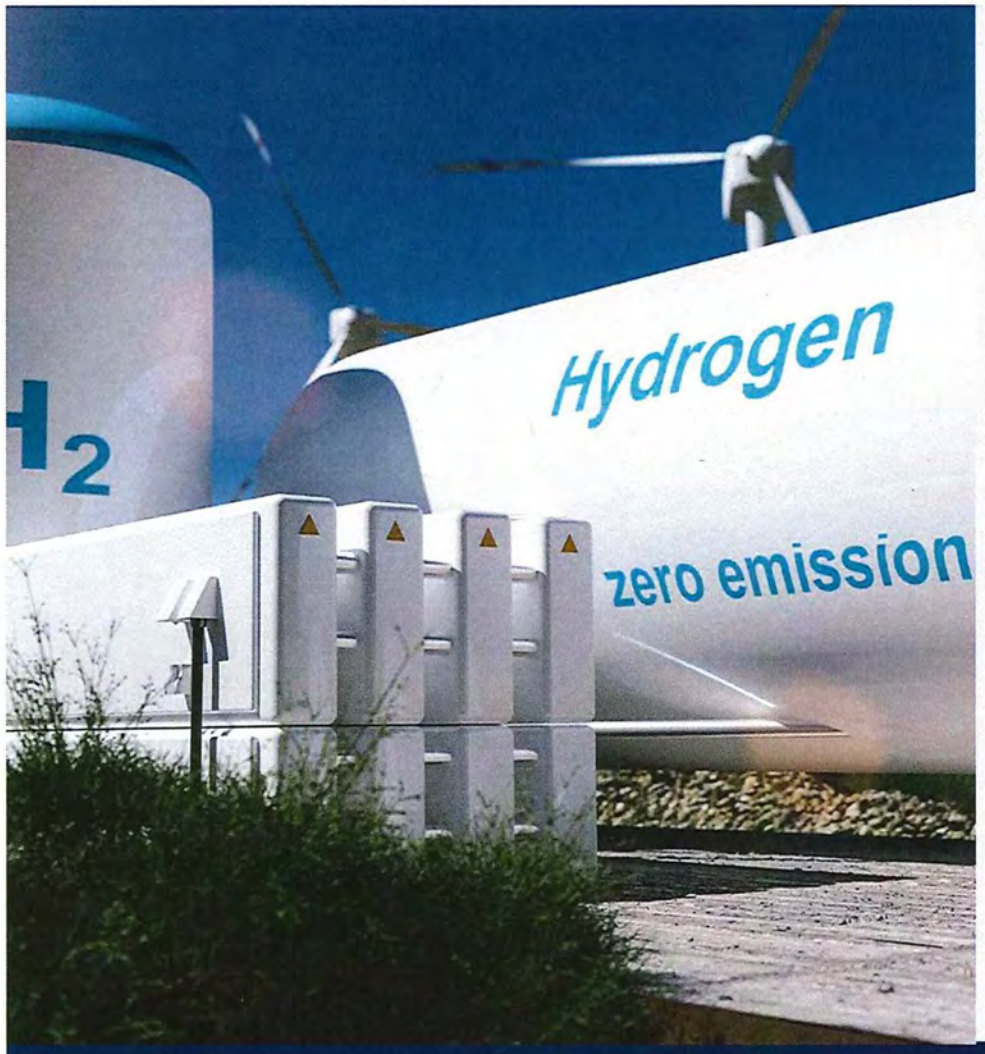
GREEN AMMONIA: Building new capacity to enter the emerging green NH_3 fuel business. Export via rail and pipeline to other states and possibly other countries for electricity generation and marine bunker fuel.

GREEN H_2: Selling compressed renewable H_2 as fuel into emerging medium and heavy duty H_2 vehicle fueling network.

GREEN METHANE: Build new capacity to produce green methane using renewable H_2 plus captured CO_2 from Iowa's ethanol industry. Export using existing natural gas pipelines.

GREEN METHANOL: Build new capacity and enter the emerging green MeOH fuel and petrochemical/refining feedstock business using renewable H_2 plus either captured CO_2 from Iowa's ethanol industry or various biomass feedstocks. Export to other states by truck and by rail.

Potential Pilot Projects & Partnerships



Pilot Projects

- Ideal Energy has modeled use cases for several of the sectors in this presentation, and currently is working with key stakeholders in Iowa on potential demonstration projects
- Ideal Energy is actively seeking additional partnerships for H_2 pilot projects in Iowa

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Thank You

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