NDEC
North Dakota Ethanol Council

April 29, 2016

Karlene Fine, Executive Director
North Dakota Industrial Commission
State Capitol – 14th Floor
600 East Boulevard Ave Dept 405
Bismarck, ND 58505-0840

Dear Ms. Fine:

The North Dakota Ethanol Council (NDEC) is submitting the enclosed application to request $50,000 in funding from the Renewable Energy Development Program of the North Dakota Industrial Commission. The funding will be used as a match for the Gateway to Science ethanol exhibit, which has a total budget of $110,000. Additional partners in this project are ethanol industry stakeholders, Gateway to Science and Science Museum of Minnesota.

It is expected this project will increase the long-term use of ethanol in North Dakota. By educating students, parents and educators in the region on the benefits of ethanol to the economy, environment and energy independence, we are working toward creating future generations of ethanol advocates.

The second result will be increased interest in science, technology, engineering and math- (STEM) related careers, including those directly or indirectly related to the ethanol industry. This is vitally important to North Dakota as it led the nation in growth of STEM jobs from 2004 to 2014, increasing the STEM workforce by 37.1 percent. In addition, STEM jobs are projected to see 19 percent growth from 2014 to 2019 (ND STEM Network).

This letter sets forth a binding commitment on behalf of the North Dakota Ethanol Council to complete the project as described in the application should the commission approve the requested grant.

Thank you for your consideration.

Sincerely,

Jeff Zueger
Chairman

1605 E. Capitol Avenue
PO Box 1091 • Bismarck, ND 58502
Phone: 701.355.4458 • Fax: 701.223.4645

Renewable Energy Program

North Dakota Industrial Commission

Application

Project Title: Gateway to Science Ethanol Exhibit

Applicant: North Dakota Ethanol Council

Principal Investigator: Deana Wiese, Executive Director

Date of Application: May 1, 2016

Amount of Request: $50,000

Total Amount of Proposed Project: $110,000

Duration of Project: June 1, 2016-December 31, 2018

Point of Contact (POC): Deana Wiese

POC Telephone: 701-355-4458

POC Email: office@ndethanol.org

POC Address: PO Box 1091, 1605 East Capitol Avenue, Bismarck, ND 58502

TABLE OF CONTENTS

Abstract	**3**
Project Description	**4**
Standards of Success	**8**
Background/Qualifications	**10**
Management	**12**
Timetable	**12**
Budget	**13**
Confidential Information	**13**
Patents/Rights to Technical Data	**13**

ABSTRACT

Objectives: The objectives of this project are: 1) to increase the long-term use of ethanol in North Dakota by educating students, parents and educators in the region on the benefits of ethanol to the economy, environment and energy independence; and 2) to ensure the future of the ethanol industry workforce by engaging students, parents and educators in the lifecycle of ethanol production, specifically the scientific process of converting an agricultural product, which is a growing source of sustainable energy, into high-value co-products, including ethanol and distillers grains.

The strategy that will be implemented to meet the objectives is the installation of a hands-on, interactive, ethanol-specific exhibit to be utilized as a pilot at the current facility beginning the summer of 2016 and then permanently installed at the new Gateway to Science facility in Bismarck, N.D., which is scheduled to open the spring of 2018.

Expected Results: It is expected this project will increase the long-term use of ethanol in North Dakota. By educating students, parents and educators in the region on the benefits of ethanol to the economy, environment and energy independence, we are working toward creating future generations of ethanol advocates.

The second result will be increased interest in science, technology, engineering and math-(STEM) related careers, including those directly or indirectly related to the ethanol industry. This is vitally important to North Dakota as it led the nation in growth of STEM jobs from 2004 to 2014, increasing the STEM workforce by 37.1 percent. In addition, STEM jobs are projected to see 19 percent growth from 2014 to 2019 (ND STEM Network).

Duration: June 1, 2016-December 31, 2018

Total Project Cost: $110,000

Participants: North Dakota Ethanol Council and industry stakeholders including: Dupont, Gavilon, Growth Energy, CTE Global Inc, Lallemand and New Age Cryo; Gateway to Science; and Science Museum of Minnesota.

PROJECT DESCRIPTION

Objectives: The objectives of this project are: 1) to increase the long-term use of ethanol in North Dakota by educating students, parents and educators in the region on the benefits of ethanol to the economy, environment and energy independence; and 2) to ensure the future of the ethanol industry workforce by engaging students, parents and educators in the lifecycle of ethanol production, specifically the scientific process of converting an agricultural product, which is a growing source of sustainable energy, into high-value co-products, including ethanol and distillers grains.

The strategy that will be implemented to meet the objectives is the installation of a hands-on, interactive, ethanol-specific exhibit to be utilized as a pilot at the current facility beginning the summer of 2016 then permanently installed at the new multi-million dollar Gateway to Science (GTS) interactive science center in Bismarck, N.D., which is scheduled to open the spring of 2018.

The North Dakota Ethanol Council (NDEC) sees it as a one-of-a-kind way to educate students, educators and the general public on the benefits and opportunities provided by the state's ethanol industry. GTS will have both agriculture and energy sections within its new exhibit gallery, and NDEC feels it is important to have ethanol featured, as it combines North Dakota's top two industries – agriculture and energy.

Methodology: Install a permanent, hands-on, interactive, ethanol-specific exhibit.

Method 1 – Final design of the pilot exhibit

NDEC has collaborated with GTS staff, GTS Exhibits Committee and the Science Museum of Minnesota (SMM) to develop messages to be communicated to visitors of the exhibit. The message of the exhibit will be "Corn and other agricultural products can be transformed through basic chemistry to become a cheaper, cleaner fuel source for vehicles." This combines the learning goals of the GTS and promotional goals of NDEC while focusing on the science behind the ethanol production process and the benefits of the ethanol industry to the state and nation.

SMM will design the pilot exhibit with frequent input provided by GTS staff, GTS Exhibits Committee and NDEC representatives with scheduled check-in points at all stages of development to ensure the exhibit is meeting the expectations of GTS and NDEC. Planning directives from GTS include: hands-on, open-ended learning; focus on STEM careers; inspire creativity and problem-solving; real-world applications; and spotlight on innovation. Exhibit development goals include:

- Focus on the relationships between STEM content by integrating various disciplines within groupings of hands-on exhibits and activities.
- Provide connections between STEM exhibit activities and potential STEM career choices. Highlight connections between gallery experiences and real-world applications.
- Provide exhibits that visitors can experience differently with each visit by focusing on hands-on, open-ended activities, deeper content, and the relationships between exhibits.
- Provide bridges between physical experiences and related STEM concepts.
- Integrate North Dakota STEM stories through images, physical subjects and place-based activities with less reliance on graphics. Exhibit materials and design elements will help distinguish the regional connections.
- Support the relationships between exhibits and programs, such as GTS's beyond-the-gallery experiences.
- Promote science literacy through the use of STEM vocabulary, scientific practices, methods and procedures. Exhibits will name the disciplines and show where they intersect.
- Emphasize real-world applications of STEM knowledge – solving problems now and in the future. Engage visitors in production processes and product-development cycles.

Planning directives from NDEC include a focus on the renewable lifecycle of ethanol production while reinforcing the economic, environmental and energy independence benefits of ethanol production and use.

Method 2 – Pilot exhibit

The exhibit will be piloted in the current gallery beginning the summer of 2016 through completion of the new science center in spring 2018. During this time, GTS will evaluate the exhibit based on actual visitor interaction. NDEC will also promote visitation to stakeholders with the intent of providing valuable industry feedback to GTS and SMM. Input gathered during the testing phase will be evaluated with the intention of modifying the exhibit to best meet the planning directives of GTS and NDEC in preparation for finalization of the exhibit and permanent placement in the new science center.

As one of only 18 exhibits to be piloted and tested in the current facility, the exhibit will also be used as a model on how other industries can work with GTS to feature their specific areas.

Method 3 – Install the permanent exhibit

Upon completion of the new science center, expected spring 2018, the final exhibit will be moved to the new facility and featured in the Transforming Energy section of the gallery. NDEC will work with GTS to develop and implement specific pre- and post-visit assessment tools that measure students' knowledge on the process of converting corn into fuel, as well as the benefits of ethanol's use.

Anticipated Results: The anticipated results of this project are two-fold. The first result will be long-term increased use of ethanol in North Dakota. By educating students, parents and educators in the region on the benefits of ethanol to the economy, environment and energy independence, we are working toward creating future generations of ethanol advocates.

The second result will be increased interest in STEM-related careers, including those directly or indirectly related to the ethanol industry. This is vitally important to North Dakota as it led the nation in growth of STEM jobs from 2004 to 2014, increasing the STEM workforce by 37.1 percent. In addition, STEM jobs are projected to see 19 percent growth from 2014 to 2019 (ND STEM Network).

Facilities: The pilot exhibit will be displayed in the current GTS gallery at 1810 Schafer Street, Bismarck, N.D. The permanent exhibit will be located in the new GTS science center, which will be located west of

the MDU Resources Community Bowl (on the Bismarck State College campus) in Bismarck, N.D. This will be a 65,000-square-foot facility, which includes a 27,000-square-foot exhibit gallery, a 200-seat theater, an education wing with a laboratory classroom, two additional classrooms, and an outdoor classroom and observation deck space. The ethanol exhibit will be placed in the Transforming Energy area of the gallery – see attached diagram.

Resources: The budget for this project is $110,000. The partners have committed $60,000 in financial resources – $25,500 cash and $10,000 in-kind from NDEC and $24,500 cash from industry stakeholders, indicating their support for North Dakota's ethanol industry and this project. NDEC is asking the Renewable Energy Council for a $50,000 matching grant.

Additional resources include the knowledge of GTS and SMM staff in development and design of the exhibit, as well as the knowledge of NDEC members and staff on the ethanol production cycle and benefits. In addition, Deana Wiese, NDEC executive director, is involved in the gallery development process as a member of the Exhibits Committee.

Techniques to Be Used, Their Availability and Capability: GTS has contracted with SMM to develop and design exhibits for the new science center. This arrangement, combined with the expertise and involvement of the North Dakota ethanol industry, guarantees the capacity to complete the permanent exhibit effectively and efficiently.

Environmental and Economic Impacts while Project is Underway: Not applicable

Ultimate Technological and Economic Impacts: This project will ultimately have positive impacts on North Dakota's economy, environment and energy independence by strengthening the state's ethanol industry through the education of students, educators and parents on the benefits and opportunities associated with the ethanol industry.

Annually, North Dakota's ethanol industry contributes more than $640 million to the state's economy; produces more than 450 million gallons of alternative fuel made from 150 million bushels of

corn, with 80 percent purchased from North Dakota farmers; and produces 1.2 million tons of dry distillers grain, a high-quality, cost-effective livestock feed, which is available to North Dakota ranchers.

The use of ethanol reduces greenhouse gas emissions by 30 to 50 percent and is likely to reduce carbon monoxide emissions in vehicles by 10 to 30 percent. In addition, the 14.7 billion gallons of ethanol used in the United States in 2015 displaced 557 million barrels of imported oil, which is the equivalent of the oil imported annually from Saudi Arabia and Kuwait combined. Use of domestic ethanol in 2015 decreased dependence on foreign oil by seven percent – from 32 to 25 percent.

Why the Project is Needed: The purpose of the new science center facility is to feature the future of jobs and technology in North Dakota, making connections between students' interests and potential career choices. Understanding the important role that renewable energy plays in the future of the state's energy resources, GTS reached out to the North Dakota ethanol industry to assist in its efforts to include an ethanol-related exhibit in the new facility.

Upon commitment from NDEC, SMM began research to identify similar exhibits around the globe that may be replicable or used as a model. However, due to the 'newness' of the industry in relation to traditional energy industries, no similar exhibits exist. Therefore, the ethanol exhibit at GTS will be a one-of-a-kind, first-ever exhibit.

STANDARDS OF SUCCESS

Measurable deliverables of the project: GTS will develop a specific pre- and post-visit assessment tool that asks students what they know about the process of converting corn into fuel, as well as the benefits of its use. The post-exhibit assessment will occur at the science center and be captured on video as students explain the process they have just learned, identifying the inputs and outcomes, as well awareness of the ethanol industry and benefits of its production and use.

Value to North Dakota: This project will assist in strengthening an industry that contributes more than $640 million annually to the state's economy and employs 250 North Dakota workers directly and another 10,000 indirectly. Each North Dakota ethanol plant is located in a community with a population

of less than 2,500 and contributes an average of 49 jobs and an average annual payroll of $3.3 million to the community. In addition, the plants purchase the majority of their corn from North Dakota farmers and sell distillers grains to North Dakota livestock producers. The use of ethanol also benefits the environment by reducing greenhouse gas and carbon monoxide emissions.

According to the American Lung Association of North Dakota, the use of ethanol in flex fuel vehicles reduces ozone-forming tailpipe pollution by up to 20 percent; prevents up to four tons of fuel lifecycle greenhouse gas emissions per flex fuel vehicle annually; decreases overall lifecycle greenhouse emissions by up to 30 percent; and cuts toxic gasoline compounds by as much as 80 percent.

What parts of the public and private sector will likely make use of the project results: GTS projects it will serve 70,000-90,000 visitors annually with the life of the exhibit being 7-10 years. This is with the expectation the exhibit will be updated to incorporate emerging technologies within the ethanol industry as applicable to ensure the message remains current and accurate. The most frequent age group will be grades K-8, but all ages will be exposed to the exhibit. Visitors will be from across the state and region. It is anticipated that the science center will be used for social gatherings, which will also provide exposure to local, state and national leaders.

The potential that commercial use will be made of the project's results: Not applicable

How the project will enhance the education, research, development and marketing of North Dakota's renewable energy resources: This project will be a long-term tool in educating students, educators and the general public in the region on the renewable lifecycle of ethanol production, as well as its benefits to the economy, environment and energy independence. It is anticipated the increased knowledge gained by this project will lead to long-term increased sales of ethanol in the state.

How it will preserve existing jobs and create new ones: This project will assist in maintaining and strengthening North Dakota's ethanol industry, which currently contributes 250 direct jobs in five North Dakota communities with populations under 2,500. By creating ethanol advocates, the project's success will lead to the ability to keep more ethanol in North Dakota, which could potentially lead to the

creation of additional jobs at the existing or new plants. It also provides an additional market opportunity for the state's corn growers.

With one of the project objectives being "to ensure the future of the ethanol industry workforce by engaging students, parents and educators in the lifecycle of ethanol production," this project will positively impact the future of the ethanol industry workforce and that of other STEM-related careers by increasing interest in STEM processes.

How it will otherwise satisfy the purposes established in the mission of the Program: This project directly aligns with the mission of the Renewable Energy Program as it develops and implements education strategies to promote the growth of North Dakota's ethanol industry. The resources provided by GTS, NDEC, industry stakeholders and the state will allow the objectives outlined in this proposal to be effectively and efficiently accomplished.

BACKGROUND/QUALIFICIATIONS

The **North Dakota Ethanol Council** is the lead applicant for this proposal and will manage the overall project. The key partners involved are the NDEC; North Dakota ethanol industry stakeholders, including CTE Global Inc., Dupont, Gavilon, Growth Energy, Lallemand and New Age Cryo; Gateway to Science (GTS); and Science Museum of Minnesota (SMM).

The NDEC was established in 2009 by the North Dakota State Legislature to promote the state's ethanol industry. Representatives from the five North Dakota ethanol plants that produce more than one million gallons of ethanol annually make up the NDEC, and its priorities include industry research and promotion, education and market development.

During its brief existence, the NDEC successfully implemented a Comprehensive Statewide Higher-Level Blend Ethanol Marketing Campaign with the assistance of the Renewable Energy Council and numerous partners. The two-year campaign resulted in a 36 percent increase in the number of ethanol gallons being sold in North Dakota. Other accomplishments include assisting in promotion of

the ND Blender Pump Program, which established North Dakota as a national leader in biofuels infrastructure, and becoming the ninth state to offer E15.

NDEC contracts with Clearwater Communications in Bismarck, N.D., to provide executive director services. Deana Wiese, CEO of Clearwater Communications, serves as the executive director of the NDEC. Wiese has 13 years of program and grant development and implementation and management experience. The Clearwater Communications team, which is available to assist Wiese, has more than 50 years of program and grant management experience. In addition, as partners in the program, the ethanol industry stakeholders are able to provide ethanol production and education expertise.

Gateway to Science has served the people of North Dakota for more than 20 years. It is the only hands-on science center in the state—no other organization shares its mission. The organization has a staff of 15, including a full-time executive director who has been with the GTS since its founding, a full-time gallery supervisor and a full-time education outreach coordinator.

The 21-member Board of Directors is comprised of 18 members plus three emeritus members. Three current board members are charter members from the 1994 inception, and over half of the board members have served 10 or more years. This collective dedication of board members, coupled with the longevity of the executive director, has taken GTS from "functioning well" to a "superior performing, high-impact organization" that has transformed the community. For its commitment to building the capacity of the executive director, board leaders and the organization, GTS is recognized by the Impact Institute with the "High-Impact Seal of Distinction."

All board members have made a commitment to the capital campaign for the new science center and are helping to make connections with other professionals and organizations. Board members recruited community volunteers to serve on six campaign committees (building, communications, exhibits, recognition, solicitation and policies and procedures), where they can share their expertise and advise on best practices. GTS is also in the process of establishing a statewide

advisory council with representation from eight regions in North Dakota. Council members will represent STEM-related industry, education and the public sector. As advocates for and ambassadors within their regions, council members will assist GTS in forming connections with their communities. The advisory council will be finalized in May and hold its first meeting this summer.

The **Science Museum of Minnesota** is home to the largest museum-based exhibit operation in the country. Over the past 20 years, it has expanded its services to help museums across the country shape their visions and see them implemented. In just the past seven years, it has created more than 75,000-square-feet of STEM-based interactive exhibits for museums and science centers from coast to coast. From master planning for new building projects to major building and exhibit renovations to designing and fabricating some of today's most successful science museum projects, SMM has contributed significantly to the field. With a staff of over 100 talented and experienced exhibit developers, designers, evaluators, project managers, prototypers and fabricators, it is dedicated and bound by its mission to work in partnership with organizations like GTS to provide the highest-quality learning opportunities for museum visitors around the world.

MANAGEMENT

The NDEC will serve as the lead entity on this project and will ultimately be responsible for the deliverables outlined in the methodology. Deana Wiese, NDEC executive director, has extensive experience managing and reporting on state, federal and corporate grants. NDEC members will monitor progress as outlined in this proposal. GTS will serve as the fiscal agent for the project. The project objectives, methods, timeline and budget will be used to evaluate the progress and, ultimately, the success of the project.

TIMETABLE

Strategy	Methods	Start	Complete
Develop hands-on, interactive, ethanol-specific exhibit to be utilized at the new GTS science center	• Design the exhibit	June 1, 2016	Summer 2016
	• Pilot the exhibit	Fall 2016	Spring 2018
	• Install the permanent exhibit	Spring 2018	Spring 2018
	• Evaluate the exhibit	Spring 2018	Dec. 31, 2018

Quarterly progress reports will be provided on Sept. 1, 2016; Jan. 1, 2017; April 1, 2017; July 1, 2017; Oct. 1, 2017; Jan. 1, 2018; April 1, 2018; July 1, 2018; and Oct. 1, 2018.

BUDGET

Project Associated Expense	TOTAL	NDIC Share	NDEC Share (Cash)	Other Partner Share (Cash)	Partner (In-Kind)
Design the Exhibit	**$20,000**		$20,000		
Pilot Exhibit Fabrication	**$30,000**	$10,000	$5,500	$14,500	
Permanent Exhibit Fabrication and Install	**$50,000**	$40,000		$10,000	
Coordination and Management	**$10,000**				$10,000 (NDEC)
TOTAL	**$110,000**	**$50,000**	**$25,500**	**$24,500**	**$10,000**

The $110,000 budget for this project is based on estimated expenses for the items outlined in the methodology portion of this document. This includes direct costs, such as contracted services, travel, materials, printing and postage, and indirect costs, such as coordination and management. The partners have committed 55 percent of the total budget. The partner dollars have been received by GTS as the fiscal agent. We are requesting funding from the Renewable Energy Council for the remainder of the project. If less funding is available than requested, the project will continue but will be delayed until additional funding mechanisms can be obtained.

CONFIDENTIAL INFORMATION

The North Dakota Ethanol Council does not consider information in this application confidential.

PATENTS/RIGHTS TO TECHNICAL DATA

The North Dakota Ethanol Council does not claim patents or rights to technical data under this project.

PREPARED BY

Science Museum of Minnesota

GATEWAY TO SCIENCE

DESIGNER: AMANDA WAMBACH

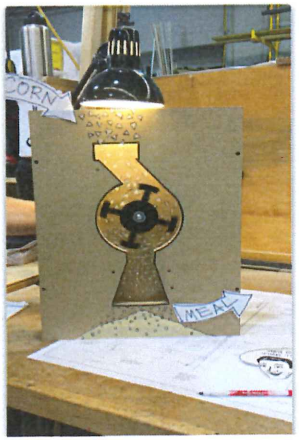
DATE: 6/15/2015

SHEET: 1

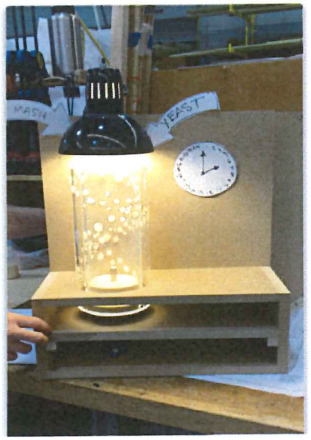
FLOOR PLAN

SCALE: 1/4"= 1'-0"

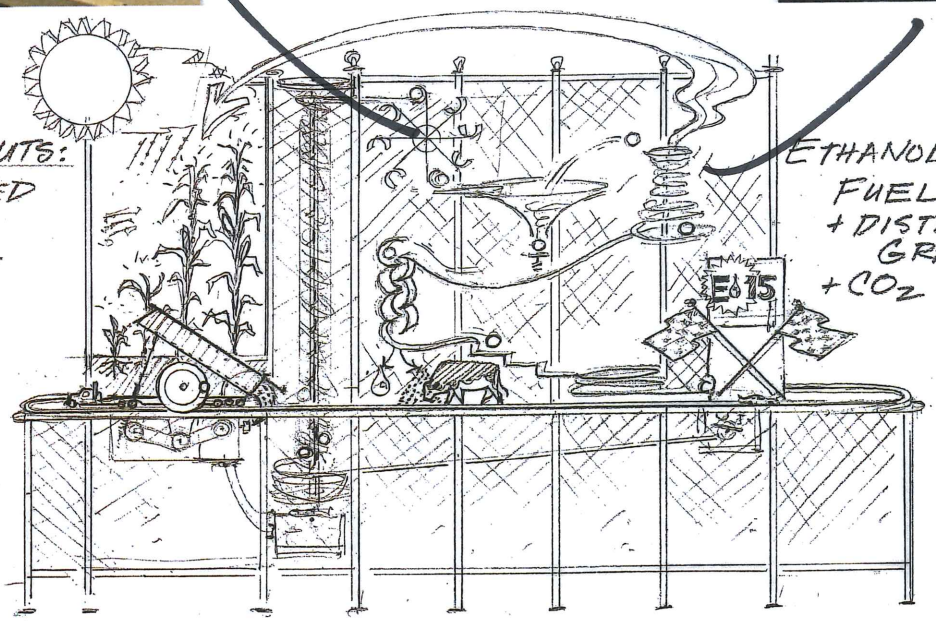
HAMMERMILL



FERMENTER



ETHANOL INPUTS:
CORN + WATER
+ENZYMES +HEAT



CORN INPUTS:
CORN SEED
+SOIL
+WATER
+SUN
+CO_2

ETHANOL OUTPUTS:
FUEL
+DISTILLER'S GRAIN
+CO_2