

Blue Flint Ethanol E85 Blending Facility

Blue Flint Ethanol

By
Jeff Zueger and
David Graf

December 1, 2007

(Revised March 13, 2008)

Grant Request: \$50,000

TABLE OF CONTENTS

TITLE PAGE.....	1
TABLE OF CONTENTS.....	2
ABSTRACT.....	3
PROJECT DESCRIPTION.....	4
STANDARDS OF SUCCESS.....	7
BACKGROUND/QUALIFICATIONS.....	8
MANAGEMENT.....	8
TIMETABLE.....	9
BUDGET.....	10
TAX LIABILITY.....	11

ABSTRACT

Objective: There currently exists a need for a supply of E85 (85% ethanol and 15% gasoline) motor fuel to the 26 retail fuel stations in the state. In addition there are approximately 25,000 FFV's (Flexible Fuel Vehicles, vehicles that can utilize gasoline or E85) in the state, with no consistent supplier of E85 to these retail fuel outlets. This has caused issues with supply, price and quality. Blue Flint Ethanol (BFE) located in Underwood, North Dakota, is proposing through this grant application to install facilities that will allow for in line blending of E85 at their facility. BFE will, in turn, market the E85 to these and potential additional retail fuel outlets as s motor fuel. Based upon our marketing discoveries with current and potential E85 retail stations the availability of an E85 product that is blended into the truck as opposed to splash or tank blended will grow retail market use of this product.

Expected Results: Having the capabilities to blend E85 at BFE will allow for BFE to directly market a blended product. This direct market connection takes out second and third party blenders. By eliminating second and third party blenders using potentially questionable blending techniques we accomplish two objectives; quality product at a more consistent price to the consumer. One of the challenges voiced by the E85 stations in the Bismarck, Mandan, and Minot area regarding E85 was difficulty in getting product, and fluctuating price. As a producer of ethanol BFE is motivated to market E85 to retail stations at pricing that will sell product and assure that the stations do not run out of product. This motivation goes beyond that of traditional fuel blenders who are not vested

in the growth of ethanol consumption in the state. Growing the use of E85 in North Dakota is good for the states economy. Use of E85 in state reduces transportation costs to ship ethanol out of state and keeps our dollars in state supporting a product that directly benefits farmers, and all of those in the supply and use chain of ethanol. The blending skid reduces the cost of BFE to get a quality product to market thereby lowering the cost at the pump. It will do this because we partner with the E85 stations that we provide product to keep a low price to increase usage.

Duration: The construction of this project will take approximately one month to complete after all the materials have been delivered to BFE. There is a 90–120 day lead time on the blending pump from the supplier. The expected life of the blending facility is 15 years.

Total Project Cost: The capital costs for this project will be \$100,000.

Participants: The General Manager for BFE is Jeff Zueger. Jeff is a registered Professional Engineer in the state of North Dakota and has been in industry for 15 years. The manager for this project will be David Graf. David holds a degree in Mechanical Engineering and has been in the engineering field for 8 years. Determan Brownie will be providing and installing the blending skid using proven technology. They have been in the petroleum supply business for 40 years.

PROJECT DESCRIPTION

Objectives: BFE is currently marketing E85 as a motor fuel into the retail fuel market. E85 is a product of blending ethanol and gasoline. Market demand for E85 is growing. The current method of blending the gasoline and ethanol is “splash” blending where ethanol and gasoline are bulk blended in a transport truck or to tank blend at the retail fuel stations by dumping in so many gallons of ethanol and before or after dumping on so many gallons of gasoline. These methods of blending results in poor quality control, inconsistent supply and high transportation costs. To perform truck splash blending the blender must move one of the blended products to the supply of facility for the other product in a partially loaded truck. At the second facility the two components, gasoline and ethanol are blended together in compartments of the truck at pre-calculated ratios. From this second location the E85 is moved to market. E85 is a blend from 70% to 85% denatured ethanol with the balance made up of hydrocarbons. Projected ambient temperatures require that throughout the year, E85 blend ratios lower the ethanol component as temperatures drop to assure proper starting and operation of the flex fuel vehicles using the product. The E85 standards as set by ASTM require ethanol blended gasoline to have different vapor pressures to respond to these vehicle combustion needs. ASTM D5798-07 sets the blend ratio of %denatured ethanol to % hydrocarbons and the range of required vapor pressures ranging from 5.5 psi (pounds per square inch) for E85 to 12 psi for E70. The lower E70 is used in the colder winter months.

Having the ability to inline blend these products prior to loading into the transport truck allows us to sell ethanol blended fuel that is consistent to the required standard. With splash blending there is an assumption made that the ratios were metered in properly and the ethanol will properly mix with the gasoline in the truck. Certification of the contents of the truck at the blending facility is difficult as inadequate mixing has occurred to sample and certify the contents of the truck compartments. Tank blending at the retail station is much worse and can lead to dispensing up to 100% ethanol or 100% gasoline. Blending skids allow the facility to provide the highest quality properly mixed product to the customer and allows for certification of the contents of the truck compartments before it leaves the site.

There are significant logistical and marketing challenges with truck splash blending. Many customers of the blender want to provide their own transportation. Truck splash blending prohibits this due to the need to coordinate both blend materials into one truck. Several of our new potential customers desire the ability to come to our facility with their trucks and load a blended E85 product. The in line blending skid will allow us to do this. The transportation costs of having to bring in a partially loaded truck with gasoline to splash blend with ethanol cost 2-10 cents more per gallon than the cost of an in line blending skid due to hauling partially loaded trucks to the blend facility area. Currently there are 25,000 FFV's and approximately twenty-six E85 fill stations in the state of North Dakota. Because of the positive economic impact and environmental benefits of E85 to the state there have been efforts to grow the use of E85. The growth of E85 is being held back by two primary issues, marketing and availability at the pump. In trying

to eliminate these problems BFE would like to market and sell E85 from our site to the retail sector of the fuel industry. Retail fuel stations have requested that E85 be supplied at a more consistent quality, delivery and price. BFE has the desire and ability to market and distribute E85 and has demonstrated this ability.

To properly blend E85 BFE needs to install equipment that performs this function prior to loading the product into a truck for transport. This will lead to a better quality and lower priced product which will help us grow the E85 market.

By BFE consistently supplying the fuel stations E85, at reasonable prices, we can help stations keep prices lower. Keeping prices lower will encourage people to continue using E85 as well as encouraging more E85 use.

Methodology: The E85 blending will be done through the proposed certified blending equipment and loaded on trucks via existing load out equipment. Blending skids allow the user to select the desired blend of ethanol and fuel for the required specification. The blending skid blends the denaturant with the ethanol before the load out skid allowing for the .02% expansion and proper mixing. This allows the blender to take samples of the E85 from every truck and provide the customer with a certificate of analysis of the E85 using our existing laboratory equipment. The ratio of ethanol and gasoline in E85 changes 3 times per year to meet seasonal blending requirements. Blending methods vary in design by blending before or after the load out skid. By blending before the load out skid, or side stream blending you take advantage of the expansion of the ethanol and

denaturant in the volume calculation. Another in line blending method is ratio blending. During this blending method, as the system fills the truck ethanol is brought in at the start and end of the fill process with gasoline added to the mixture in the middle of the fill process. This can also lead to some inconsistencies because the mixing takes place in the truck more than the line. Both methods are much better than the splash blending and or tank blending as the products do not mix well in the truck and stratification will occur causing poor fuel quality. (FMC Technologies bulletin TP0A015)

Anticipated Results: The blending skid using side stream blending along with testing performed at the facility will ensure that E85 blended at BFE will meet ASTM Standards. This will also allow BFE to supply E85 to the private sector keeping pricing more consistent and increasing usage which assures that consumers get a quality product at a competitive price. Side stream blend is a mechanical way of mixing the two products giving us a high quality fuel as opposed to the splash blending where you end up with two divided products and an unknown mixture of ethanol and denaturant. We also anticipate market growth due to the ability to provide a blended E85 final product into any transport truck at our facility. BFE staff has participated in many discussions with retail fuel stations including the North Dakota Petroleum Marketers Group where we were consistently told they need a quality E85 product that is readily available at a more consistent price. If this was achieved more of them would consider putting in and keeping E85 pumps. This blending skid along with BFE's marketing desire and ability will accomplish these requests. By growing E85 consumption in the state we increase in state use of a renewable energy product that has a full life cycle within our state.

Facility/Resources: The E85 blending skid will be procured and installed at the BFE facility, utilizing our current resources, piping systems, electrical capabilities and load out skid to tie the blending skid to our current load out system. By using BFE's current infrastructure blending will be simplified which will keep the project costs down. In addition BFE has full lab capabilities to assure accurate certificate of analysis for all future E85 sales.

Environmental and Economic Impacts: According to the American Heart and Lung Association "Using E85 can reduce ozone forming pollutants by 20% and fuel lifecycle greenhouse gas emissions by nearly 30%." The increase use of ethanol benefits local communities, agricultural producers, consumers and the environment with ethanol being cleaner burning than gasoline. This project makes a renewable fuel, E85, available to local markets thereby growing the use of E85. This allows for a product that is produced in state to be utilized in state. ND consumer's spending money in ND on products created in state helps the local and state economy. To quantify the economic value is difficult but the following facts can be used. Ethanol shipped by rail to the east or west coast of the United States costs about 22 cents per gallon in freight. Ethanol used within 100 miles of the production facility has about 5 cents per gallon freight. Hauling partially loaded trucks of ethanol or gasoline to be blended with the other adds 2 cents to 10 cents per gallon to the cost of E85. Not having the ability to allow customers to use their trucks to come to BFE and load E85 on their truck adds about 2 cents to 10 cents per gallon due to the inability to combine these moves with other gasoline moves that they

are executing. For every gallon of ethanol that does not leave the state and is used in state we add about 15 cents income to an in state business.

Ultimate Technological and Economic Impacts: As E85 becomes more available to consumers auto manufactures will start to design engines more technologically suited to the high octane E85 and utilizing its benefits as a fuel. Being able to provide a low cost high grade fuel to as many consumers as possible will increase its usage. Increased ethanol usage will create more income for farmers, create high paying jobs for Americans as more plants are built and help consumers save money on fuel costs.

Why the Project is Needed: The current use of splash blending and in tank blending is not cost effective, leads to inconsistency in product and is preventing growth of E85 usage in North Dakota. The E85 blending equipment at BFE is needed to provide a quality E85 product, on time, at a competitive price. There are currently 26 retail E85 fuel outlets with no current consistent supplier to these fuel stations. In addition, to help further the future of ethanol, progress needs to be made in the marketing and availability of E85. This project is directly related to accomplishing each of these tasks. By converting North Dakota corn to ethanol in state and selling the finished product in state we have a positive impact to the states economy

STANDARDS OF SUCCESS

Ethanol production has significant positive economic impact to the state of North Dakota. Currently there is no adequate blending infrastructure to move E85, one of the two products ethanol is used in, to the market. By installing this blending facility BFE will have the ability to supply a quality E85 to retail fuel stations at a competitive price. Lower E85 pricing benefits the public immediately when they use it for fueling their vehicles. Providing low cost, more readily available E85 to retail fuel stations benefits all users of E85 including the fleet cars for the State of North Dakota, many of which are currently using E85.

Ethanol has significant economic value to the state of ND. To assure the future of ethanol we need to increase availability and use of ethanol. This in turn will continue to expand ethanol production while preserving existing jobs. Increased E85 market demand spurs new jobs in both the production of corn and ethanol which is a big win for North Dakota. Two of the current restraints of selling more E85 are marketing and product availability. This project will help with both of these issues through increasing the ease of delivery of E85 to the fuel outlets and allowing BFE to continue to find new markets for our product.

A key measurement of success will be increased E85 sales and increased retail fuel outlets. These are both easily measurable indicators of success.

BACKGROUND/QUALIFICATIONS

Blue Flint Ethanol is a 50 million gallon per year ethanol plant; 49% owned by Great River Energy and 51% owned by Headwaters Incorporated. The plant has been operational since February 2007 and is currently running at 115% capacity. Determan Brownie Inc. will be providing the blending skid, they manufacture and install the skids and have been in business for over 40 years.

MANAGEMENT

Jeff Zueger, General Manager of Blue Flint Ethanol, is a registered Professional Engineer in the state of North Dakota and has been in the power industry for 15 years. Jeff was the project manager for the design and construction of the BFE facility. David Graf, who will be overseeing the blending project, has a degree in Mechanical Engineering and 8 years experience in the engineering field, he has been managing projects at BFE since the first production of ethanol at BFE, almost a year ago. David will be approving all bids and contractors, reviewing drawings and general construction that is being done regarding this project. Construction will begin by pouring all the concrete pads for the pipe rack and electrical conduit and blending skid. The concrete pads will be visually inspected and checked for size requirements. The next step will be to install all the piping, solenoid valves and electrical conduit from the tie in point in the tank farm to the load out skid. The blending skid will then be installed. The electrical can then be

installed from the tank farm to the ethanol load out panel. Piping will then be installed with project completion including electrical, controls and final testing and certification.

TIMETABLE

From the start of construction this project is estimated to take one month to complete.

The concrete pads and pipe rack will be finished the first week. Piping and electrical conduit will be scheduled the next week, or sooner, depending on completion of the concrete pads. The installation of the blending skid and pulling all the electrical wire for the project should be completed by week three. At this point tie in points will be cut in and connected. Week four will include starting and calibrating the system. Interim reports will be submitted on a weekly basis.

BUDGET

Capital costs:

Structural: \$10,000

Mechanical: \$60,000

Electrical: \$30,000

Total: \$100,000

Operating Costs:

Salaries: Not applicable

Indirect Costs: Not Applicable

This grant request is for 50% of the capital costs totaling \$50,000. Blue Flint Ethanol will commit the other 50% of the capital costs and future costs related to maintenance, salaries, and indirect costs. This grant is necessary as it will make up half of the projects capital cost allowing us to move forward with the project.

TAX LIABILITY

Please see the attached letter requesting the Certificate of Good Standing. Upon receipt of the affidavit from the State Tax Commissioner Blue Flint Ethanol will forward to the ND Industrial Commission.