

Contract No R-009-020
Dakota Spirit AgEnergy Final Report
March 31, 2012

This report was prepared by Great River Energy pursuant to an agreement with the Industrial Commission of North Dakota, which partially funded the report through the Renewable Energy Program.

Executive Summary

Dakota Spirit AgEnergy, LLC was formed to develop and build a commercial scale cellulosic Biorefinery adjacent to Great River Energy’s combined heat & power plant in Spiritwood, North Dakota. Great River Energy dedicated key personnel and formed a multi-organization project team to develop the project.

Dakota Spirit AgEnergy evaluated the Inbicon 20 MGY cellulosic technology and determined that it was not economically feasible in a green field application at this time. The second generation (2G) technology is quite expensive at roughly \$20 per installed gallon of capacity due to its current demonstration scale, compared to mature conventional first generation (1G) technology at \$2 per installed gallon of capacity. Additionally, the uncertainties associated with cellulosic feedstock and storage logistics create considerable risk.

Table 1 Original 20 MGY Cellulosic Ethanol Financial Summary

Cellulosic Ethanol Technology	2G at 20 MGY
Total installed cost	\$380 Million
Annual revenue	\$93 Million
Annual expense	\$113 Million
Net Income	(\$20 Million)

The project team determined that there could be economic advantages to combining first and second generation technologies together. The mature first generation technology would provide a foundation of cost effective technology and balance of plant components at a larger commercial scale, and a smaller scale second generation addition would allow for a more cost effective cellulosic feedstock supply radius with slightly less risk.

Table 2 Hybrid 1G + 2G Biorefinery Financial Summary

Hybrid 1G + 2G approach	Phase 1 1G at 65 MGY	Phase 2 1G at 65 MGY + 2G at 10 MGY
Total installed cost	\$130 Million	\$230 Million
Annual revenue	\$200 Million	\$250 Million
Annual expense	\$190 Million	\$235 Million
Net Income	\$10 Million	\$15 Million

Dakota Spirit AgEnergy is now moving forward as a Phase 1 Biorefinery to establish the sustainable foundation for future growth. Dakota Spirit AgEnergy is currently awaiting a “renewable fuels” D code RIN certification under RFS2 from the EPA. Once the designation is secured, a Private Placement Memorandum will be issued to invite private equity to finance the project. We currently expect project financing to be finalized in the June/July timeframe and break ground shortly thereafter. The construction lead time is 18 months, projecting a plant start up in early 2014.

1. Technology/Product Selection & Initial Design Package

Evaluations have been completed for 1) an Inbicon 20 MGY stand alone 2G cellulosic ethanol plant, 2) a conventional 1G 65 MGY dry mill ethanol plant, and 3) an Inbicon 10 MGY “mild integration” 2G cellulosic addition to a conventional dry mill ethanol plant. The 65 MGY 1G conventional ethanol plant has been selected for Phase I, in order to build out the balance of plant and infrastructure at a commercial economic scale that makes sense. Inbicon’s 10 MGY “mild integration” cellulosic design using wheat straw and corn stover is proposed for a Phase II future expansion to provide more favorable economics and lessen the risk of a single biomass feedstock.

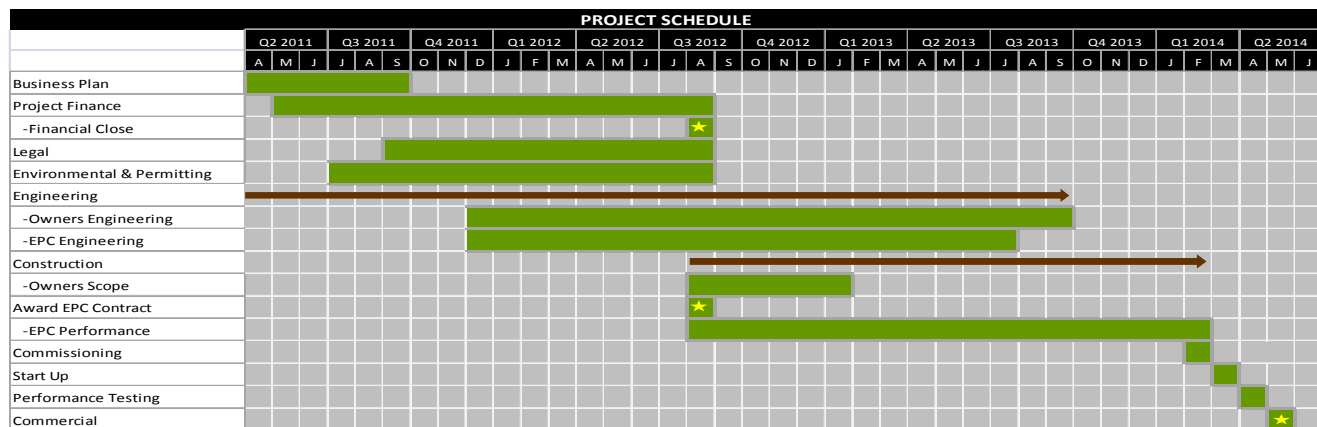
2. Capital Budget

The capital budget for the original 2G cellulosic ethanol has gone from \$380 million for a 20 MGY stand alone plant to \$100 million for a 10 MGY “mild-integration” expansion that leverages the infrastructure and balance of plant at larger commercial scale economics. The expansion concept relies on existing or new 1G ethanol to provide the economic foundation for a cost effective expansion. This multi-phase approach provides a bridge from current technology to more advanced cellulosic technology. The capital budget for Dakota Spirit AgEnergy Phase I – 65 MGY conventional dry mill ethanol plant is \$130 million or \$2 per installed gallon.

3. Preliminary Schedule

The preliminary schedule calls for the debt and equity financing to be secured in July 2012 with ground breaking shortly thereafter. The construction timeline is approximately 18 months. Start up and commissioning would then follow by 2Q2014.

Figure 1 Dakota Spirit AgEnergy Phase 1 Project Schedule



4. Drawings

The overall plot plan and general arrangement drawing is shown in Appendix 3. A significant amount of engineering has gone into the site grading plan to determine overburden cuts and fills to establish appropriate elevations, storm water run-off design, and building and equipment foundations on challenging soil conditions. Transportation access on roads and rail loops has been closely coordinated with Stutsman County's engineer and Burlington Northern & Santa Fe railroad and rail consultants to create approved and functional designs. Detailed Process and Instrument Diagrams (P&IDs) are nearly complete for the entire ethanol plant.

5. Major Risk Summary & Mitigation Plan

Major risks have been identified, and plans developed to mitigate these risks to the extent possible.

6. Preliminary Site Survey

A preliminary site survey has been completed by Interstate Engineering. Please see Appendix 5 for detail topographic map of the area. In addition, specific foundation loadings have been calculated and Braun Intertec has made soil borings to determine soil conditions at these critical design points along with groundwater monitoring. A foundation plan to compare differential settling using pilings, geo piers and mat foundations is currently underway.

7. Financial Model (confidential)

A financial pro forma has been created and exercised with various cases. This information is confidential due to the concurrent equity raising program for the project.

8. Indicative air emission inventory

Great River Energy and Barr Engineering have been working to assess the environmental requirements that will apply to Dakota Spirit AgEnergy. Air permitting is generally on the critical path for developing these types of projects, and so efforts have primarily focused on air emission issues. The U.S. Environmental Protection Agency's (EPA) Renewable Fuel Standard (RFS) is also a critical aspect for the successful development of Dakota Spirit AgEnergy and significant efforts have been made toward obtaining EPA's approval of DSA under the RFS.

The initial step in assessing the applicability of air emissions requirements is to develop an air emissions inventory. Barr Engineering has developed a draft emissions inventory (Table 3) based on preliminary plant designs and their experience working on other ethanol projects.

TABLE 3 Preliminary Air Emissions Inventory

	Potential Emission Rates			
	Uncontrolled		Controlled	
	(lb/hr)	(tons/yr)	(lb/hr)	(tons/yr)
VOC	320.0	248.1	22.4	63.8
PM	51.1	44.5	51.1	45.3
PM _{2.5}	5.4	17.1	5.4	17.2
PM ₁₀	10.8	23.7	10.8	23.7
CO	279.6	1,216.4	16.2	62.8
SO ₂	13.1	54.8	13.1	54.8
NO _x	19.3	46.3	19.3	46.3
Total HAPs	16.3	65.8	3.0	9.5

9. Determination of applicable environmental requirements

Based on the plant's expected potential to emit (PTE), a minor source Permit to Construct (PTC) would need to be obtained prior to starting construction of the plant. The plant would not be subject to the state's major source New Source Review (NSR) requirements, which are significantly more complicated, costly, and time consuming than the minor source PTC requirements.

The plant may be subject to the Miscellaneous Organic Chemical Manufacturing National Emissions Standards for Hazardous Air Pollutants (NESHAP), which is commonly abbreviated as MON. The MON applies to any miscellaneous organic chemical manufacturing facility that has the potential to emit 10 or more tons per year of any single hazardous air pollutant (HAP) or 25 or more tons of total HAPs. Because of Dakota Spirit AgEnergy's proposed ownership structure, its emissions must be totaled with Spiritwood Station's emissions. Spiritwood Station's potential to emit for total HAPs is 22.9 tons per year, so the combined emissions are just high enough that DSA would be a major source of HAP emissions, and thus subject to the MON. We will continue to refine the emissions inventory as we work with the KFI to confirm if potential emissions exceed the major source threshold. Great River Energy has recent experience with the MON at Blue Flint Ethanol, and believes that the MON could be met at DSA without any significant cost increases.

Several tanks at the plant will also be subject to the New Source Performance Standards for storage tanks, (NSPS Subpart Kb). This rule applies to most ethanol plants and compliance with the design and operating standards is not problematic.

10. North Dakota Dept of Health opinions on applicable requirements

Great River Energy and Barr Engineering have had several conversations with North Dakota Department of Health (NDDH) staff about applicable requirements for the facility. Based on these discussions, NDDH agrees with our preliminary assessment of applicable requirements and permitting approach. As the emission inventory and project design firms up, we will have further discussions with NDDH staff to seek their continued support of our assessment.

11. Qualitative assessment of ambient air impacts

An ambient air impacts analysis consisting primarily of running computerized air dispersion models for criteria pollutants (SO₂, NO_x, PM10 and CO) is required as part of the major source NSR program. As indicated above, the plant will not be subject to the major source NSR program. The NDDH also has a policy on requiring an ambient impacts analysis for minor sources based on the facilities potential to emit. In accordance with NDDH guidance, we have initiated air dispersion modeling using the advanced AERMOD model. The modeling is extremely sensitive to stack height and locations and we are currently working to optimize stack heights.

12. Draft application: Air Emission Permit to Construct

A draft permit application is currently being prepared. Significant input from the design engineers is needed to prepare the application and the engineering firm has only recently been selected. Dakota Spirit AgEnergy, Barr Engineering and KFI have been cooperatively working since January, 2012 to assemble the data required to complete the application.

13. Wetland impact analysis

Barr Engineering has obtained confirmation from the Corps of Engineers that the wetland delineation completed in 2007 and 2008 for the Spirit Ethanol project can be used for the DSA project as long as it is transferred prior to October 15, 2012. Further, the permit for DSA would be similar to the permit issued for the Spirit Ethanol project. The preliminary design for the energy park indicates two to five acres of jurisdictional wetlands will be impacted. Dakota Spirit AgEnergy has initiated discussions with the US Fish and Wildlife Service to identify cost effective local opportunities to restore wetlands that were previously drained.

14. Environmental Assessment Worksheet

An environmental assessment is not required for the project.

15. EPA Renewable Fuel Standard

For DSA's ethanol to be marketable in the United States, it must qualify as a renewable fuel as described in the EPA's Renewable Fuel Standards (40 CFR 80). These standards require the lifecycle carbon intensity of the fuel to be 20 percent less than the carbon intensity of a 2005 petroleum-based fuel. Dakota Spirit AgEnergy and Barr Engineering completed a petition for the plant to qualify its ethanol as a renewable fuel and submitted it to the EPA on August 12, 2011. We continue to work with the EPA to finalize the process and currently expect them to issue their final approval by May 2012.

16. INVOICES AND EXPENSES INCURRED TO DATE

Table 4 Project Development Budget

	TOTAL	GRE Cash Share	GRE In-Kind Share	NDIC Share
Budget	\$1,250,000	\$500,000	\$250,000	\$500,000
Through 3/31/2012	\$1,374,654	\$501,347	\$373,307	\$500,000

Table 5 Invoices to Date

INVOICES TO DATE:	
Inbicon 20 MGY Project Development Package	\$218,121
Muse Stancil Grain Origination & Competitive Analysis studies	\$51,033
Fagen Pre-FEED Engineering	\$38,500
DMVW B&W Rail Service Design	\$11,096
Barr Engineering – environmental permitting including RFS2 petition	\$97,904
Inbicon 10 MGY Mild Integration Project Development Package	\$75,000
Karges-Faulconbridge BOP Pre-FEED Engineering	\$500,000
Braun Intertec site ground watering monitoring	<u>\$9,692</u>
Subtotal Invoices	\$1,001,347

Table 6 GRE Internal and In-Kind Development Expenses to Date

GRE INTERNAL and IN-KIND EXPENSES	
Project Management (2 FTE including new Sr. Project Engineer in ND)	\$150,000
Financial Modeling	\$50,000
Environmental Management	\$25,000
Great Plains Institute – Federal Policy & Producer Advisory Group	<u>\$148,303</u>
Subtotal internal and in-kind expenses	\$373,307

17. Glossary of Acronyms

1G – first generation ethanol, conventional dry mill corn process

2G – second generation biofuels, cellulosic

BU – Bushels

DSA – Dakota Spirit AgEnergy, LLC

EPA – Environmental Protection Agency

FTE – Full Time Employees

HAP – Hazardous Air Pollutants

IDC – Interest During Construction

KFI – Karges-Faulconbridge, Inc – engineer on the project

MGY – millions of gallons per year

MON - Miscellaneous Organic Chemical Manufacturing National Emissions Standards for Hazardous Air Pollutants (NESHAP)

NDDH – North Dakota Department of Health

NESHAP - National Emissions Standards for Hazardous Air Pollutants

NSR – New Source Review

PTE – Potential to Emit (based on 24 hours x 7 day per week operation)

RFS – Renewable Fuel Standards

RFS2 – Renewable Fuel Standards – revision 2

TPY – Tons (short) Per Year