MARYLAND GRAIN PRODUCERS UTILIZATION BOARD
(MGPUB)

PROFORMA FEASIBILITY REPORT

EXECUTIVE SUMMARY

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MARYLAND GRAIN PRODUCERS UTILIZATION BOARD

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OVERVIEW

Maryland Grain Producers Utilization Board (MGPUB) retained Voudrie Business Development, Inc. and Katzen International, Inc., to prepare this Proforma Feasibility Report (report). In addition, Voudrie/Katzen retained SusTech Corp and Durante & Associates, Inc. to provide supporting information including local project-related characteristics, and market identification and assessment.

This report provides a technical and economic analysis of a 15 MM GPY dry milling facility utilizing barley as a the feedstock. Additionally, the report provides a cost to build and a source and use of funds comparison to a plant twice the size --- a 30 MM GPY dry milling facility. Doubling the size provides scaling factors that cover the size range of interest. Note, however, that the small producer tax credit described elsewhere applies only to facilities below 30 MM GPY.

The reports present the economics of such a facility using $2.00 per bushel for barley as a "value added" price compared to the local barley prices in the last 3 years. In effect, by establishing this $2.00 per bushel for barley, the MGPUB has directed this Study to answer the question "If barley were at $2.00 per bushel, does a barley-based fuel ethanol plant make economic sense?".

The reports present the proposed details and economic values for a "new start-up" value added ethanol venture processing barley and other economically priced grains. This report is designed to provide the economic viability of developing a motor fuel grade ethanol processing business in Maryland. The information presented throughout this report provides possible plans and economic values that should be considered as the MGPUB group reflects upon the alternatives of bringing "new wealth" to the barley agricultural communities in Maryland.

The projections, forecast and values included throughout this report are based upon best estimates of past proven systems, designs, technologies, methods and formulas of prior years' knowledge of the grain processing industry and more specifically the motor fuel grade ethanol processing industry.

The early stage process is forecast to produce fuel grade ethanol and distiller's dried grains with solubles and carbon dioxide. This feasibility report supports the conditions for which this proposed project might be successfully designed, structured, developed, engineered, built and constructed. Also, the economics of this proposed business venture indicates that the cash capital investment of $12,000,000 can receive an operating working capital cash flow on total assets return of 10 to 15%, and breakeven operating at 55 to 65% of designed capacity. The total project cost is forecast at $31,000,000. This report is based upon ethanol at $1.35/gal, DDGS at $100/ton, carbon dioxide at $20/ton, and barley at $2.00/bu.

The forecast return on investments based on "book pretax income adjusted to include the small producer's tax credits or net after tax income" are as follows:

13.6 % - Property, Plant and Equipment
11.5 % - Total Assets
30.0 % - Equity Invested

MOTOR FUEL GRADE ETHANOL (MFGE)

WHY ETHANOL?

- **Rising Energy Dependence and Costs**
- **MTBE Phase Out**
- **Congressional Legislation Pending**
- **Clean Air Act of 1990**

MFGE is an oxygenated gasoline additive approved by the U.S. Environmental Protection Agency (USEPA) and by virtually all automobile and small engine manufacturers. Equally important is the acceptance of MFGE by consumers as evidenced by approximately 2 billion gallons of MFGE blended gasoline sold at retail in North America each year, primarily in the mid-west where MFGE is produced from corn. This represents 1.5 percent of the total gasoline market of 134 billion gallons.

MTBE, an imported petroleum-based fuel oxygenate, has been found to contaminate underground water supplies. Over the next several years, it is expected that the USEPA will greatly restrict or eliminate the use of MTBE. The Environmental Protection Agency has stated that MTBE should be removed from all gasoline and supports replacing these markets with MFGE. The replacement of MTBE doubles the demand for MFGE within the next several years. The industry is committed to expanding and increasing production within the next several years to support the anticipated increased demand. The MFGE processors in the mid-west are currently operating at full capacity to meet the customer demand.

The market for fuel ethanol is a function of public policy initiatives such as the partial federal excise tax exemption that allows for ethanol to be marketed competitively with wholesale gasoline. Additional initiatives that are more regulatory in nature could require ethanol use either as an oxygen additive or as a renewable component. These regulatory driven programs could not only increase the value of ethanol but also be a key factor in determining where the market is. With the recent MTBE oxygenate ban in California and 15 other states, there is increasing demand for ethanol. The east and west coast MTBE replacement markets are in the order of 1 billion gallons per year

Interest in and support for ethanol is at an all time high. President Bush has called for an extension of the existing tax exemption beyond its current expiration date of 2007. New plant construction and expansions are taking place throughout the country. The economic development, environmental, and energy security benefits are becoming quite apparent to lawmakers and the public resulting in a solid base of support for ethanol nationwide.

Annual increases in ethanol production could help meet the likely 2% annual increase in gasoline demand projected by the federal government.

PROFORMA FINANCIAL VALUE AND ECONOMICS

COST TO BUILD

The feasibility of designing, developing, engineering, and building a MFGE proposing facility is supported by the proforma financial reports and statistics presented in the following sections and pages. The proposed facility preliminary best estimate cost for the business design, structure and development process, and the process design, engineering details, construct and build forecast to be $30,886,800 for a 15 MGY and $52,000,000 for a 30 MGY.

FORECAST COST TO BUILD

Classification	15 MGY	30 MGY
Plant and Equipment		
Equipment	$12,763,700	$21,721,000
Installation Labor	5,623,100	9,279,000
Land and Site Development	Included above	Included above
Other Project Development Costs	7,150,000	11,405,000
Contingency	2,750,000	5,595,000
Total Costs To Build Plant	$28,286,800	$48,000,000
Working Capital	2,600,000	4,000,000
TOTAL CASH REQUIREMENTS	$30,886,800	$52,000,000

The engineering capital cost to build includes costs associated with barley based operations. The Katzen process incorporates consideration for feedstock abrasiveness in the design. These considerations include slurry pumps on high solids services and heavy wall piping in high velocity services where abrasion is most severe. In addition the operating cost are based upon barley operations, which incorporate higher than typical (corn based) maintenance costs.

These forecasts include costs beyond the bricks and mortar, steel, buildings, construction management and engineering and process design. The additional cost includes land and site improvement, rail siding spur, company corporate costs and expenses, interest during construction, legal, banking, financing, spare parts inventory, laboratory equipment, furniture and fixtures, and cost of money (interest). The contingency was reduced from 15% of the bricks and mortar to offset the higher value estimated for other development costs. And the business development policies and procedures must be designed, developed and staffed before plant startup.

Generally, the contingency fees are fully utilized by engineering, management, and board of directors design changes and price increases. These fees represent the best available estimates at the preliminary process design and engineering stage.

FINANCIAL CONDITIONS

PROFORMA SOURCE AND USE OF FUNDS

Classification	15 MGY	30 MGY
Source of Funds		
Equity		
Common Shares	$11,500,000	$20,000,000
Contributed Capital	500,000	500,000
Debt Financing	18,887,000	31,500,000
Total Source of Funds	$30,887,000	$52,000,000
Use of Funds		
Working Capital	$2,600,000	$4,000,000
Property, Plant & Equipment	28,287,000	48,000,000
Total Use of Funds	$30,887,000	$52,000,000

Financing Terms:	
Term Debt	60%
Terms	7 years
Depreciation – Life	20 years
Amortization	5 years

PROFORMA OPERATING RESULTS

The proforma operating results are presented for a 15 million gallon per year MFGE facility.

FORECAST PROFIT AND LOSS

The book profit and loss results as presented below are adjusted to reflect the financial impact of the ethanol small producer's tax credits. These pass thru credits are available to qualified small producers (maximum 30 million gallon per year), limited to the first 15 million annual gallons produced, at 10 cents per gallon produced or a maximum credit of $1,500,000 per year.

First Year - Operating Results

Book Pretax Income Adjusted to Tax Based Income
(Includes Impact of Small Producer's Tax Credits)

Net Sales	$28,229,000
Pretax Income (Book Basis)	$2,365,000
Tax Adjustments:	
Add: Small Producer Tax Incentive	1,500,000
Taxable Income	$3,865,000
Add (Deduct)	
Federal Income Taxes	(1,546,000)
Small Producer Tax Credits	1,500,000
Net Income Adjusted for Incentives and Income Taxes	$3,819,000
% to Net Sales	13.5%
Property, Plant & Equipment	13.6%
Total Assets	11.5%
% Return on Equity	30.0%

The gross small producer's tax credits must be added to income before federal income tax calculations. The net financial impact of the $1,500,00 (less 40% for federal income tax) nets $900,000 ($.06 per gallon ethanol for a 15 MGY plant) as an after-tax credit against federal income tax for investors.

FORECAST FINANCIAL RATIOS

The financial operating ratios and results reflect the first 12 months of operation for a 15 million gallon per year plant operations. These results represent book based income, and as such, excludes the financial impact of the small producer's tax credits.

First Year Operating Results

Description	Per Cent/Times
Financial Ratios:	
Working Capital	1.05
Debt to Equity	1.04
Accounts Receivable – days	25 days
Total Liabilities to Equity	1.47
Equity to Debt	.96
Cash Flow Break-Even Analysis:	
Ethanol – Gallons	10,459,000
Production Capacity	63.7%
Total Fixed Cost	$5,453,000
Variable Cost - % of Net Sales	72.3%

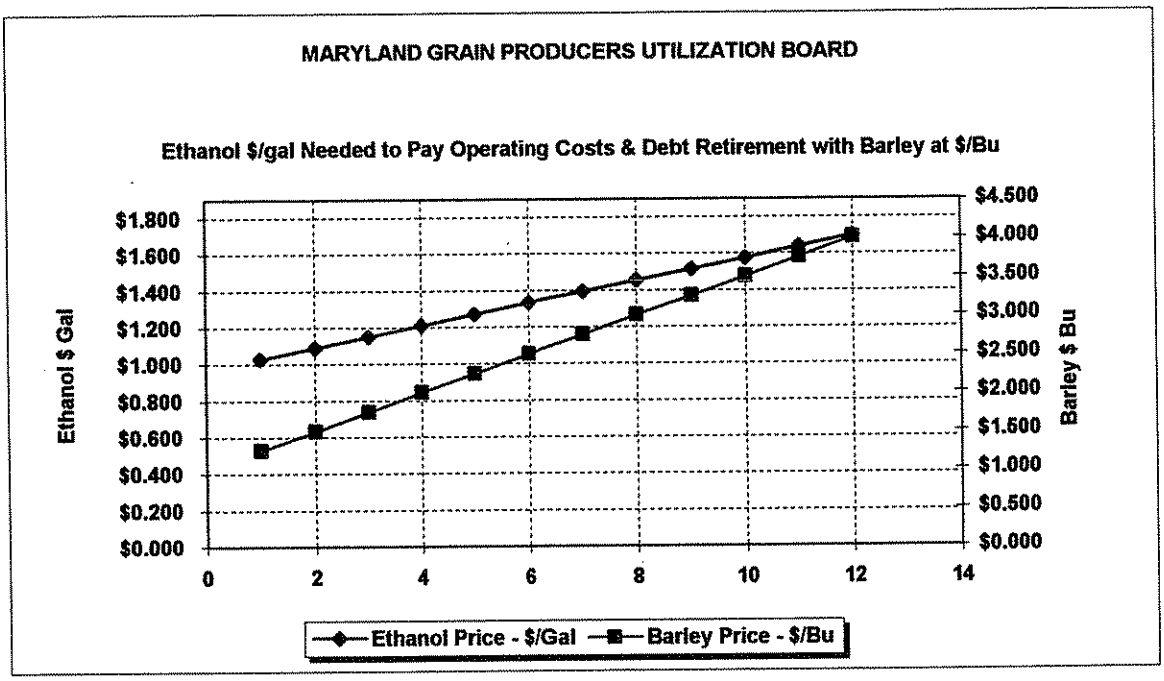
SENSITIVITY ANALYSIS

The economic concern relative to producing ethanol is market price, cost of barley, and utilities. What is the economic impact to the Project? The chart below gives the price needed for ethanol to pay $/bu for barley and the operating costs, expenses and debt retirement. This analysis accepts the selling price of DDGS and CO_2 as relative to the price paid for barley.

The ethanol trend line forecast the selling price needed per gallon of ethanol to pay the $/bu barely price trend line. As an example, the author suggests that the price of barley might be $2.50 per bushel in the near future. Then look at the price line for barley at $2.50 per bushel to see that the price needed for ethanol is $1.33 per gallon.

This economic model forecast that a plant structured, developed and designed as described in this report can cash flow covering operating costs, expenses, and debt payment with the ethanol selling price at $1.21 per gallon and barley cost at $2.00 per bushel.

(See chart below)



Ethanol Market - $/Gal	**$1.03**	**$1.09**	**$1.15**	**$1.21**	**$1.27**	**$1.33**	**$1.40**	**$1.46**	**$1.52**	**$1.58**	**$1.64**	**$1.70**
Barley Market - $/Bu	**$1.25**	**$1.50**	**$1.75**	**$2.00**	**$2.25**	**$2.50**	**$2.75**	**$3.00**	**$3.25**	**$3.50**	**$3.75**	**$4.00**

SUMMARY OF CASH REQUIREMENTS NEEDED TO CASH FLOW

Costs, Expenses and Debt Retirement	$ per Gallon Ethanol
Price paid for Barley	$.977
Revenue – Co-product:	
DDGS	(.478)
CO_2	(.053)
Net Cost of Barley	$.446
Variable Costs	.400
Fixed Costs	.240
Interest on Debt	.107
Total	$1.193
Add (Deduct):	
Debt Principle Payment	.180
Depreciation – included in fixed costs above	(.101)
Small Producer's Tax Credit (net of FIT)	(.060)
Forecast Costs, Expenses and Debt Payment	$1.212

VOUDRIE BUSINESS DESIGN, BUSINESS DEVELOPMENT AND FINANCING

It is expected that the project will be based upon business design, business development, financing and management advisory services provided by Voudrie Business Development, Inc. Established in 1991, Voudrie has been active in the ethanol and grain processing industry, for 18 years, serving the last 10 years as an advisor providing services for 6 projects from early stage planning through plant startup and processing, as well as, numerous proforma feasibility studies. Voudrie business design and development concepts support fair governance philosophies for equity investors, debt holders, employees and value added concepts for all participants. Capital invested in projects served in the range of $150,000,000.

Voudrie business services include assisting, coordinating project activities and preparing information for clients with business planning and project development, raising project equity and placing debt-financing packages. Strategic business packages include business structure, business and industry analysis, legal governing documents and prospectus materials, market planning, sales programs and agreements, financial planning and forward forecasting, engineering and construction agreements, and other support service to prepare the business for management operations and internal controls.

BUSINESS DESIGN

The business entity needs to be discussed thoroughly with the organizing group to determine an acceptable form of governance for the proposed project. The agricultural communities across the country have different philosophies relative to forming an entity as a way of doing business. The general forms used would include but not be limited to Limited Liability Companies (LLC), Cooperatives, Partnerships, or maybe "C" Corporations.

Several questions need to be thoroughly understood before finalizing an agreement to form a business entity. This document does not intend to dwell into these areas, however, the preferred choice needs to be good for the community and potential investors. Projects need investors and therefore potential investor concerns need to be addressed up front.

The preferred business entity should be designed to incorporate full advantage of federal and state policies available for MFGE entities. Pass-thru status is imperative in that the small producer's tax credit representing $.10 per gallon of ethanol up to the first 15 million gallons per year needs to be covered. Some producers' are not positioned to take advantage of these credits due to forming an entity that does not allow these particular credits to be passed thru to the investors. Cooperatives can not pass these credits thru to investors. Another area is to be positioned to minimize state and federal tax liabilities to protect investor equity positions.

The LLC form of business can usually raise equity from growers, non-growers, corporations or basically, anyone individual or form of doing business. The LLC allows broader participation for equity investors. Most of the incentives of a Cooperative are available to LLC investors, such as, pass-thru status. LLC's can not go directly to the Cooperative Banks for financing, therefore, must find other sources of debt financing.

BUSINESS DEVELOPMENT

Business development is a logical process; it is a project business management function to coordinate the elements of project finance – equity and debt, including grower relations & feedstock planning, plant siting, construction, operations management, marketing offtake agreements and preparing for plant start up permanent financing plans, staffing, customers, suppliers (vendors), and business policies and procedures. Basically, by the time construction is complete ready to start operations, the business development process must be prepared to operate the plant as planned.

FINANCING

Traditional projects are generally positioned for financing early in the business design and development stage as to business structure and governance, offtake agreements and feedstock support planning. Critical elements to project financing are: business design and development, competitive costs to build and operate the facility, sales and marketing programs for finished products, feedstock planning to support the process, and comprehensive critical sensitivity analysis of the economics.

Thoughtful consideration should be given to every detail and decision as agreed upon throughout the planning process in relation to project financing. Success is in the business design for governing the business, business development strategies, process design and production process, and an early stage development and construction management team in place to implement the plans.

EQUITY

Equity participation is part of the business design and structure planning process that clearly defines the rules for raising equity. This proposed 15 MM GPY project is forecasting equity participation to be in the range of $10,000,000 to $12,000,000 or about 30 to 40% of the total investment. Equity can vary depending upon the proposed financing package and business structure. Limited Liability Corporation or Partnerships, C Corporation and Agricultural Cooperative's have varying qualifications, such as, growers, non-growers, debt to equity and cash flow coverage ratios. Equity participation is part of the business structure planning process that generally details the requirements for raising equity.

DEBT

Many producers are formed as cooperatives and as such can go to the Cooperative Bank. Cooperative banks have specific business detail requirements, namely, that producers usually are required to deliver product to the plant at a predetermined price approved by the Cooperative Bank. Generally, about 80% of the investors must be producers and as such limits raising equity from non-producers. Some cooperative entities require 100% producer participation.

Commercial banks and private placement institutions provide financing. The U. S. Department of Agriculture offers loans and loan guarantee programs available through the Office of Rural Development. Generally, banks work with the USDA for these federal programs, however, this does not preclude the group from contacting these departments.

MANAGEMENT SERVICES

Start up companies normally need ongoing services beyond the business design and development and financing activities. Voudrie provides these oversight services for the new board of directors. These services assist the board with business information that is needed to prepare for management of the operating company. Such activities might include, but not be limited to, advise and information that new governing bodies need until staffing is in place, administrative and financial reporting and implementing internal controls throughout the process.

KATZEN TECHNOLOGY AND PROCESS DESIGN

It is expected that the project will be based upon technology and engineering services provided by KATZEN INTERNATIONAL, INC. (Katzen). Established in 1955, Katzen has been active in the ethanol industry for more than 40 years and has been instrumental in the design, construction, modification and operation for more than 50 plants worldwide. Katzen ethanol production technology developments have focused on maximizing the yield of ethanol per bushel of grain while minimizing operating costs.

TECHNOLOGY

By focusing on the process attributes that generate high yields, Katzen technology reduces other factors often associated with problems in ethanol production. In the area of mashing, cooking/sterilization, and liquefaction, Katzen technology maximizes the conversion and recovery of the fermentable carbohydrates and eliminates the common contamination problems in its systems by sterilization of the incoming grain and applying C.I.P. (Clean-in-Place) cleaning similar to systems used in the food processing industry.

Several process steps have been combined and/or eliminated with Katzen design allowing for reduced capital and maintenance costs and increases in operating efficiency.

The application of Simultaneous Saccharification and Fermentation (SSF) process technology has been optimized, reducing the overall complexity of the fermentation process. This has led to a significant reduction in installed cost of the fermentation area process equipment. Fermentation is continuously monitored and controlled to produce the maximum yield of ethanol per bushel of grain in the shortest period of time.

Katzen distillation and dehydration technology incorporates a cascade distillation system with an integrated molecular sieve dehydration system. All Katzen distillation/dehydration plants meet or exceed the ASTM standard for motor grade fuel ethanol. The incorporation of proprietary distillation column tray technology has virtually eliminated the need for frequent scheduled cleanings often required in high-fouling processes such as cereal grains and molasses-based fermentation ethanol plants.

By combining technologies and related process steps from the front-end of a plant (mashing/cooking) with the back-end of the plant (dehydration/distillation and by-product recovery), Katzen technology offers several overall process advantages. First, byproduct concentration and processing utilizes a modified evaporation system that acts as a total process "to waste energy sink" rather than an energy consuming system. This technology allows a Katzen plant to operate using less steam and to run for longer periods of time between shutdowns for maintenance and cleaning. Secondly, by controlling all material flows through the process, even the washings from equipment, Katzen achieves a more environmentally friendly facility. When operating on standard grain based feedstocks the facility operates in a "zero discharge" mode with no effluent from the process areas.

The proposed plant must have the capability to process barley into ethanol and related co-products. The analysis should note the potential for co-processing wheat or other products that enhance feasibility of the project.

PROCESS DESIGN

The plant, as conceptually designed in the preliminary engineering effort, has the capacity to process various cereal grains on a campaign basis. The cereal grains capable of being processed include barley, wheat, corn, grain sorghum and triticale. The technology required for processing these grains is quite similar though changes in the types and dosages of enzymes applied will be required.

In addition, cereal grains such as barley have a substantially lower starch content than more traditional feedstocks such as corn. Because of this the major process streams carry substantially more non-fermentable solids. This results in a fermentation system that produces lower concentrations of ethanol as compared to a corn based plant. In addition the non-fermentable solids include a substantial amount of non-fermentable polysaccharides, including beta-glucans. The presence of high concentrations of these materials will increase the fouling of critical heat transfer surfaces in the distillation and evaporation areas, resulting in increased cleaning cycles. The net result is that key pieces of major process equipment for a plant designed to process barley will be larger and more costly than those designed for a plant of comparable ethanol production capacity processing corn. This differential is approximately 25%. In other words, a plant designed to produce

15 million gallons of ethanol per year from barley will cost approximately 25% more than a comparable plant designed to process corn.

Or, from another perspective, a plant designed to produce 15 million gallons of ethanol per year from barley will be capable of producing approximately 19 million gallons per year when processing corn. Experience indicates that corn and grain sorghum are essentially equivalent feedstocks. The only issue of significance is that grain sorghum produces more foam during fermentation and requires some antifoam strategy. Wheat can be substituted as a feedstock as well, though some capacity differential will be experienced as compared to corn. Depending upon variety, wheat will "de-rate" a plant's production capacity by no more than 10 %.

The issue of additional capacity-related costs associated with barley-based operations were factored into the preliminary engineering capital cost model. Note that the KATZEN process incorporates consideration for feedstock abrasiveness in the design. These considerations include slurry pumps on high solids services and heavy wall piping in high velocity services where abrasion is most severe. In addition the operating cost model was developed based upon barley operations, which incorporates higher than typical (corn based) maintenance costs.

MARKET IDENTIFICATION AND ASSESSMENT

MARKET IDENTIFICATION

The marketing study analyzed three scenarios that represent the most likely combinations of policy and regulatory developments that will shape the market for the next decade. The following summary highlights public policy issues that can bring change to the current marketing of ethanol. Section 4 of this report has a complete narrative of each of these issues.

Scenario 1. Federal Reformulated Gasoline (RFG).
This would be the continuation of an existing federal program where one third of the nation's gasoline is required to contain oxygen additives. There is no other product available in any quantity to meet an oxygen requirement other than MTBE or ethanol. A federal ban of MTBE nationwide is not out of the question.

There are numerous questions with regard to ethanol's use in RFG such as environmental impacts, supply, and cost that make it very unlikely for ethanol to capture the entire market. However, with the move away from MTBE both by state ban or by oil industry choice, ethanol demand will grow.

Scenario 2. Creation of a Renewable Fuel Standard (RFS).
The Northeast states have indicated their near unanimous opposition to an ethanol-only RFG program. If the Northeastern states band together it is possible the oxygen requirement in federal RFG will be dropped as part of the effort to eliminate MTBE.

We believe this scenario to be a very likely outcome of the debate over MTBE and oxygenates. A Maryland plant would be providing a product that refiners need and in fact, must have.

Scenario 3: Abolishing the RFG Oxygen Program with no RFS Established.
The worst case scenario would be to leave ethanol to fend for itself in the motor fuel world with its value derived from displacing gasoline and providing octane.

We anticipate significant growth in ethanol value even under this low-growth scenario as it should continue to track gasoline.

REGIONAL MARKET FOR A MARYLAND PLANT

The Northeast is among the most densely populated and nearly the most polluted areas in the country. Even if the current federal Reformulated Gasoline Program were to be abandoned, the Northeast states will face increasingly stringent air pollution controls necessitating some use of clean additives such as ethanol. Maryland, as part of the Northeast block of states, has experienced significant pollution problems of its own, with Baltimore being one of the original cities specified in the Clean Air Act as being required to use the aforementioned gasoline. With the Washington D.C. metropolitan area electing to use reformulated gasoline as well, the entire area has required a significant amount of oxygenate additive to meet the demand. Again, this has been met almost exclusively by MTBE.

The potential market on the East Coast is phenomenal having had virtually no ethanol production and little market penetration. It would represent a huge market under the RFG scenario. The eight states of NESCAUM (Northeast States for Coordinated Air Use Management) have estimated they would need 960 million gallons per year by 2004 under a moderate MTBE Phase out schedule. (It should be noted, however, they strongly oppose an ethanol-only RFG scenario.)

With 75% of the Northeast market required to use RFG, the obvious focus of any marketing strategy for a Maryland plant should be on that region, as well as the even more immediate markets of Baltimore, the six surrounding Baltimore counties, and the Washington D.C. metro area encompassing parts of D.C., Maryland and Virginia.

TARGET MARKET

Maryland is strategically located in the center of the largest petroleum consuming region, using more than 40 percent of all the gasoline manufactured in the United States. For all three scenarios discussed earlier, the optimum market for a Maryland plant is the subregion we have created of Maryland, Virginia, Pennsylvania, Delaware, and D.C., all of which is identified as the target market. Total gasoline in those areas is approximately 11.7 billion gallons. This represents just under 9 percent of the total U.S. gasoline, and is roughly equivalent to the petroleum demand of the State of Texas. Without any regard to oxygen demand or other regulatory drivers, the penetration of 30 million gallons for a Maryland facility into this target market would represent only 0.26 percent market share. Effectively 3 percent of the gasoline in the target market could be used for 10 percent ethanol blends. That is an extremely modest goal for the Maryland program to assume. Under an RFG scenario, approximately 6.3 billion gallons of gasoline are required to contain oxygenate which would provide an opportunity for ethanol blends to capture 5 percent of the oxygenate market with a 30 million gallon per year plant, which is again, an extremely modest and attainable goal. In short, this level of ethanol production being added to the motor fuel pool is, in our view, easily absorbed.

MARYLAND ETHANOL PROJECT TARGET MARKET GAL/YEAR			
	Total Sales	**RFG Market**	**Ethanol @ 5.7 Vol**
Maryland (60% RFG)	2,443,162,464	1,465,897,478	
Virginia (50% RFG)	3,628,617,157	1,814,308,579	
Pennsylvania (50% RFG)	5,045,419,858	2,522,709,929	
Delaware (100% RFG)	396,141,551	396,141,551	
District of Columbia (100% RFG)	179,604,336	179,604,336	
Target Market "TM" Sales	11,692,945,366	6,378,661,873	
Total US Gasoline	133,719,147,445		
Target Market "TM" as % of Total Gas	8.74		

MARKET PENETRATION 'MP'	Total Sales	RFG Market	Ethanol @ 5.7 Vol
100% MP of 10% Blends in TM	1,169,294,537	637,866,187	363,583,727
50% MP of 1 0% Blends in TM	584,647,268	318,933,094	181,791,863
10% MP of 10% Blends in TM	116,929,454	63,786,619	36,358,373
5% MP of 10% Blends in TM	58,464,727	31,893,309	18,179,186
PLANT PRODUCTION *	30,000,000	30,000,000	30,000,000
% of Total Gasoline TM	0.26%	0.47%	0.47%
% as 10% blend	3%	5%	8%

Source: Gasoline Sales from U.S. Energy Information Administration

The proposed Maryland facility would need just a one-eighth percent market penetration for the proposed amount of ethanol, a figure that could easily be met. We believe that a 15 to 30 MGY plant could be positioned to get delivery commitments from Buyers as the concept becomes more clearly defined as a proposed project. Until there is a committed Seller, a commitment to construct a plant, a time schedule for construction, an expected time of first delivery, etc, there will not be firm commitments from any Buyers.

Whether selling directly to refiners or selling to distributors/jobbers for the fuel distribution centers, a Maryland plant would have an enormous advantage over Midwest suppliers. Clearly, however, under the RFG scenario, Midwest suppliers would come to the East Coast under the assumption of price increases easily equal to their transportation costs. A Maryland plant should be able to show significantly more profit with a likely 10 cent or more transportation advantage, but there certainly would be competition.

Under the RFSG scenario Maryland would still have an advantage over Midwest producers, but in the early years of the percentage requirement under an RFS, it is likely most of the blending and the credits generated for other refiner, would take place in the East Coast, close to the source. Over time as the requirement for volume grows, the East Coast will become somewhat saturated and expansion to other areas will have to take place.

The difference between ethanol value to Maryland could be at least 8-12 cents per gallon lower, or the transportation cost from the Midwest to Baltimore and the east. The price of ethanol under the RFS would track gasoline, much like the conventional scenario. However, the market is essentially guaranteed because the product is required.

Furthermore, there should be a premium on the credits ethanol blenders would receive which are then sold to help other refiners meet their needs. It is anticipated that these credits should be reasonably close to the value of the actual ethanol, which would be on top of the ethanol price. However, as the history of pricing and octane giveaway indicates, this is far from certain. More detailed study on the economic impact of the credits is necessary.

In both the RFS and RFG scenarios, the likelihood of securing contracts increases significantly. Traditionally, ethanol has been a spot market commodity with refiners choosing to play the field between MTBE, ethanol, and other octane additives. The RFG or RFS scenarios would change their purchasing strategy. Securing contracts is a major hurdle for a prospective plant to overcome and could be of enormous value in obtaining financing.

In fact, the single greatest impediment to financing an ethanol facility has been market uncertainty. The RFG and RFS scenarios, one of which we believe will be the ultimate outcome, address this financing hurdle.

Much of this report is focused on the traditional gasoline blend market. The opportunity to feed the significant oxygen demand of the Northeast and the immediate area of Maryland, Washington, and northern Virginia makes this the primary choice. The use of ethanol in blends as high as 85 percent, however, presents another potential market.

ETHANOL PRICING OUTLOOK

We believe the public policy, or market drivers will be created in order to drive demand and be implemented on a timeline so as not to create some of the market imbalances discussed above. If so, then pricing should remain constant with gasoline as a baseline, or low scenario with significant potential price increases in the RFG and RFS scenarios.

History clearly shows that our worst case scenario for ethanol price is within a few cents (up or down) of regular gasoline. The conventional scenario simply lacks the value of either being an oxygenate or a renewable component. It is possible that ethanol will inch its way closer to premium unleaded values rather than regular as refinery capacity continues to fail to meet demand. Ethanol has the ability to take a low value product (low or sub octane gasoline) and turn it into a high value product (high octane premium) that otherwise would have necessitated refinery processing. Furthermore, MTBE competes with ethanol not only as an oxygenate but as an octane enhancer so ethanol should capture some of that demand and value.

Maryland and the Mid-Atlantic region gasoline pricing is generally higher than national averages (~ $1.40 per gallon) often with a 10-12 cent/gallon price differential. On the other hand, Central Atlantic prices that would affect Maryland are on the average 5 cents less than New England and the Northeast states. The lower Atlantic, the Midwest, and the Gulf Coast tend to be extremely low prices with the extremely high prices of the West Coast raising the national average. In short, viewing national averages for a look at Maryland price possibilities is an accurate barometer.

Some studies suggest that the RFG scenario (where MTBE is banned) could raise ethanol prices by 33 cents per gallon over year 2000 prices. Obviously, this is one of the reasons most the state Governors in the Northeast oppose this scenario in favor of RFS.

Using the Department of Energy increase of 2.8 percent cost increases in petroleum products, we anticipate that to be a minimum, and thus constant, figure. Regular unleaded gasoline could be reasonably expected to increase to the following amounts for the next decade, based on the prediction of a low year-end price of gasoline of $1.40 in the low scenario, and a year-end price of $1.50 in the high scenario (see charts below).

Motor Gasoline Retail Prices, US City Averages
(Cents per gallon, Including Taxes)

Year	Unleaded Regular	Ethanol		Year	Unleaded Regular	Ethanol
1978	67.0	1.45		1990	116.4	1.25
1979	90.3	1.63		1991	114.0	1.15
1980	124.5	1.75		1992	112.7	1.23
1981	137.8	1.75		1993	110.8	1.08
1982	129.6	1.66		1994	111.2	1.08
1983	124.1	1.68		1995	114.7	1.10
1984	121.2	1.54		1996	123.1	1.22
1985	120.2	1.48		1997	123.4	1.19
1986	92.7	1.05		1998	105.9	1.07
1987	94.8	1.08		1999	116.5	1.11
1988	94.6	1.06		2000	151.0	1.37
1989	102.1	1.13		2001 1st 6 months	150.0	1.63

Source: Energy Information Administration

Projected Gasoline Pricing

Year	High Scenario	Low Scenario
2002	1.54	1.43
2003	1.57	1.47
2004	1.61	1.51
2005	1.65	1.55
2006	1.69	1.59
2007	1.73	1.63
2008	1.77	1.67
2009	1.81	1.71
2010	1.85	1.75

Ethanol values should remain close to gasoline pricing, with ethanol ranges from $1.38 to $1.80 assuming ethanol is within gasoline 5 cents above and below.

MARKETS FOR DISTILLER'S DRY GRAINS WITH SOLUBLES (DDGS)

Discussions with the largest broker of DDGS in the U.S. about placement of DDGS from Maryland resulted in the following: the nearest "protein deficit" areas that are good markets for DDGS are Southeastern Pennsylvania, upstate New York, and North Carolina. DDGS from a 15.0 GPY Maryland facility could likely all be placed in Southeastern Pennsylvania. DDGS in these Eastern markets brings a premium price. Shipping to upstate New York and North Carolina would cost less than from the Midwest. Overseas shipment is also viable if enough DDGS were accumulated to fill a ship's "hold."

Poultry feeding of DDGS is a recent development that is still being evaluated by the industry. At present, some DDGS feed at a 10% to 15% level for turkeys in Minnesota has been successful and other trials are being conducted. Given the high level of chicken production on the Eastern Shore, DDGS (or one of its components) might become a feedstock of choice. The development process locally may be long, however.

DDGS is a commodity. There are national companies interested in purchasing and distributing this product from barley, wheat and/or corn. The price indicated is a best estimate based on current market; there is no guarantee that current market prices will hold.

The forecast market price of DDGS is $100.00 per bushel. The current price for DDGS is in the range of $90 to $120 per ton and this feasibility report forecast grain at $2.00 per bushel. The historical pricing is tabulated below:

Historical Pricing

Avg Yrs	$Ton
10	$117.00
5	115.00
2	85.00
August	120.00
This Report	$100.00

Market price will generally fluctuate with the price of grains; however, consideration should be given to the increased volume of product that will be produced from the anticipated growth within the industry. This may tend to depress the market price for DDGS.

MARKETS FOR CARBON DIOXIDE (CO_2)

A fuel ethanol facility can produce food grade CO_2. The major local market for food grade CO_2 is for soft drink production. Discussion with the CO_2 purchasing agent for the largest regional soft drink producer determined the following: The delivered price is in the range of 4 to 5 cents per pound ($80 to $100/ton). Purchasing is done on an annual basis with truckload deliveries to regional plants on an as needed basis. Much of the CO_2 currently delivered to the Maryland market comes from Hopewell, VA. Since Hopewell is at least 150 miles from Baltimore, there should be some freight savings with local supply.

SusTech Corporation has previously analyzed this "make or sell CO_2" tradeoff for the local area. The result of that analysis showed a very attractive return on investment. However, the availability of capital for self-manufacture is the concern for a start-up fuel ethanol facility. "Across the fence" sale of CO_2 carries margin and profit with it. The detailed design and engineering phase of the project should undertake analysis of this make or sell decision.

Carbon dioxide is included as an "across the fence" product in that the customer would capitalize and operate the CO_2 plant adjacent to the MFGE plant and purchase crude over the fence. This is an acceptable process for marketing CO_2 that would possibly be used for refrigeration or beverage carbonation. The price is forecast to be $20.00 per ton, however, is not definitive until a customer defines the use and demand for this product. BOC Gasses Group, headquartered in Murray Hill, New Jersey, is a major marketer of carbon dioxide and BOC maintains a substantial position in the marketplace.

TRANSPORTATION AND DISTRIBUTION

Ethanol from a Maryland facility will primarily be delivered to Maryland fuel terminals that transcend Maryland state borders. These terminals will likely include the target market states of Pennsylvania, Delaware, Virginia, and the District of Columbia, as well as Maryland itself. Research conducted as part of the study with the Maryland Energy Administration has revealed numerous fuel terminals and bulk facilities that could handle the output from a Maryland ethanol plant. Many of these can be supplied by pipeline or barge and all can be supplied by truck. Any terminal dealing with bulk fuels is capable of serving as a throughput location for ethanol.

There are a number of ways ethanol transactions are structured, such as a plant renting terminal space and conducting its own marketing with one or more terminals serving as the pickup spot. More common and often preferable is an agreed upon purchase by a customer (such as an oil company or petroleum distributor) whereby they would take the delivery at a terminal location by rail, barge, or truck. It is clear from the data of terminals that regardless of where the ethanol plant was to be located in the state, it could easily reach these key distribution outlets. Baltimore and the Eastern Shore points can be met by barge and that is generally the most inexpensive way to move ethanol. Greater volumes are typically necessary, however, to utilize barge traffic, and it is more likely trucking would be the preferred option for the MGUPB plant.

As indicated in the full report, a location of refineries serving the target markets is somewhat irrelevant. This is due to the fact that ethanol is not typically blended at the refinery level but rather at the distribution points or anywhere where they "break bulk." As an example, one of the prime suppliers to the Baltimore region is Crown Petroleum, yet Crown has no refineries in Maryland or even in the surrounding region. Crown owns two refineries in Texas and gasoline is sent from those refineries to the Maryland market via the Colonial or Plantation pipelines. The pipelines provide product at the terminals that is then divided up from there. There are more than 60 locations potentially available for ethanol storage and distribution ranging from southern Maryland to the northern border, and from western areas such as Deep Creek Lake to the Eastern Shore of Salisbury.

In summary, there are no terminal distribution issues that would inhibit the distribution of ethanol from a Maryland facility.

FEEDSTOCK GRAINS – BARLEY & WHEAT

AGRICULTURAL UNDERSTANDING OF THE ROLE AND POTENTIAL OF BARLEY

Barley in Maryland is grown as part of the double cropping practice where it is sown in October, harvested in June, and usually followed by a soybean summer crop. Sometimes barley straw is also harvested, otherwise the straw adds to soil tilth. Wheat plays a similar role in double cropping and farmers decide between barley and wheat as the second crop. Barley has an advantage over wheat in that barley matures 2 weeks earlier than wheat, which allows the follow-on soybean crop 2 additional weeks to mature, thus adding 6 to 8 bushels/acre to the soybean crop.

The real determinant between planting wheat and barley is an economic one. Barley generally has a higher yield/acre but brings a lower price. Using the State of Maryland prices and yields from the State of Maryland 1999 Grain Production Table below (Grain Availability), a gross revenue per acre can be calculated, as follows:

Barley:	80.0 Bu/acre x $1.30/Bu =	$104.00/acre plus soybean incremental of
	7.0 Bu/acre x $5.21/Bu =	$ 36.47/acre
	Total	$140.47/acre
and		
Wheat:	59.5 Bu/acre x $2.37/Bu =	$141.02/acre

which is just about equivalence from a gross revenue perspective (without taking costs into account).

As a "straw man," a purchase price of $2.00/Bu for barley by the fuel ethanol plant has been proposed as being affordable. If this were the case, the value added per bushel would be $2.00/Bu - $1.30/Bu = $0.70/Bu and $0.70/Bu x 80 Bu/acre = $56.00/acre. On a regional basis, the plant would require approximately 7,000,000 Bu/yr and the value added would be $0.70/Bu x 7,000,000 Bu/yr = $4,900,000/yr.

Of great significance, however, an informal survey of farmers found that, if the price of barley were to rise to $2.00/Bu with a barley-to-fuel ethanol plant in the picture, farmers would switch acreage from wheat to barley. A switch of only 10% of Delmarva wheat acreage to barley, when added to the existing barley crop, would be enough to supply the plant. It should be kept in mind that switching isn't critical to the project as the plant will be designed to utilize barley, wheat, or corn.

Also of significance, a number of agriculturally oriented people were asked about the potential marketplace impacts of a barley-to-ethanol plant, with the result that none of them foresaw any impacts to markets and, in particular, to the chicken processing industry that is the mainstay of the Delmarva agricultural economy.

With respect to bringing idle cropland into barley production, the 1997 U.S. Census of Agriculture has the most current statistics on Maryland idle cropland by county. Neither the State nor the USDA statisticians in the State have more recent data. Maryland has recently instituted a program whereby farmers are paid to idle a buffer zone of 20 to 30 feet of land adjacent to waterways to reduce chemicals runoff. However, this program is not believed to result in a significant reduction of cropland. When asked about idle farmland, all respondents believed there was very little of it. Maryland farmers on the Eastern Shore do receive a State subsidy for raising cover crops with the objective that agricultural runoff is reduced.

FEEDSTOCK ANALYSIS
(FOB Plant Site)

LOCALLY GROWN BARLEY, WHEAT AND CORN				
Description	**Feed Barley 48#**	**soft red wheat 60#**	**50% Each Barley/Wheat**	**Corn 56#**
% of bushel grind	100.0.%	100.0%	100.0%	100.0%
Bushels Needed if 100% feedstock	7,325,667	5,490,196	6,390,931	5,190,311
Feedstock – Pounds	350,000,000	329,411,765	339,705,882	290,657,439
Cost per bu of feedstock fob plant	$14,651,333	$14,096,078	$14,339,706	$12,690,311
$ per bushel	$2.0000	$2.5675	$2.2438	$2.4450
$ per pound	$.0417	$.0428	$.0422	$.0437
Cost per gallon of ethanol produced	$.9733	$.9397	$.9560	$.8460
Gallons produced	15,000,000	15,000,000	15,000,000	15,000,000
DDGS - Tons	73,600	54,700	63,700	42,200
Carbon Dioxide - tons	40,000	40,000	40,000	40,000

ANALYSIS OF FEED BARLEY
TEST WEIGHT (48#) (44#) and (40#)
(FOB Plant Site)

Description	**TW 48#**	**TW 44#**	**TW 40#**
% of bushel grind	100.0.%	100.0%	100.0%
Bushels Needed if 100% feedstock	7,325,667	7,988,545	8,784,000
Feedstock – Pounds	350,000,000	350,000,000	350,000,000
Cost per bu of feedstock fob plant	$14,651,333	$14,645,667	$14,640,000
$ per bushel	$2.0000	$1.8333	$1.6667
$ per pound	$.0417	$.0417	$.0417
Cost per gallon of ethanol produced	$.9733	$.9764	$.9760
Gallons produced	15,000,000	15,000,000	15,000,000
DDGS - Tons	73,600	73,600	73,600
Carbon Dioxide - tons	40,000	40,000	40,000

The analysis holds the process to 15,000,000 gallon ethanol that requires 350,000,000 pounds of feedstock assuming that the 48# bushel starch content remains at the same percentage for lower test weights.

The issue of cup weight does not bear into the design of the plant. The statistical variability of cereal grains does not impart significant design constraints on the process. Typically, low cup weight grains are lower in high-density components such as protein and fiber. Generally, the starch content in pounds per 48 pound bushel generally does not vary significantly. This may impact the value of the DDGS byproduct but should not impact the plant capacity or performance. One would expect that low cup weight grain would receive a deduction in pricing when compared to a standard bushel.

GRAIN AVAILABILITY AND PRICE

From a markets perspective, the larger of these two nodes of production is known geographically as the Delmarva Peninsula (an acronym for Delaware-Maryland-Virginia), bounded on the west by Chesapeake Bay and, on the east, by the Delaware Bay and Atlantic Ocean.

This Delmarva agricultural region had the following grain production in years 2000 and 1999:

GRAIN PRODUCTION
Year 2000

Location By County	Combined Barley and Wheat	Barley	Wheat
TOTAL DELMARVA GRAIN	25,431,200	6,793,200	18,638,000
Grain Requirements - As Is Bu	6,390,931	7,325,667	5,490,196
% of Plant Capacity	100.00%	100.00%	100.00%
North Central	4,064,500	1,368,700	2,695,800
Southern	1,070,000	241,200	828,800
Northern Eastern Shore	8,527,900	1,966,700	6,561,200
Southern Eastern Shore	2,973,100	468,700	2,504,400
Location By County	**Combined Barley and Wheat**	**Barley**	**Wheat**
Western Counties	64,500	54,700	9,800
TOTAL MARYLAND	**16,700,000**	**4,100,000**	**12,600,000**
Delaware	6,426,000	2,268,000	4,158,000
Virginia (Eastern Shore)	2,305,200	425,200	1,880,000
DELMARVA TOTAL	**25,431,200**	**6,793,200**	**18,638,000**

GRAIN PRODUCTION
Year 1999

Crop	Production Bushels	Harvested Acres	Yield Bushels/Acre	Bushelweight Lbs/Bushel
Barley	4,860,000	58,400	83.2	48
Wheat	14,705,000	250,700	58.7	60
Corn for grain	39,018,000	403,600	96.7	56

Source: Agriculture in Maryland, Summary for 1999, Maryland Department of Agriculture

The markets for these grains are diverse. Maryland and the Delmarva Peninsula are usually corn net importing regions because of the extensive chicken industry on the Eastern Shore. Wheat is consumed locally for various human food products such as bread. The nearest wheat flourmill is in Pennsylvania so Delmarva wheat growers are at some freight disadvantage compared to wheat from the other production node. Barley seems not to have a strong market. Barley is used as a feed mix product primarily and is also used as a feed for pigs.

Approximately 95% of the above Delmarva grain is produced within a 75 mile radius of a central point on the Peninsula.

GRAIN PRICES

Anecdotally, the drop-off in price of barley has resulted in many farmers reducing their barley planting in 2001 because they have been losing money at these low prices for the last 3 years. One farmer stated that, for the first time in 40 years, he isn't growing any barley this year.

There has been a sharp drop-off in grain prices received by farmers in Maryland:

Maryland Grain Prices

Year	Barley	Wheat	Corn
1997	2.05	3.15	3.00
1998	1.30	2.45	2.35
1999	1.30	2.37	2.33
2000			
Jun-01	1.20	2.30	2.10

Sources: 1997-1999 Agriculture in Maryland, Summary for 1999, Maryland Department of Agriculture.
June 2001 Maryland Grain & Livestock Report, Vol. 26, No. 24, June 15, 2001.

Loan Deficiency Payments
($ per Bushel)

Crop Year	Barley	Wheat	Corn
2001	$1.48	$2.56	$2.09

Source: Crop Y2001 Farm Service Agency – Maryland Base County Loan Rates 11/26/01

A review of the analysis of historical grain pricing and loan deficiency payments indicate that the MGPUB suggestion of a value added payment to growers of $2.00 per bushel for barley is reasonable in that the loan deficiency payments are currently $1.48 per bushel. This suggest adequate margins to cover potential storage and transportation costs.

OPTIMAL FEEDSTOCKS

The proposed facility design will process various cereal grains, including barley, wheat, corn, grain sorghum, and triticale. Though oats has sufficient starch for consideration as an ethanol feedstock, the high beta-glucan content and lack of significant commercial demonstration warrants that this should be considered cautiously. The impact of the various feedstocks on plant cost and operating capacity was discussed previously.

Historically, corn has proven to be the most optimal North American feedstock from an overall capital and operating cost perspective. This can change in isolated situations where local grain pricing is depressed due to an imbalance in supply and/or demand.

Feedstock – As Is Bushels	Base Price Per Bushel	Grain Cost Per Gal	Net Grain Cost Per Gal
Barley	$2.00	$.976	$.433
Wheat	$2.57	$.939	$.523
Corn	$2.45	$.846	$.513
Equal blend – barley & wheat	$2.24	$.956	$.471
1/3rd blend – barley, wheat & corn	$2.31	$.919	$.492
Triticale	$2.20	$.894	$.531

The base price of barley as a value added price to respond to RFP request and other grains are based on best estimates as related to average market and loan deficiency payment. Grain cost per gallon represents the ethanol yield per bushel to the base price per bushel, i.e., 48# TW barley base price at $2.00 with a 2.0476

gallon per bushel equals $.976 cost per gallon. Net grain cost per gallon represents the grain cost per gallon less the revenue per bushel forecast for distiller's dry grains and carbon dioxide, or net grain cost.

Note: Growers should grow what is best for Growers; the ethanol plant can use the grains Growers grow.

STAFFING – MANPOWER

The proposed facility is designed to operate at peek efficiency with the following manning forecast salaries, wages, and benefits.

Managers:		
General	1 position	
Production	1 position	
Administrative	1 position	
Clerical:	2 positions	
Day shift:	4 positions	
Rotating shifts:	4 employees each of 4 shifts	
Total Manning:	25 employees	$1,125,000

ENERGY, UTILITIES AND ENVIRONMENT

Maryland is currently in a transition phase of electricity deregulation and has previously undergone natural gas deregulation. Deregulation has vastly complicated energy purchase decisions by manufacturing facilities, however, there are savings rewards for those facilities that persevere. Two of the Hurlock sites described above have the option of buying from an electricity cooperative as well that is not being deregulated. Having multiple suppliers either through deregulation or geography provides a favorable negotiating situation but one that is difficult to estimate without actually undergoing the negotiations.

ELECTRICITY

As stated above, there are two potential electricity suppliers to the Hurlock sites, Choptank and Connectiv. Connectiv serves most of the Eastern Shore as well.

Connectiv Power Services' Large General Service Secondary Rate LGS-S

	Summer	Winter
Distribution Demand	$3.30/kW	$3.30/kW
Transmission Demand	$5.39/kW	$3.15/kW
Energy	$0.051/kWh	$0.051/kWh

Choptank Electric Cooperative Primary Service

Demand	$10.00/kW
Energy	$ 0.04189/kWh

The above electric rates are the published rates of the regulated utilities. Better rates may be available under other tariffs. Electricity purchase through independent electricity marketing companies may provide significant savings from the above tariffs.

ENERGY COST CONTROL

While it is not possible to determine specific energy prices at this time given the complexities of purchase options, deregulation, site specific factors, etc., the KATZEN operating cost estimates used typical rates for industrial facilities. As an example, two of the Hurlock sites could receive electricity either from a public utility or a rural electric co-operative. The two types of supplier operate under different regulations and have many other differences.

Additionally, the PJM (Pennsylvania-Jersey-Maryland) grid operator has a PJM Power Program that rewards self-generation or load shedding during grid system peaks. This program can be financially attractive, especially when designed into a project on the front end.

NATURAL GAS

Natural gas service to Hurlock and most of the Eastern Shore is provided by Chesapeake Utilities. There are basically three options (simplified) for natural gas supply to a manufacturing facility:

High Load Factor Rate – This rate changes quarterly

Delivery Service	22.6 cents/ccf
Gas Sale	69.0
Total	91.6 cents/ccf

Interruptible Rate – Assumes No. 2 fuel backup system. This rate changes monthly.

Delivery Service and Gas Sale	64.5 cents/ccf

This rate is more volatile and was as high as $1.25/ccf last winter.

Transmission Gas – This is a negotiated, unregulated rate with potential for significant cost reduction over the above rates.

The 5% Maryland Sales Tax does not apply to gas and electricity consumed directly and predominately in a productive activity. Connectiv believes the price of natural gas to be on the decline.

WATER AND WASTEWATER

The City of Hurlock has both a water supply plant and a wastewater treatment plant. The fuel ethanol plant will be designed as a zero water discharge plant with no process discharge to the sewer system. Only a modest amount of incoming process water will be required, well within the City supply capability.

ENVIRONMENTAL CONSIDERATIONS

Maryland has a mixture of attainment and non-attainment areas for criteria pollutants. In general, the lower Eastern Shore counties are attainment areas. The major air pollutant for a fuel ethanol facility will likely be NOx from combustion sources. The potential to emit NOx limits without controls as major sources in the Counties of interest are as follows:

A. 25 tons or more per year – Baltimore, Carroll, Cecil, Baltimore City
B. 50 tons or more per year – Frederick
C. 100 tons or more per year – Caroline, Dorchester, Kent, Queen Anne's, Talbot, and Washington.

Accordingly, air emissions should not be a problem given natural gas as the primary fuel, low NOx burners and other technically advanced equipment.

The plant will have a low level of aroma primarily from the grain drying operation. While this aroma is not objectionable, plant siting should not be close to populated areas. Given some separation from population, noise will not be a concern either.

As indicated above, the zero discharge design eliminates water discharge concerns.

INCENTIVES FOR ETHANOL

FEDERAL EXCISE TAX CREDITS FOR BLENDERS (*NEW BLENDERS*) $8,100,000

The Energy Tax Act of 1978 established an exemption for 10% ethanol blended gasoline. The provisions of this Act have been changed over the past years. The latest change occurred in 1998 that extended the tax credits to 2007. The current credit is $.54 per gallon of ethanol blended with gasoline until 2003 at which time the credit declines to $.53 cents on down to $.51 cents by year 2007. These credits represent "new wealth" to the State for gasoline converted to ethanol blends.

SMALL PRODUCER TAX CREDITS $1,500,000

The Clean Air Act of 1990 allows for a $.10 cents per gallon income tax credit for up to 15 million gallons per year of production of ethanol by qualified small producers. Small producers are defined as a person or business with a productive capacity for alcohol 30 million gallons of alcohol per year or less. It is important to review the tax code as to qualifications for these credits. This credit is due to sunset December 31, 2007.

STATE INCENTIVE PROGRAMS

Like the federal government, many states have elected to encourage ethanol use through a variety of incentive mechanisms. Most incentives have been in the form of excise tax reductions in the state's fuel tax rate. States have adopted this form of incentives to encourage ethanol use. Many states have adopted innovative mechanisms to stimulate the production and use of ethanol fuels. The specific component of incentive programs varies from state to state as a result of differing public policy objectives and state constitutional provisions.

Many states include cash incentives ranging from –0- to $.30 per gallon of ethanol produced. A 15MM GPY facility could benefit from –0- to $4.5 million. Traditionally, state incentives have been based upon gallons of ethanol produced that correlate to bushels delivered by growers.

The State of Maryland has recognized that some regions of the State have not shared equally in the recent prosperity of the state and has taken a number of initiatives to equalize the situation. This could be particularly helpful to a barley to ethanol facility, as the incentives tend to be rural based. DBED has provided a "Statement of Capabilities" for the project that is included as an Appendix. The incentives are highlighted below and described in more detail in the Appendix:

- **One Maryland Economic Development Tax Credits**
- **Maryland Enterprise Zones**
- **Maryland Job Creation Tax Credits**

STATE FUNDING FOR PROJECTS

In theory, almost any project can receive funding support through the various programs administered by DBED's Division of Financing. In practice, there is competition for limited funds in the programs. Some of the programs are highlighted below and described in more detail in the Appendix.

- **Maryland Industrial Financing Authority (MIDFA).**
- **Sunny Day Funds**
- **Maryland Economic Development Assistance Authority (MEDAAF).**

ASSESSMENT FOR INCENTIVES

The MGPUB and other interested ethanol advocacy organizations should initiate preliminary discussions with state officials, lawmakers and financial advisors to evaluate which incentives are most productive to accomplishing specific objectives. Assuming that ethanol production incentives are the most useful mechanism for plant development, discussions about the specific application of such incentives should commence. Production incentives will likely prove to have several advantages. First, such incentives will make the project more attractive from a financing perspective. Production incentives will also make a Maryland-based ethanol plant more competitive relative to plants in the Midwest. Regardless of the incentive level, this mechanism will create a competitive margin that helps make the project competitive compared to existing producers. When coupled with the transportation differential these factors will provide a competitive margin for a new plant located in Maryland relative to existing plants in the Midwest.

PRODUCT INFORMATION - DESCRIPTION

PRIMARY OFFTAKE: MOTOR FUEL GRADE ETHANOL (MFGE)

MFGE is an oxygenated fuel blending component approved by the U.S. Environmental Protection Agency and by virtually all automobile and small engine manufacturers. MFGE offers nation-wide environmental benefits as well as economic benefits for feedstock supplies from agricultural/rural areas of the U.S. The use of MFGE as a motor fuel component in the United States grew from insignificance in the 1970's to approximately 2.0 billion gallons in year 2000. The 70's represented a decade of research, engineering, and experimenting with various technologies and processes, which became cost effective and accepted in the 1980's.

Over the next several years, it is anticipated that the U. S. Environmental Protection Agency will greatly restrict the use of MTBE in gasoline. MFGE, a domestic, renewable, clean-burning fuel is the de facto oxygenate replacement for MTBE.

SECONDARY OFFTAKE: DISTILLER DRIED GRAINS WITH SOLUBLES (DDGS)

Distiller dried grain with solubles (DDGS) is a high protein (27 – 30%) product sold as feed for dairy, cattle & calves and beef cattle. DDGS contains bypass protein that is superior to other protein supplements such as cottonseed and soybean meals. From a dairy and beef cattle feeding perspective, bypass protein is more usable by the animal, thus generating greater lactation in milk cows and weight gains in beef cattle. Also, DDGS can be used as a supplement in chicken, dog, and fish food. The syrup (CDS), when mixed with distillers dried grains can be used as DDGS or it can be sold separately as a feed ration additive. The CDS and wet cake (WDG) can bypass the dryers and be sold as a wet livestock feed, thus reducing the cost of plant operations.

SECONDARY OFFTAKE: CARBON DIOXIDE

The carbon dioxide used now in industry is not normally derived from flue gases. Some process plant the United States have been set up to extract CO_2 from flue gas for EOR (enhanced oil recovery) use, but in most cases the carbon dioxide is produced for the particular process involved, or in the case of the majority of EOR projects the CO_2 is extracted from natural sources. These natural wells can contain up to 97% by volume

carbon dioxide and may be piped hundreds of miles to the oil fields. In addition, carbon dioxide is a by-product gas of many chemical processes including the production of ammonia, hydrogen, substitute natural gas, removal from natural gas reservoirs, fermentation, limestone calcinations and a number of processes using carbon monoxide, all of which are often exploited as a source of CO_2.

Major uses of carbon dioxide – Refrigeration, Beverage Carbonation, Urea, Methanol, and Enhanced Oil Recovery.

OTHER INFORMATION

PLANT SITING

Discussions with the Maryland Department of Business and Economic Development (DBED) with respect to siting centered on the barley to ethanol plant need to be close to the barley resource and have capacity/capability for industrial zoning, natural gas, rail, water and public sewage. DBED believed indicated that many sites were potentially available with these criteria in the State; however, the Eastern shore has some shortcomings in natural gas and rail. DBED also pointed out the advantages of the State's Enterprise Zone Program (described later). In reviewing potential sites on the Eastern Shore, the Enterprise Zone in Hurlock, Dorchester County seemed to meet all the above plant needs and a site review was arranged with the Mayor of Hurlock. With respect to resource transportation, Hurlock is a little southwest of the center of the Delmarva Peninsula.

Hurlock turned out to have at least 4 sites potentially meeting the plant requirements:

Site 1 – The Hurlock Enterprise Zone This site is described by the Zone brochure Hurlock Industrial Park Site Plan that follows. There is potentially a problem, however, in that the Zone Covenants and Restrictions are written for light industry. Either the facility classification would have to fit the light industry category or a variance would have to be approved for the plant to take advantage of the Enterprise Zone benefits.

Site 2 – Adjacent to the Enterprise Zone The Mayor is trying to extend the Zone to include an adjacent property on which a million square foot warehouse has just been built and there is about 35 acres still available. Conceivably, this property could be zoned for heavy industry.

Site 3 – Across Town The Mayor is negotiating to purchase a 100-acre tract that could become a heavy industry industrial park.

Site 4 – Down the Road There is a grain dealer with existing silos and an inactive rail spur about a half-mile down the road from Site 3. He has 75 acres for sale.

All 4 sites are along well-maintained roads that parallel the Maryland and Delaware Railroad and a Chesapeake Utilities 6-inch natural gas pipe with a minimum of 30 pounds pressure. All are flat, water body-free farmland areas that can be hooked into City water and sewage. Electrical service is available from either the Choptank Electric Co-Op or Connective (formerly Delmarva Power) and, for Sites 2 and 3, there is a choice of either.

The purpose of this sites review is to show that attractive sites are available in the State rather than to try to select a site at this point in the project. Accordingly, more detailed site information was not gathered.

Hurlock, like most of the Eastern Shore, is agriculturally based. The Mayor expressed his belief that an agriculturally based new industry in town would be well received by the community as fitting into the kinds of businesses they hope to attract. Even if there are some noise or odor issues associated with the facility, he

feels that the community can tolerate them as being in their best interest as a farming-based community. Current industries include chicken processing and vegetable canning operations. The only negative encountered was the memory a failed ethanol facility in the nearby town of Federalsburg during the oil crisis about 20 years ago. (Note: This should not be an issue as that plant was an inadequate and inefficient operation typical of ethanol plants hastily cobbled together in response to the oil crisis of the time. The currently proposed plant is technically far advanced and designed by a well qualified, specialty engineering firm.)

HULL-LESS BARLEY

Since the international ethanol industry has minimal production experience with hulless barley KATZEN can only speculate as to the expected impact of using this grain as a feedstock for ethanol production . Hull-less varieties of barley reduce the need for design and operational considerations relating to the abrasiveness of hulled varieties. The relative starch content relative to the total solids is consistent with the hulled varieties. It appears that the primary difference is a significant reduction in the fiber content associated with the hull. It should be noted that though there is a reduction in the fiber content and a corresponding increase in the starch there is also a small increase in the concentration of beta-glucan content. Again, this appears to be due to the reduction in the fiber content causing a relative increase in all non-fiber components. KATZEN would expect a reduction in operational problems associated with the abrasive fiber. We would not expect a reduction in fouling related to beta-glucan content. We expect that the only capital reduction associated with substituting hulless barley for hulled barley is a moderate reduction in the size of the DDGS dryer and related material handling and storage systems. KATZEN expects that if one were to factor this into the design there would be, at most, a 2% reduction in the cost of constructing the plant. It should be understood that if one were to design a facility based upon hulless barley then switching to hulled barley would reduce the ethanol production capacity of the plant.

As regards experimental hull-less barley, we will be recommending an alternative consideration of triticale rather than the hull-less barley. We are currently growing a test plot in Presque Isle, Maine with results later this year (2001). We do agree that hull-less is better than hulled barley. Analytical data indicates that triticale offers starch content comparable to hull-less barley or wheat. More importantly triticale offers beta-glucan content similar to wheat.

POULTRY LITTER

Waste streams, such as poultry litter, that are high in lingo-cellulosic content can be considered as an alternative fuel for generating steam for the ethanol plant. Prior to incorporating the use of solid-fuel boilers into financial proformas a number of factors warrant consideration. The factors are:

a. Refuse-fired solid-fuel boilers are specialty items designed for a fuel's specific heat value and gas generally results in reduced combustion efficiency and is likely not cost effective.
b. Because of the issue presented in Item "a" above and since the fuel is not a readily available commercial commodity and the possibility of a supply interruption is significant a traditional-fuel fired standby boiler will be required. This will significantly increase the capital cost of the project.
c. Refuse-fired solid-fuel boilers are more capital intensive than gas or oil fired package boilers. Consider that a gas or oil-fired package boiler for a 15 MM GPY dry mill ethanol plant would have an estimated installed cost of less than $500,000. By contrast a refuse-fired solid-fuel boiler designed to fire chicken litter would have an estimated installed cost in excess of $3.0 million. This cost includes solid fuel receiving, storage and handling systems as well as the gasifier and related steam generation systems.
d. Refuse-fired solid-fuel boilers are more labor intensive than gas or oil fired package boilers.
e. Refuse-fired solids-fuel boilers and their ancillary systems are significantly more maintenance intensive than comparably size gas or oil fired package boilers.

f. Compared to gas or oil fired boilers, refuse-fired solid fuel boilers are considerably more difficult to permit. In most states permitting an ethanol facility based upon a gas or oil fired package boiler will require approximately six months. By contrast solid-fuel boilers can require a year or more to permit.

g. Due to the factors detailed above KATZEN typically recommends that preliminary feasibility studies be based upon conventionally fueled package boilers. If the project works under these criteria then alternate fuels can be considered during the business plan development phase of the project.

Also, there are a number of non-technical issues concerning the use of poultry litter as a fuel. Poultry litter is foul smelling and likely to cause difficulties in siting and/or operating the ethanol facility given current public concerns about NIMBY (Not In My Back Yard). These difficulties may result in delays in timing, added costs, permitting difficulties, and other constraints that may even become barriers to construction. On the other hand, the State is highly desirous of finding a solution to the chicken litter problem and can be expected to provide incentives to solve the problem.

BIO-MASS MATERIAL

From a fuel perspective this was discussed in the item related to utilizing chick liter as a source of energy for generating steam. From a feedstock perspective KATZEN can state that to date there are no biomass technologies that have been successfully demonstrated on a scale sufficient to secure project finance. Note that KATZEN is currently participating in several biomass based ethanol technology development projects.

CO-GENERATION

There is an opportunity to integrate power co-generation into an ethanol project. This can be done in one of two ways. In one case the ethanol plant can be located adjacent to an existing power plant using the power plant's exhaust steam as an energy source. Typically, newer power plants are designed for maximum energy efficiency and produce minimal steam at a pressure that would be of value to an ethanol plant. As well, power plants have been hesitant to enter into these types of ventures since the cost of problems associated with the energy integration far out-weigh any potential benefits. We are not aware of any projects where a new ethanol venture has been able to successfully negotiate such an agreement with an existing power plant. The other option is to build a stand-alone co-generation facility as part of a new ethanol project. KATZEN is currently participating in two such projects. This type of business integration eliminates the potential conflicts that can develop with an "across-the-fence" type arrangement. It will require a though understanding of the local power market which can be quite complex and is subject to substantial change in this era of deregulation.

Two local situations where low cost steam was available at manufacturing complexes (chemical and paper) were investigated. In both cases there were mitigating factors that outweighed potential savings in energy costs.

FRACTIONATE – CEREAL GRAINS

BETA GLUCAN

Based upon KATZEN's preliminary investigation there is no barley based beta-glucan recovery technology available that has been demonstrated on a commercial scale. Because of this we cannot recommend that the subject of beta-glucan recovery be included in the feasibility study. KATZEN has been involved in similar projects were ethanol plants served as a "hub" for new "related" product technologies. These projects are inherently difficult if not impossible to finance. The new product increases the capital demand for the project based upon an often hypothetical undeveloped market. New technology is costly to develop to a commercially viable state. New markets are historically even more difficult to develop and demonstrate to a banker's

satisfaction. These applications are often best implemented as a Phase 2 approach. Once the Phase 1 plant in constructed and operating the new technology can be implemented on a commercial demonstration scale generating product volumes large enough to confirm product quality and confirm preliminary markets. Only then does one develop the business plan and pursue project finance.

EXTRACTION PROCESS

The most advanced extraction process is the "Quick Germ" process of recovering the germ from corn prior to the dry grind ethanol process. This Quick Germ process has been developed by the U.S. Department of Agriculture and the University of Illinois at Urbanna and is described in Cereal Chem. 74(4):462-466 Economics of Germ Pre-separation for dry-grind Ethanol Facilities. A field trial of the process has been initiated on corn. The status of this and all other potential process improvements should be reviewed during the detailed design and engineering phase of the project. From a business perspective and a capital raising perspective, only well proven processes should be incorporated.

REWARD FACTORS FOR THE STATE OF MARYLAND

VALUE ADDED & NEW WEALTH

- Value added agricultural processing for the State of Maryland
- New market for State of Maryland agriculture: ethanol, spent grain, carbon dioxide
- New construction money to the State of Maryland
- New jobs: construction, plant operations, transportation, ripple effect
- Demand for alternative oxygenated fuels in US is high on the East Coast
- Growth industry that reduces US dependence on foreign crude oil is high priority for Bush administration
- Plant and support structure will add to local and State economy
- International market potential for DDGS (Maryland has 3 Foreign Trade Zone, 35 State Enterprise Zones and a Federal Empowerment Zone)
- Location for proposed project – several areas will be offered, such as, Dorchester County, Maryland

LOCAL FACTORS OF VALUE – DORCHESTER COUNTY, MD

(Listed only as a view of values that might be available to an ethanol plant)

- Access to ethanol & DDGS market – rail, barge, and truck
- Strong community support
- County is one of seven jurisdictions offering significant tax credits for capital investments that create jobs
- Diversified economy rooted in high technology, biosciences and services, and revitalized manufacturing and international trade
- Stable and enthusiastic labor force
- High quality workforce paired with a competitive cost of doing business
- Excellent existing site for the proposed plant
- Sufficient hospitals and health care services
- Universities, community and technical colleges
- Recreational facilities and cultural opportunities
- Utilities – diversified mix of power generation sources
- Transportation – Baltimore/Washington Airport (BWI), Port of Baltimore seaport, interstate highways, parkways, railroads, motor freight carriers, bus and parcel services
- The County has 2 State Enterprise Zones – 97 acre Hurlock Industrial Park, and the City of Cambridge