EVALUATING POTENTIAL BIODIESEL MANUFACTURING SITES IN NEW YORK STATE

Interim Report

Prepared for

THE NEW YORK STATE
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7683 - PON 736 - 02

NYSERDA Report 04-22 **June 14, 2006**

NOTICE

ABSTRACT AND KEY WORDS

The evaluation of the feasibility to manufacture biodiesel fuel in the state of New York involves correlation of accumulated information. A Geographical Information System (GIS) overlay method was used to evaluate eight criteria for establishing possible construction sites. The criteria input are ranked and the GIS process identifies the top counties to locate the facility.

A financial model and commercialization plan were developed from the information gathered. Standard accounting and modeling practices were used to generate the balance sheets and cash flow statements. A sensitivity analysis was performed to show the impact of diverse situations on the model.

Key Words: Biodiesel, Manufacturing, New York, Business Plan, Plant Layout

ACKNOWLEDGEMENTS

I would like to thank Energy Consulting & Management Solutions (ECMS), Lee Ackerman; Olver Incorporated, Shawn Veltman; and C. J. Schneider Engineering, Chuck Schneider, Bob Blanford, and Norris Smith for their hard work and support in preparing this study.

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SUMMARY

The study identified an estimated 20% internal rate of return to build a 15-million gallon per year biodiesel plant in the state of New York. A return of this level is not great enough for equity investors, who typically expect a 25% to 30% rate of return. The state of New York should implement legislation to provide incentives, develop an infrastructure to distribute biodiesel product, and mandate usage of biodiesel to create a market.

The US biodiesel industry is an expanding industry that has experienced tremendous growth since 1999. The National Biodiesel Board reports that US sales have increased from about 500,000 gallons in 1999, to more than 75 million gallons in 2005.

The first small-scale commercial biodiesel plant was built by Environmental in 1993 and had a capacity of less than 300,000 gallons per year. Since that time, 65 other plants of varying sizes have been constructed in the US (See **Figure 4.1** in the Local Marketing Identification section of this report). Current individual plant capacities range from 100,000 gallons per year to 12 million gallons per year, with the average plant size being approximately 6-million gallons per year.

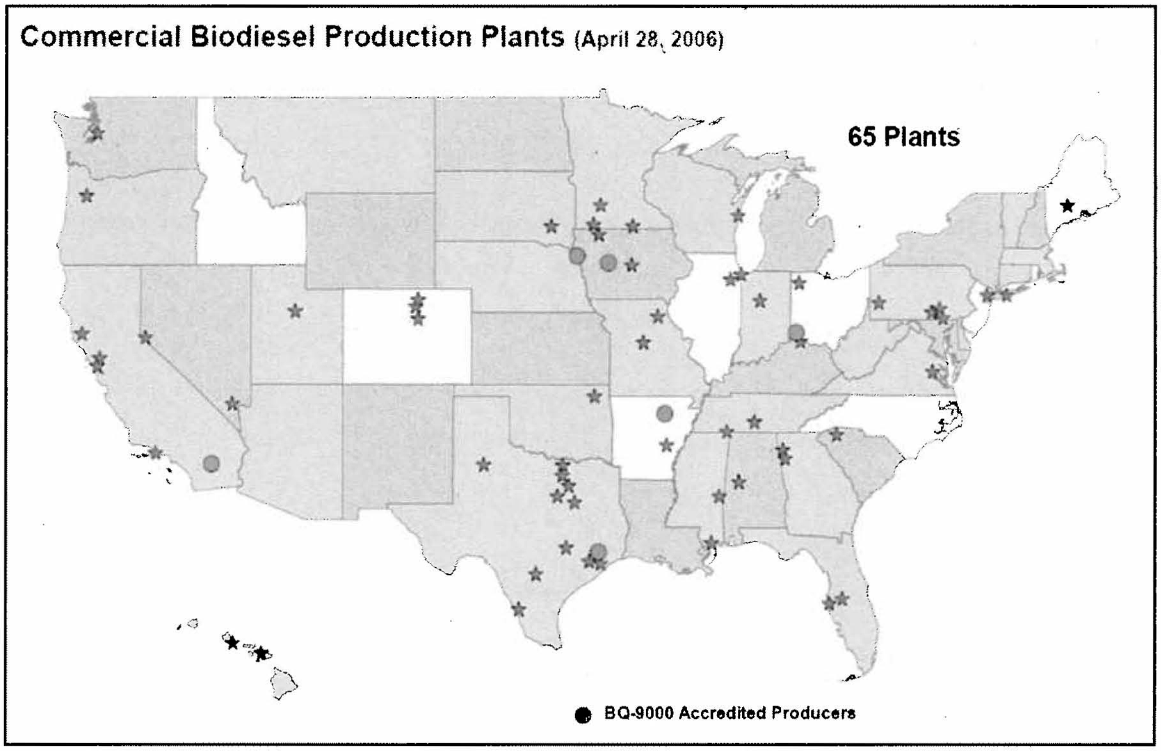


Figure 4.1 Current and Proposed Biodiesel Production Plants

As of February, 2005, there is no known current or planned biodiesel production in New York State. However, the market could potentially be as large as 100-million gallons per year.

With regard to developing, constructing, and operating a biodiesel plant in New York, the following parameters were examined:

- Site Screening
- Feedstock Availability and Cost
- Local Market Identification
- Site-Specific Preliminary Process and Plant Design
- Permitting and Environmental Issues
- Financial Model - Commercialization Plan
- Recommendations

Using Geographic Information System technology (GIS), a number of locations throughout New York State were considered as plant sites on the basis of a variety of factors. A large amount of soybean and waste oil feedstock would have to be transported to the plant and quantities of biodiesel taken away, thus nearness to soybean and waste oil production, cheap transportation, economic incentives, and gas and electricity availability were all factors that were considered in detail. The conclusion was that Albany County and in particular two sites, Port of Albany and Green Island, presented the most ideal conditions for a plant location, mainly due to access to river transportation.

Vegetable oils, animal fat, and recycled fats and oils are the main feedstock sources for biodiesel. While New York State does not produce vegetable oils or animal fats in commercial quantities, they are available from nearby states. Using statistics based on a 1998 report by G. Wiltsee, urban waste grease resources for the New York City metro area were projected and quantified. New York City generates copious quantities of recycled fats and oils, which are the least costly feedstocks; however, reliable sourcing may be an issue. The optimal feedstock composition for a New York biodiesel facility on a cost and quality basis was determined to be:

- Soybean Oil: 50%
- Yellow Grease: 40%
- Brown grease: 10%

The natural market for the plant's output is New York State itself. According to the New York State Procurement Office, historical biodiesel consumption was 1.0 million gallons in 2003, and 1.6 million in 2004. Projected consumption for 2005 is 2.0 million gallons and 3.0 million gallons in 2006. Today, the prime consumers are the federal and state transportation fleets which by law are mandated to use renewable energy sources. Aiding in the expansion are various incentives; chief among them are the Blender's Tax Credit and the Commodity Credit Corporation 850 Program. The Tax Credit is a $1/gallon excise tax credit available through January 1, 2007. This will lower the cost to the end user. The 850 Program provides incentive payments to biodiesel producers. Regarding biodiesel pricing, there has historically been a disparity between biodiesel and diesel prices, where biodiesel has been costlier than diesel (See **Table 4.4** and **Table 4.5** on the following page from the Local Marketing Identification section of this report). This has limited the demand for biodiesel; however, the general onset of higher gas and oil prices is expected to narrow the gap.

Table 4.4 Diesel Fuel Prices

Region	Week of		
	12/8/03	**3/8/04**	**6/14/04**
New England	$1.61	$1.76	$1.81
Central Atlantic	$1.59	$1.74	$1.78
Lower Atlantic	$1.43	$1.58	$1.64
Midwest	$1.45	$1.59	$1.66
Gulf Coast	$1.43	$1.57	$1.64
Rocky Mountain	$1.53	$1.62	$1.88
West Coast	$1.64	$1.85	$2.00
Nationwide Average	**$1.48**	**$1.63**	**$1.71**

Source: US Department of Energy, *Alternative Fuel Data Center: The Alternative Fuel Price Report*

Table 4.5 Biodiesel (B-20) Fuel Prices

Region	Week of		
	12/8/03	**3/8/04**	**6/14/04**
New England	No info	No info	No info
Central Atlantic	$1.84	No info	$2.08
Lower Atlantic	$1.65	$1.69	$1.84
Midwest	$1.55	$1.65	$1.73
Gulf Coast	No info	No info	No info
Rocky Mountain	$1.75	$1.83	$2.11
West Coast	$1.78	$2.21	$2.06
Nationwide Average	**None given**		

Source: US Department of Energy, *Alternative Fuel Data Center: The Alternative Fuel Price Report*

Glycerol and, to a much lesser extent, potassium sulfate are commercially saleable by-products from biodiesel production. The former is used principally in the pharmaceutical and food industries while the latter is used as fertilizer. These represent less than 5% of total projected revenue.

ENERGEA's "Continuous Trans Esterification Reactor" (CTER) technology was chosen due to its proven processing capability, efficiency, and least cost. Since 1997 ENERGEA has been working on the development of a second generation in Biodiesel Technology. ENERGEA has been involved in research in the field of biodiesel for four years. The new CTER biodiesel technology, which is pending patent, was tested successfully in 1999. With its CTER, ENERGEA was successful in optimizing the conversion of biogenic fats and oils, a method known since the thirties. The significant advantage of this technology is the acceleration of the transformation process; within a few minutes high-quality standardized biodiesel is produced from biogenic fats and oils. ENERGEA is an Austrian firm.

Because ENERGEA's system is closed, permitting issues are minimized. The main permit requirement, among many, is the air permit, which is needed prior to construction and can take up to 18 months to acquire. Minor amounts of methanol are emitted from the ENERGEA system and thus need to be accounted for in this permitting process.

A detailed financial projection was created. The following spreadsheet is from the **Appendix 6-A's Financial Plan**:

INCOME STATEMENT	YEAR 2004	YEAR 2005	YEAR 2006	YEAR 2007	YEAR 2008	YEAR 2009	YEAR 2010
Sales							
Biodiesel		$ 8,313,256	$ 33,422,683	$ 33,931,658	$ 33,931,658	$ 33,931,658	$ 33,931,658
Glycerol		$ 344,785	$ 1,379,138	$ 1,379,138	$ 1,379,138	$ 1,379,138	$ 1,379,138
Potassium Sulfate		$ 51,028	$ 205,154	$ 208,278	$ 208,278	$ 208,278	$ 208,278
Total Sales		$ 8,709,069	$ 35,006,975	$ 35,519,074	$ 35,519,074	$ 35,519,074	$ 35,519,074
Other Income							
Federal Incentives			$ 3,000,000				
Total Other Income		$ -	$ 3,000,000	$ -	$ -	$ -	$ -
Total Income		$ 8,709,069	$ 38,006,975	$ 35,519,074	$ 35,519,074	$ 35,519,074	$ 35,519,074
Cost of Sales							
Soybean Degummed Oil		$ 3,614,491	$ 14,531,730	$ 14,753,025	$ 14,753,025	$ 14,753,025	$ 14,753,025
Yellow Grease		$ 1,700,937	$ 6,838,461	$ 6,942,600	$ 6,942,600	$ 6,942,600	$ 6,942,600
Brown Grease		$ 283,489	$ 1,139,743	$ 1,157,100	$ 1,157,100	$ 1,157,100	$ 1,157,100
Methanol		$ 703,960	$ 2,830,205	$ 2,873,305	$ 2,873,305	$ 2,873,305	$ 2,873,305
Potassium Hydroxide KOH		$ 41,656	$ 171,829	$ 187,450	$ 187,450	$ 187,450	$ 187,450
Sulfuric Acid		$ 53,748	$ 216,089	$ 219,379	$ 219,379	$ 219,379	$ 219,379
Nitrogen		$ 118,511	$ 476,464	$ 483,720	$ 483,720	$ 483,720	$ 483,720
Process Water		$ 887	$ 3,566	$ 3,620	$ 3,620	$ 3,620	$ 3,620
Electrical		$ 77,829	$ 312,905	$ 317,670	$ 317,670	$ 317,670	$ 317,670
Natural Gas		$ 180,726	$ 726,591	$ 737,656	$ 737,656	$ 737,656	$ 737,656
Waste Water		$ 2,283	$ 9,180	$ 9,320	$ 9,320	$ 9,320	$ 9,320
Maintenance		$ -	$ 174,769	$ 174,769	$ 174,769	$ 174,769	$ 174,769
Plant Salaries and Benefits		$ 155,601	$ 641,076	$ 660,308	$ 680,118	$ 700,521	$ 721,537
Rolling Stock Equipment Lease		$ 12,500	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000
Depreciation		$ 2,404,634	$ 3,467,271	$ 2,816,256	$ 2,349,386	$ 2,349,386	$ 2,349,386
Total Cost of Sales	$ -	$ 9,351,253	$ 31,589,880	$ 31,386,179	$ 30,939,118	$ 30,959,521	$ 30,980,537
Gross Margin		$ (642,184)	$ 6,417,096	$ 4,132,895	$ 4,579,956	$ 4,559,553	$ 4,538,537
Gross Profit Margin		-7.37%	18.33%	11.64%	12.89%	12.84%	12.78%
General & Administrative Costs							
Taxes and Insurance		$ 43,692	$ 636,021	$ 590,195	$ 534,965	$ 489,636	$ 444,308
Administrative Salaries and Benefits		$ 69,192	$ 285,073	$ 293,625	$ 302,433	$ 311,506	$ 320,852
Office and Administrative Expense		$ 50,000	$ 51,000	$ 52,020	$ 53,060	$ 54,122	$ 55,204
Bank Project Loan Interest Expense		$ 882,853	$ 1,105,196	$ 1,019,721	$ 928,067	$ 829,787	$ 724,402
Amortization-Loan Fees		$ 12,500	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 37,500
Amortization-Start-up Expenses		$ 38,470	$ 153,879	$ 153,879	$ 153,879	$ 153,879	$ 115,409
Total Gen. & Admin. Expenses	$ -	$ 1,096,707	$ 2,281,169	$ 2,159,440	$ 2,022,404	$ 1,888,930	$ 1,697,675
Net Income	$ -	$ (1,738,891)	$ 4,135,927	$ 1,973,455	$ 2,557,552	$ 2,670,623	$ 2,840,863
EBITDA		$ 1,599,566	$ 8,912,273	$ 6,013,312	$ 6,038,884	$ 6,053,675	$ 6,067,560

The internal rate of return is estimated to be approximately 20%; however, there are numerous factors which can put this return and profitability at risk, with the most obvious being feedstock cost and biodiesel sales quantity and pricing. Others risk factors include incentive availability, by-product demand, and capital structure.

Section 1

INTRODUCTION

This report approaches evaluating the feasibility of manufacturing biodiesel fuel in the state of New York. We evaluated the key elements of a basic business plan to manufacture biodiesel fuel at specific locations. In selecting a specific site, we are able to predict the cost of transportation for raw materials from the nearest sources. The sites evaluated had to meet certain basic utility, zoning, and access requirements. Part of the transportation cost evaluation involved determining the availability and the quality of the feedstock required for the conversion process. Any manufacturing feasibility study must include an evaluation of the markets close to the plant site. This influences the type and cost of transportation of finished product to potential customers. Once the conversion process is defined, a preliminary layout of the facility is determined. The facility must be sized to meet the capacity stated in the business plan. Using the process requirements and facility layout, the study then estimates the operating and capital costs for such an operation. The study then pulls all of the evaluations together into a defined financial model to determine commercialization feasibility and risk factors to be considered when presenting a profitable business plan to investors.

The bulk of this report was researched and prepared based on data from 2002 through 2005. In the recent year, the situation regarding biodiesel has changed rapidly. Although the capital costs, fuel prices, and manufacturing incentives have changed, the plant equipment and layout have not changed.

Section 2

SITE SCREENING

PRELIMINARY SCREENING ASSESSMENT

Biodiesel fuel production requires the availability of key ingredients, economical sources of energy, and accessibility to cost-effective transportation. In an effort to identify counties within New York State that could serve as feasible locations for a biodiesel plant, these critical factors were examined and the optimal combination was determined. In an attempt to remove preconceived bias and give empirical weighting to variables, GIS technology was used to create an adjustable model, using data layers from New York State's GIS Clearinghouse and other resources. A powerful aspect of GIS is its ability to formulate new data from existing data. Model inputs were derived from the factors studied and a system of weighting those inputs was developed. Both raster and vector data were collected. In the end, eight different data layers were chosen as inputs for the model. The top three scoring counties as selected by the model were further researched as future plant site locations.

Factors Included In The GIS Model

The eight factors chosen as model inputs for biodiesel plant site selection were each given a ranking from one to ten. The factor rankings were then weighted, and an overall score was determined. The factors that were considered were: site proximity to railroad transportation, soybean production plants, waste oil production plants, and blending sites. Also taken into consideration was the accessibility of roads, natural gas utilities, and electric utilities. Finally, the last factor considered was whether or not the county had environment attainment areas.

Road Accessibility

The biodiesel plant will require large amounts of soybean and waste oil to be transported to the plant and, in turn, biodiesel transported from the plant to the blending sites. The estimated production of the plant (15 million gallons annually), will require over 6.5 million bushels of soybeans. Therefore, the plant must be located in an area where there is cost-effective access to primary transportation routes. For modeling purposes, each primary road was given a one-mile buffer. The area of each buffer was normalized by county area. Each county was then given a ranking from one to ten using natural breaks as a classification scheme. The process was repeated again for a five-mile buffer of each primary road. **Figure 2.1** displays the resultant rankings of each county for the one-mile buffer from a primary road. **Figure 2.2** displays the rankings of each county for the one to five mile buffer from a primary road.

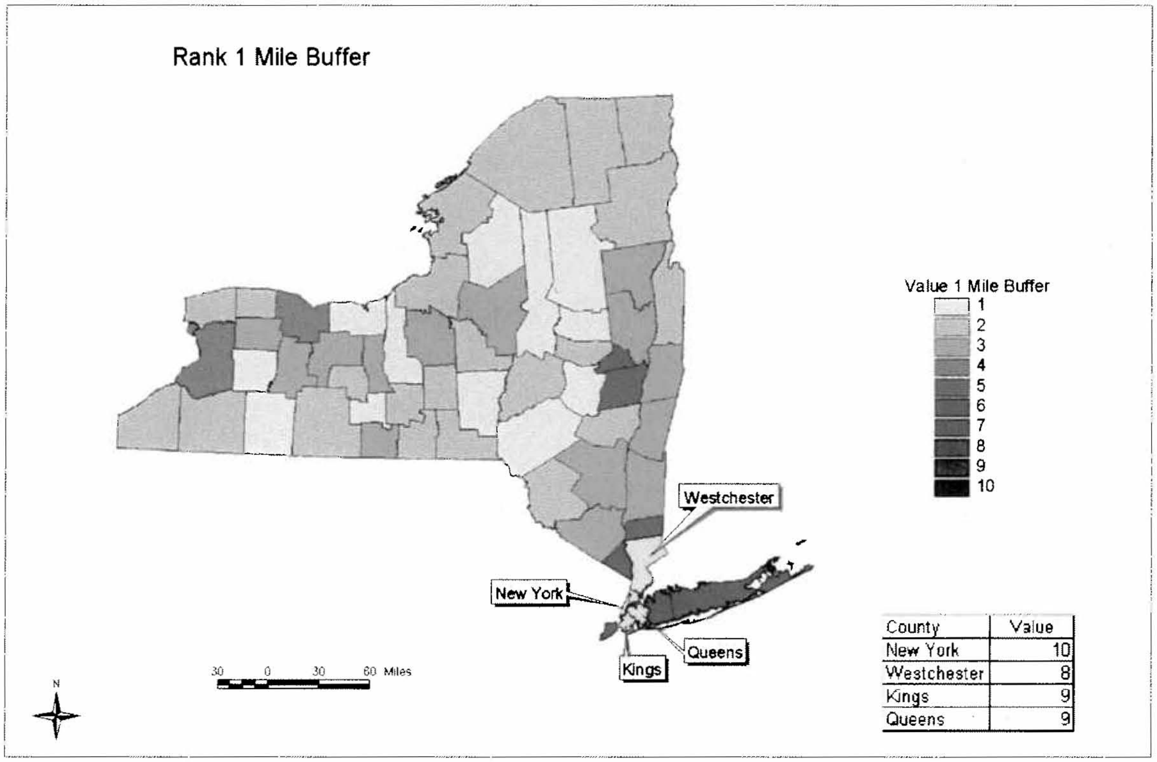


Figure 2.1 The Rankings of Each County for Accessibility Within a Mile of Primary Roads

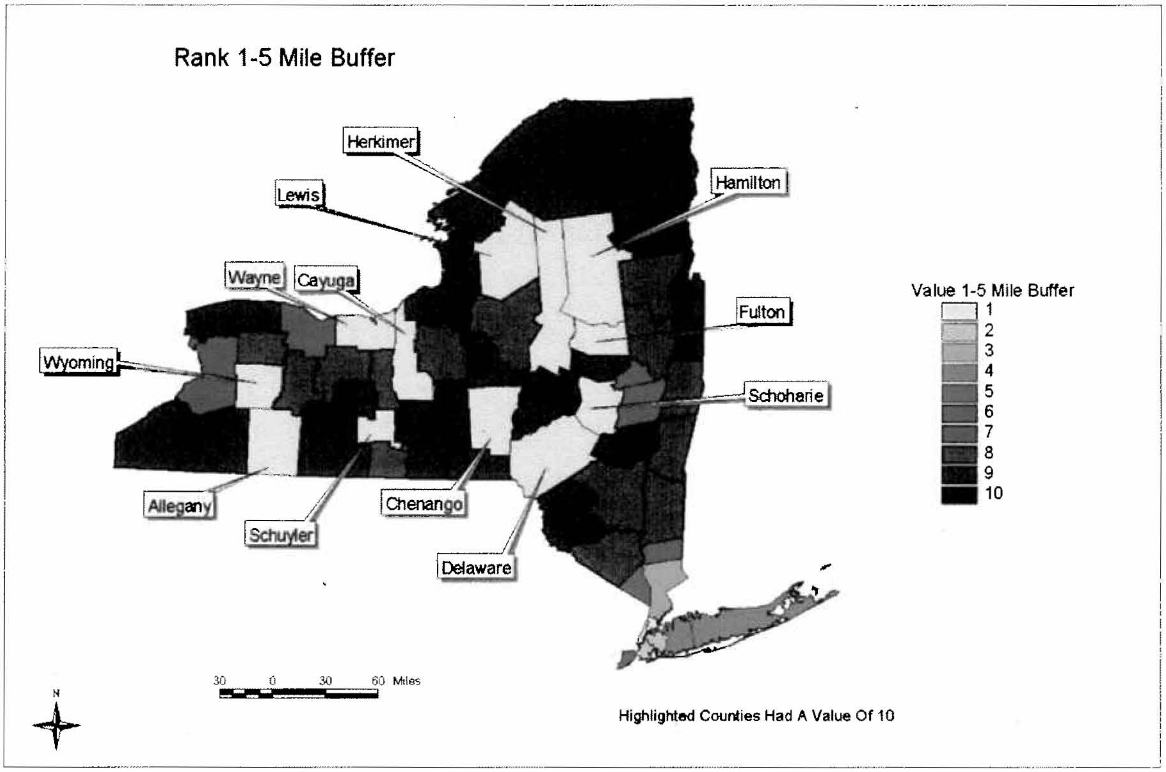


Figure 2.2 The Rankings of Each County for Accessibility Within One to Five Miles of Primary Roads

Railroad Accessibility

Rail transportation can be more cost effective than trucks on conventional roads simply due to economies of scale; trains can carry larger quantities. Also, using trains alleviates some of the environmental and community concerns about truck transportation, such as noise pollution and the risk of spills of hazardous materials. Therefore, the site location of the biodiesel plant should be accessible to the rail network. The existing rail mileage for each county was calculated and then normalized for county area. Each county was then given a ranking from one to ten using natural breaks as a classification scheme. **Figure 2.3** displays the rankings of each county for their accessibility to railroads.

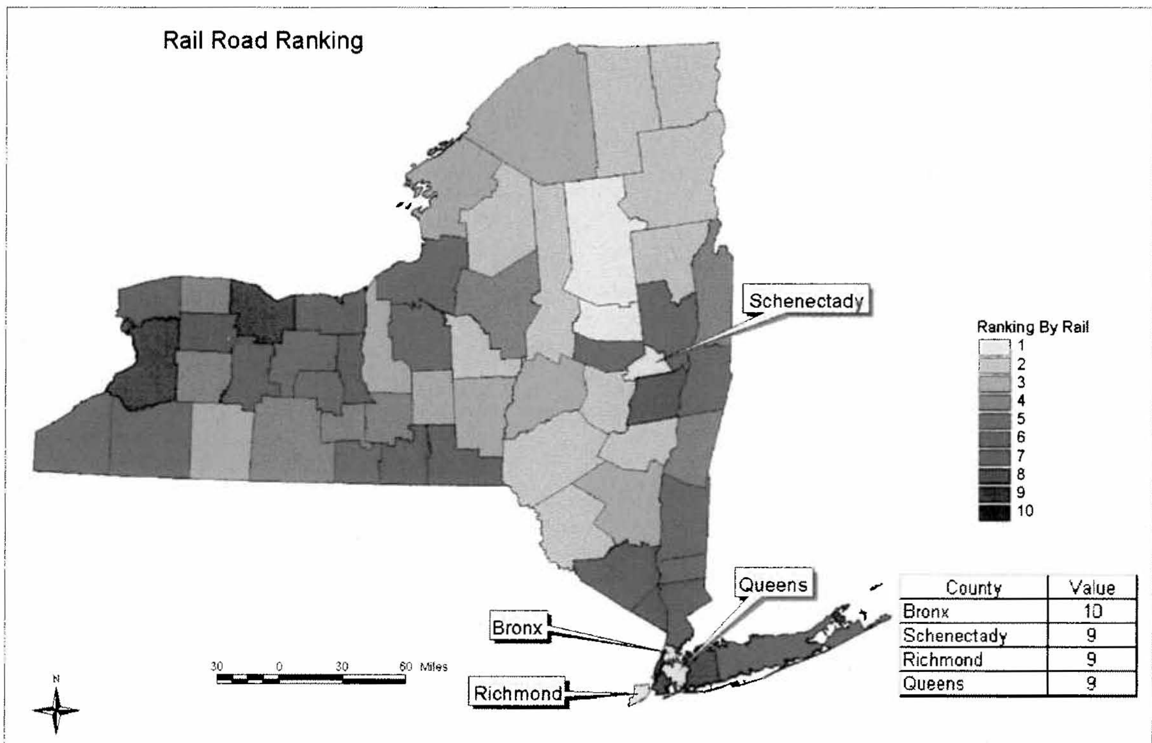
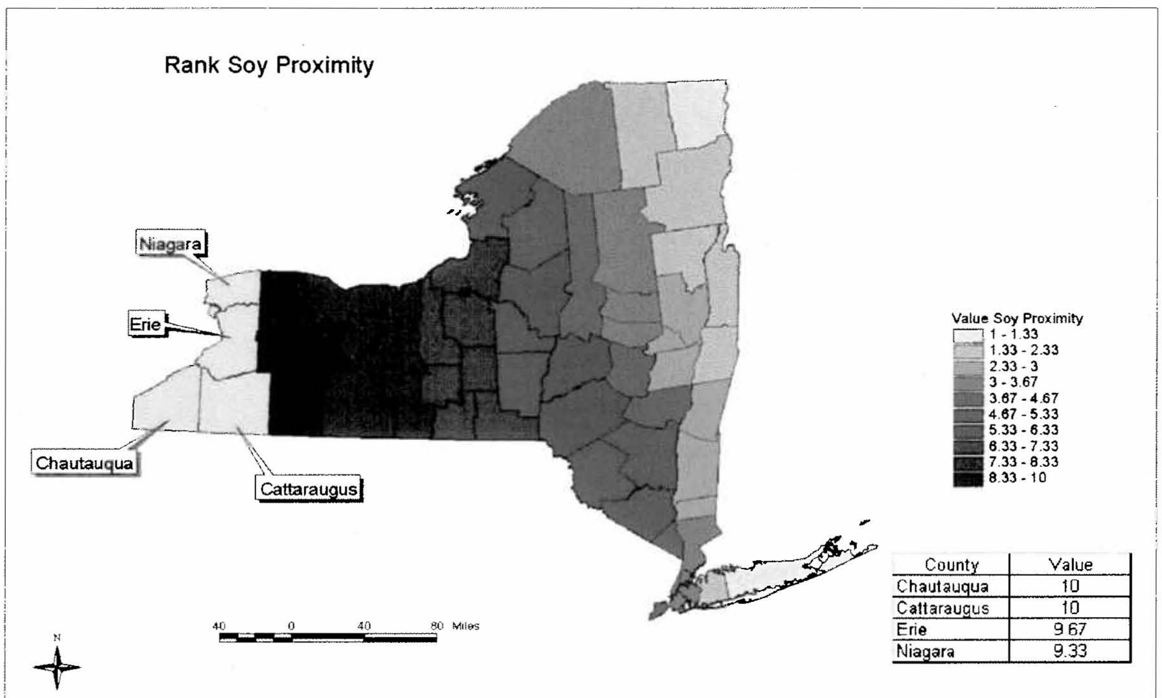


Figure 2.3 The Rankings of Each County for Accessibility to Railroads

Proximity to Soy Production Plants

Soybean oil is one of the primary constituents of the biodiesel fuel. Cost-effective transportation of the soybean oil from the production plant to the biodiesel facility is paramount to site location. The distances of each county centroid to each of the nearest large capacity soy production plants, which are located in Bellevue and New Bremen, Ohio, and Remington, Indiana, were calculated. Each county was then assigned a ranking from one to ten based on the inverse distance to each soy production plant respectively using natural breaks as a classification scheme. The three rankings were averaged together to calculate one overall ranking for proximity to soy production plants. **Figure 2.4** displays the rankings of each county for their proximity to soy production plants.



County	Value
Chautauqua	10
Cattaraugus	10
Erie	9.67
Niagara	9.33

Figure 2.4 The Rankings of Each County for Proximity to Soy Production Plants

Proximity to Waste Oil Production Plants

Another primary constituent of biodiesel fuel is waste oil. The potential site location must afford low-cost transportation of waste oil. The distance (in miles) was calculated from each county centroid to the waste oil production plant in Long Island, New York. Each county then received a ranking from one to ten based on the inverse distance to the production plant using natural breaks as a classification scheme. **Figure 2.5** displays the rankings of each county for their proximity to waste oil production plants.

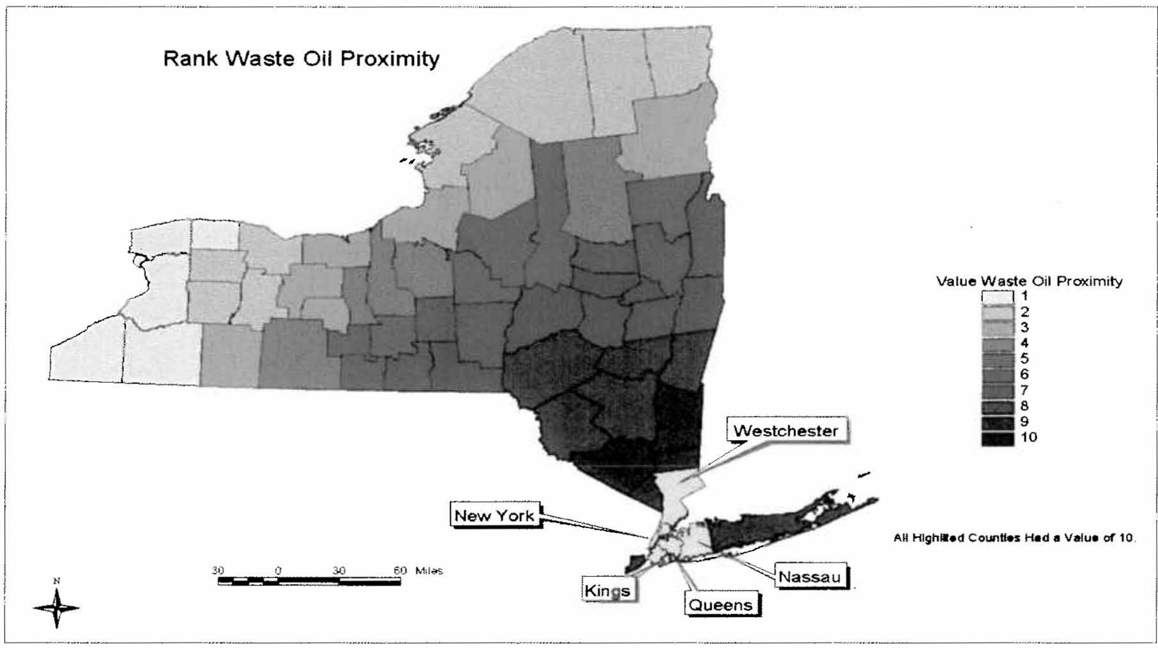


Figure 2.5 The Rankings of Each County for Proximity to Waste Oil Production Plants

Proximity to Blending Sites

The biodiesel fuel manufactured at the plant will need to be transported to a blending site facility where it is added to petroleum diesel fuel. Several blending sites in the state of New York exist, but the biodiesel site should be located in an area with low-cost transportation to these blending sites. The distance (in miles) was calculated from each county centroid to the blending sites in Long Island, Buffalo, Syracuse, Albany, and Tarrytown in New York. Each county was then given a ranking from one to ten based on the inverse distance to any blending site using natural breaks as a classification scheme. **Figure 2.6** displays the rankings of each county for their proximity to blending sites.

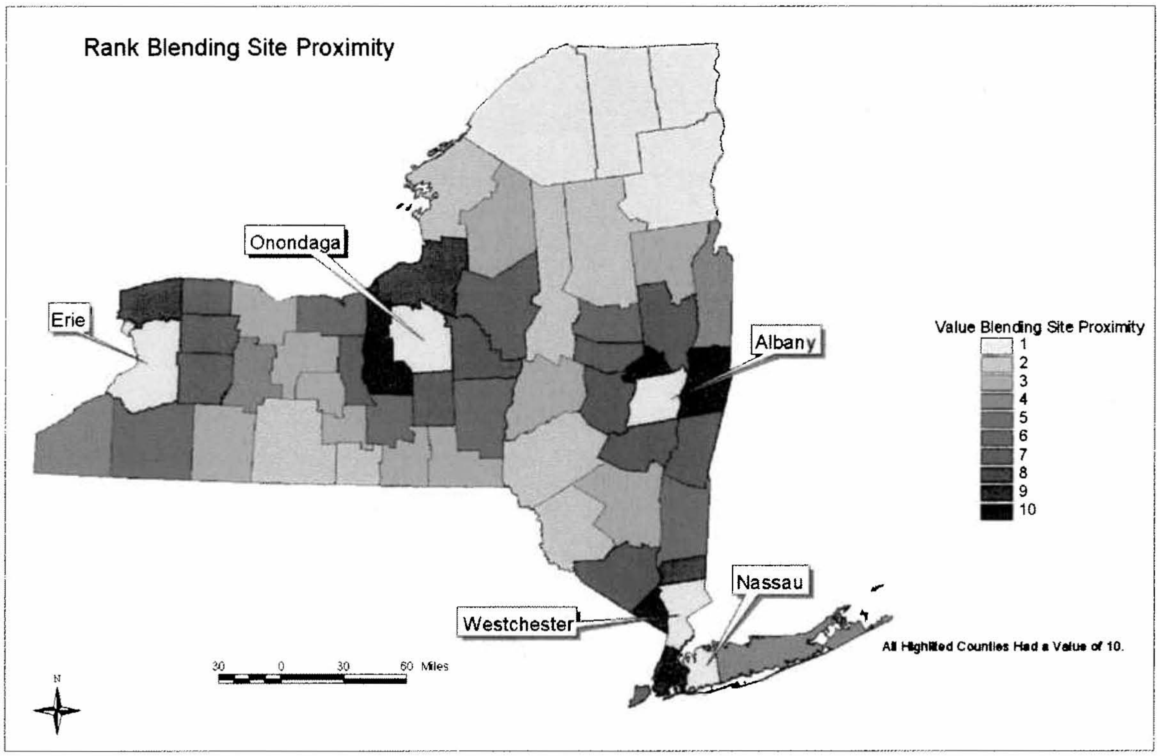


Figure 2.6 The Rankings of Each County for Proximity to Blending Sites.

Environmental Attainment Areas

The manufacturing of biodiesel fuel produces certain emissions and waste products. Due to existing air pollution, a number of areas in the State of New York are listed as non-attainment by the EPA and have stricter air emissions regulations. The biodiesel plant should be located outside these areas in order to reduce the cost of pre-treating and removing particulates from the air. Counties or counties that had cities listed as non-attainment by the EPA, as of August 27, 2003, were assigned a ranking of five. Those that were in attainment received a ranking of ten. **Figure 2.7** displays the rankings of each county for their environmental attainment.

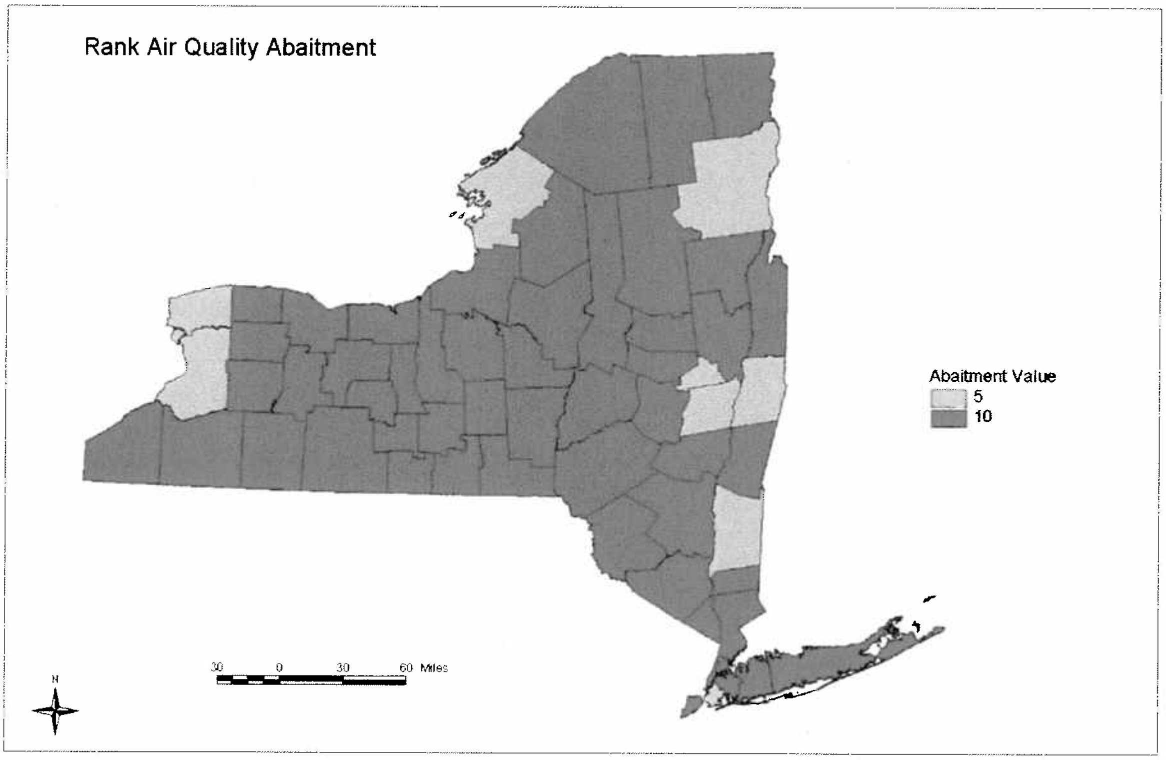
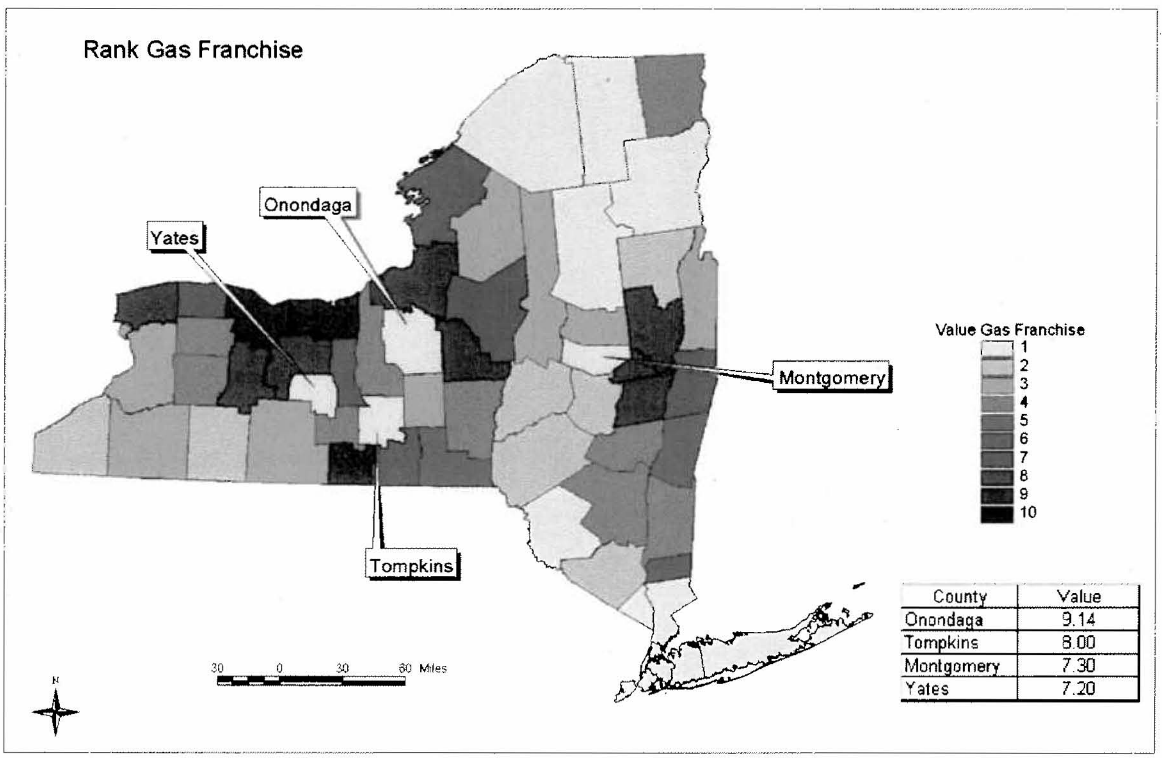


Figure 2.7 The Rankings of Each County for Environmental Attainment Values

Natural Gas Accessibility

Natural gas is necessary to create the steam used in the biodiesel production process. Low-cost, reliable natural gas service is integral to successful biodiesel production. Using service area as a criterion, the top five franchises for natural gas were chosen. Based upon the New York State Public Service Commission's records for 2003 January billings by gas franchises, the franchises were ranked one to five corresponding with the lowest total cost for Industrial customers. Since franchise areas cross county boundaries, the area within a county comprised by each franchise was calculated. This calculated area was used as a percentage to create a weighting factor, which was then multiplied by the franchise's rank. The franchise values within each county were added together to obtain a final franchise value for each county. To standardize rankings with the other data layers, the final values were multiplied by two and used in the relative weighting factors further explained on Page 2-11. **Figure 2.8** displays the rankings of each county for their accessibility to natural gas.



County	Value
Onondaga	9.14
Tompkins	8.00
Montgomery	7.30
Yates	7.20

Figure 2.8 The Rankings of Each County for Gas Franchises (x1)

Electric Accessibility

Electricity is used to power many of the processes in the biodiesel production process, which is why affordable electricity is necessary. The top six franchises based upon service area covered were chosen for electric providers. Using the New York State Public Service Commission's records for 2003 January billings by electric franchises, the franchises were ranked one to six based upon lowest total cost for Industrial customers. As was the case with gas, franchise areas cross county boundaries. Therefore, the area each franchise comprised within a county was calculated, and this calculated area was used as a percentage to create a weighting factor. This factor was then multiplied by the franchise's rank. The franchise values within each county were added together to obtain a final franchise value for each county. To standardize rankings with the other data layers, the final values were multiplied by one and two thirds. **Figure 2.9** displays the rankings of each county for their electric franchises.

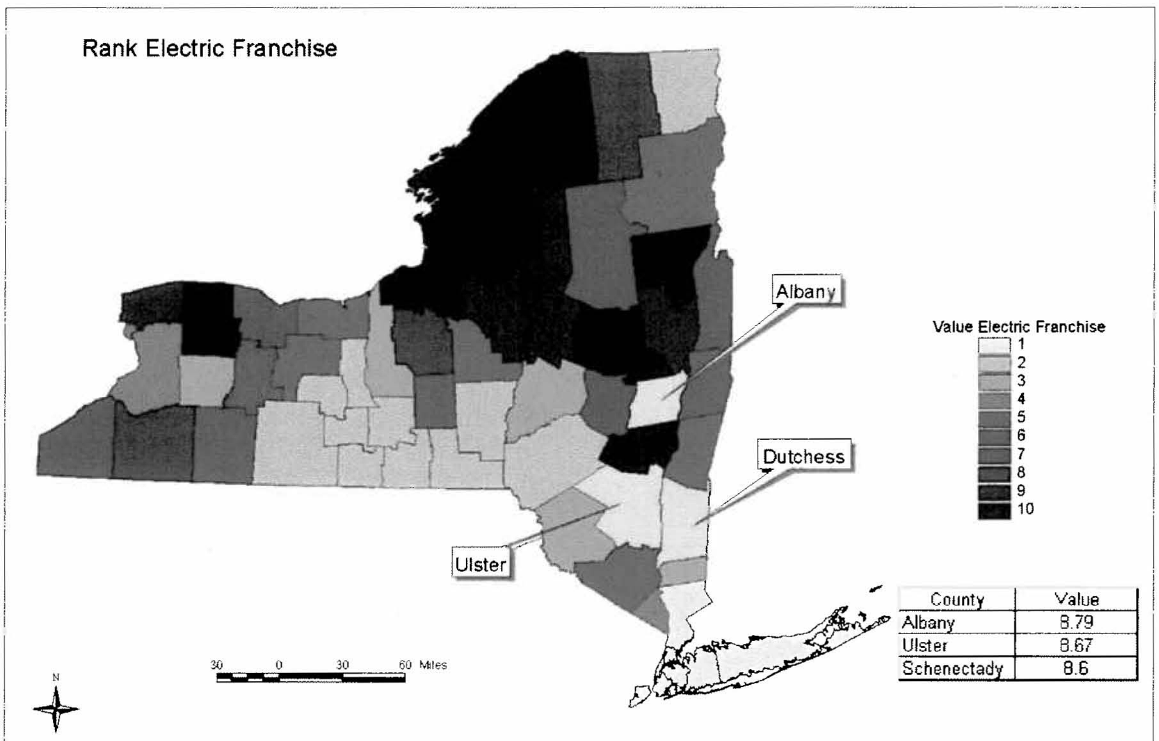


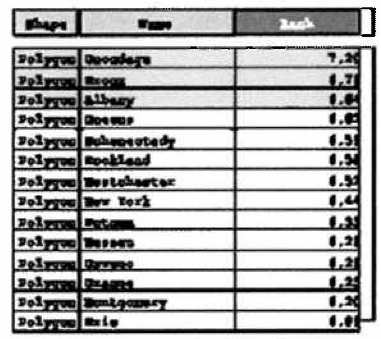
Figure 2.9 The Rankings of Each County for Electric Franchises

Weights Given To Factors

Each factor was given a weight based on the relative importance of that factor to the plant site. **Table 2.1** details the weight of each factor. For each county, the weighted individual factors were added together to obtain an overall county ranking. The three top ranking counties were chosen for further review. **Figure 2.10** displays the overall rankings of each county with the top three highlighted and labeled.

Table 2.1 Weights given to Factors used for Site Selection

Factor	Weight
Road Accessibility (1 mile)	.08
Road Accessibility (1-5 miles)	0.02
Rail Accessibility	0.10
Proximity to Soy Production Plants	0.15
Proximity to Waste Oil Production Plants	0.15
Proximity to Blending Sites	0.20
Natural Gas Accessibility	0.10
Electric Accessibility	0.10
Environmental Attainment Areas	0.10
TOTAL	1.00



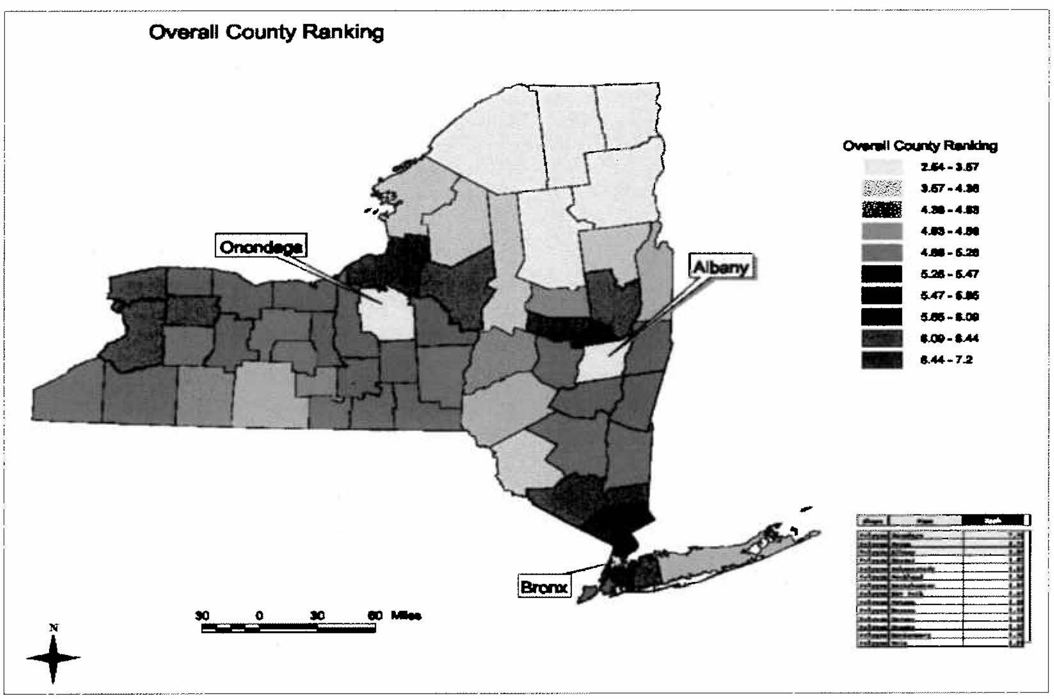


Figure 2.10 The Overall Rankings of Each County for Suitability for Biodiesel Plant

REFINED SITE SEARCH

The three most suitable counties in New York State for location of a biodiesel production facility, as identified by the GIS Study, are: Onondaga with a score of 7.63; Bronx at 6.70; and Albany, which scored 6.66. The Economic Development Offices of each county were contacted and both Onondaga and Albany counties replied with suggested sites and other data. The Bronx Borough Presidents Office, however, did not respond to a letter sent describing the project.

Potential Sites

The Business Development Office and the Industrial Development Agency at Syracuse, New York, recommended two (2) sites for the biodiesel project:

1. Morgan Road (CYW-83) – The Morgan Road Business Park in the North Syracuse area; and
2. Radisson/Sixty Road (CYW-98) – NE side of the Baldwinville Industrial Park NW of Syracuse.

The Albany County Chamber of Commerce – Albany County Partnership presented a number of options for an industrial site proposed. The following are three (3) options recommended for further examination:

1. Port of Albany – Albany, New York;
2. Bethlehem and Selkirk Yard Industrial Sites; and
3. Albany County Empire Zone – Green Island, New York.

The following **Table 2.2** compares critical site selection factors of the above selected sites:

Table 2.2 Critical Site Selection Factors for Selected Site

Site Factors	Morgan Road	Sixty Road	Port of Albany	Bethlehem/ Selkirk	Green Island
Primary Road Accessibility	1.53 Miles	1.47 Miles	1 Miles	1 Miles	1 Miles
Interstate Accessibility	4.49 Miles	5.41 Miles	1 Miles	8 Miles	1 Miles
Rail:					
CSX Service	Yes	Yes	Yes	Yes	Yes
Short Line			Via Short Line		
Switch Change			$120/Car		
Water Transportation:	No	No	Yes	No	Site is on the water can be included in project
Barge			Yes		
Ship			Yes		
Proximity to Soy Oil	410 Miles	410 Miles	545 Miles	553 Miles	545 Miles
Proximity to Waste Oil	250-310 Miles	250-310 Miles	150-250 Miles	150-250 Miles	150-250 Miles
Proximity to Blending	250-310 Miles	250-310 Miles	0-250 Miles	0-250 Miles	0-250 Miles
Natural Gas	National Grid	National Grid	National Grid	National Grid	Green Island
				8 & 12" Lines	Authority
Power	National Grid	National Grid	National Grid	National Grid	National Grid
				69 kV	
Water	Yes — County	Yes - County	Yes - City	Yes — Municipal	Yes - City
				16" Lines	
Waste Water Service	Yes — County	Yes - City	Yes - City	No — Onsite Required	Yes - City
Empire Zone	No	No	No	No	Yes
Environmental Attainment Area	Yes	Yes	No	No	No
Land Cost Estimate	$45,000/Acre	$25,000/Acre	Lease Only	$60,000/Acre	
Industrial Zoning	Yes	Yes	Yes	Yes	Yes

Local Incentives

Local incentive packages are comparable for all five sites considered, with the exception of Green Island and Port of Albany. Port of Albany is a private company offering and would require further negotiations with the owner and local government. Green Island is an Empire Zone, and the Empire Zone Incentive Package is reportedly one of the best in the country, offering the following benefits:

- NYS Wage Tax Credit
- NYS Investment Tax Credit
- New Business Refund
- NYS Sales Tax Credit
- Property Tax Abatement
- Utility Rate Reduction
- Zone Capital Tax Credits
- New York S2CC Loans
- QEZE Benefits

Local Utilities

Utilities at the sites are comparable with National Grid providing natural gas and power to all the sites except Green Island, which is provided natural gas by the Green Island Authority. Water and wastewater is provided by the local municipals except the Selkirk site, which would require on-site waste water processing.

Local Transportation

Rail Transportation. All the sites considered in the refined search are serviced by CSX Transportation Inc., except the Port of Albany, which is serviced by Short Line to Conrail and the C.P. Switch Change at the Port of Albany at a cost of $120 per car. The Selkirk Industrial Area sites are close or adjacent to the CSX Selkirk yard. Actual freight rates would be developed through a negotiated process that would include specific factors, such as annual tonnage, number of cars per shipment, distance, switching, and service requirements.

Water Transportation. The Syracuse sites do not have direct access to barge service, with the closest port being Port of Oswego located 35 miles North of Syracuse. Baldwinsville is located on the Seneca River and is part of the New York State Barge Canal System, which includes the Oswego Canal. Commercial use of the canal system is increasing as the New York Canal Corporation makes improvements to the system. Commercial tonnage on the canal system was 11,982 tons in 2004, up 37% from the 8,711 ton level in 2003. A biodiesel facility in the Syracuse area could benefit from low-cost water transportation in the future as improvements on the system are made.

Albany is located on the Hudson River, 124 nautical miles north of New York City, and has access to New York City via the Hudson River, the New York State Barge Canal System, and the St. Lawrence Seaway via the Champlain Canal. Specifically, the Port of Albany is an important transportation hub for New York State and can accommodate ocean-going ships, as well as barge traffic. It is a full-service facility that includes 18-million gallon capacity bulk liquid storage. As to the Albany County Empire Zone site at Green Island, New York, it is located at the confluence of the Mohawk and Hudson rivers. Green Island is a waterfront development site that could be developed to accommodate barge shipments of raw materials and biodiesel. To this end, Green Island Development plans include over $3 million to be invested in water access infrastructure improvements.

Road Transportation. The Syracuse sites are approximately five miles from interstate access. The Port of Albany is adjacent to Interstate 787, as is the Green Island site. The Selkirk sites are eight miles south of Interstate 87 via State Route 396.

Land Costs

The Syracuse site costs are $25,000 to $45,000 per acre. In Port of Albany, land costs are set by a negotiated lease with the current landholder. The Selkirk area sites are approximately $60,000 per acre. The cost of acreage in Green Island would also be determined by a negotiated agreement via the Albany County Economic Development.

FINAL SITE RECOMMENDATIONS

Of the three counties initially identified by the GIS Study, two were examined in greater detail. Five sites within those counties were studied; and based on the results of this refined search, two sites warrant further consideration as the location for a biodiesel facility. Both of these sites, Port of Albany and Green Island, are located in the county of Albany.

Albany County is recommended as the most advantageous location for a New York State biodiesel facility. Raw material costs account for approximately 80% of the production cost of biodiesel. The plant is to use a large percent of waste oil feedstock from New York City; Newark, New Jersey; and the Boston area. Syracuse is closer to the soy oil feedstock but is farther from the major biodiesel markets. Albany will have slightly higher rail cost from the Midwest; but those costs should be more than offset by the lower transportation costs of B-100 (pure biodiesel) that ships by truck to eastern blenders. The Albany County sites offer the opportunity to lower both feedstock and B-100 transportation costs to the New York City/New Jersey area by the use of existing waterways and cost-effective transportation would provide a competitive advantage for the plant. Albany offers multiple areas for industrial development.[1]

Port of Albany

As stated previously, the Port of Albany is located 124 nautical miles north of New York Harbor, on the Upper Hudson River, which feeds into New York State's extensive canal system. Increased state interest in revitalizing the Erie and Champlain canal systems would suggest the potential for moving commercial products via water. The Erie Canal runs from Albany to Oswego and Buffalo, connecting the Port of Albany with the Great Lakes. Additionally, the Champlain Canal runs from Albany to Lake Champlain in Vermont. Deep water facilities are located on both the Albany (west) and Rensselaer (east) sides of the Hudson River.

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[1]Paul Oliver, Albany County Partnership, Albany, New York, February 2005; Patricia Byrne, CSX Transportation, Selkirk, New York, February 2005; and Bill Welch, Empire Harbor Marine, Albany, New York, February 2005.

The Hudson River is a navigable, year-round waterway with a draft of 32 feet. The port will accommodate ships with overall lengths of up to 700 feet, with a maximum beam of 110 feet, and a maximum air draft of 135 feet. Wharf length on the Albany side is 4,200 feet, and on the Rensselaer side, it is 1,100 feet. The Port has heavy-lift, on-dock rail capability and a 225-ton American Crawler crane.

An extensive inland transportation network is one of Albany's greatest assets and makes the capital region a superb distribution center. The Port has immediate access to an interstate highway system (the New York State Thruway and I-787), and a 20-mile standard gauge switching railroad, which connects to the Conrail and CP Rail via Albany Port Railroad Corporation. Both Conrail and CP Rail have major classification yards in close proximity to the port, assuring adequate car supply and timely service.

Both electric power and gas are supplied by National Grid. The Port is hooked up to municipal water and sewer services. This location would provide the ability to bring both yellow and brown greases in by water from the New York City/Newark metropolitan areas, and to rail in soybean oil from the nearest major processing facility in Ohio. It also affords a central location from which to distribute the biodiesel produced at the facility.

Green Island

The Village of Green Island was added to the Albany County Empire Zone in March 2001. It includes 189.5 acres of industrial-zoned property. The property is located at the confluence of the Mohawk and Hudson rivers. River frontage is available and the majority of the property has never been developed. Green Island was once home to thousands of industrial and manufacturing jobs and is a community that is actively pursuing a business-oriented renaissance. The Green Island Zone provides a variety of economic development opportunities that include waterfront development and redevelopment of vacant industrial facilities, as well as green space for the construction of new facilities. In addition, the Village of Green Island has secured funding for an industrial access road from Interstate 787 to the IDA-owned Ford Plant and more than $3 million for infrastructure, construction, and improvements. Green Island has abundant electricity available at rates that are less than half the cost of local independent operating utilities. This clearly gives Green Island based businesses more than a competitive edge in the market place. The site has already attracted significant economic development interest.[2]

Site Information[3]

Location	Interstate 787 North, Green Island, New York
Acres in EZ	189.5
Available acreage	160+
Available Buildings (for lease or sale)	3
Existing Businesses	Research and development, automotive part manufacturing
Previous Business Activities	Former Ford Motor plant and other manufacturing uses
Topography	90% Level, 10% moderately sloped
Electric	Green Island Power Authority
Natural Gas	National Grid
Rail	CSX
Water/Sewer	Municipal water and sewer; storm drainage system and basins
Telecommunication	T-1 line and fiber line provided by Verizon
Zoning	Industrial
Distance to highway	Adjacent to NYS Interstate 787
Distance to airport	Approximately 7 miles
Distance to Universities	Within 15 minutes of University of Albany, Siena, RPI, Hudson Valley Community College, Russell Sage, Union College and Saint Rose
Incentives	Empire Zone, Energy costs significantly below market rates through the Green Island Power Authority, County and Village IDA incentives
Additional	Waterfront access, over $3 million to be invested in local infrastructure and construction and improvements

[2]John Brown, Director of Community Development, Green Island Community Development, Green Island, New York, July 2005.

[3]Ibid.

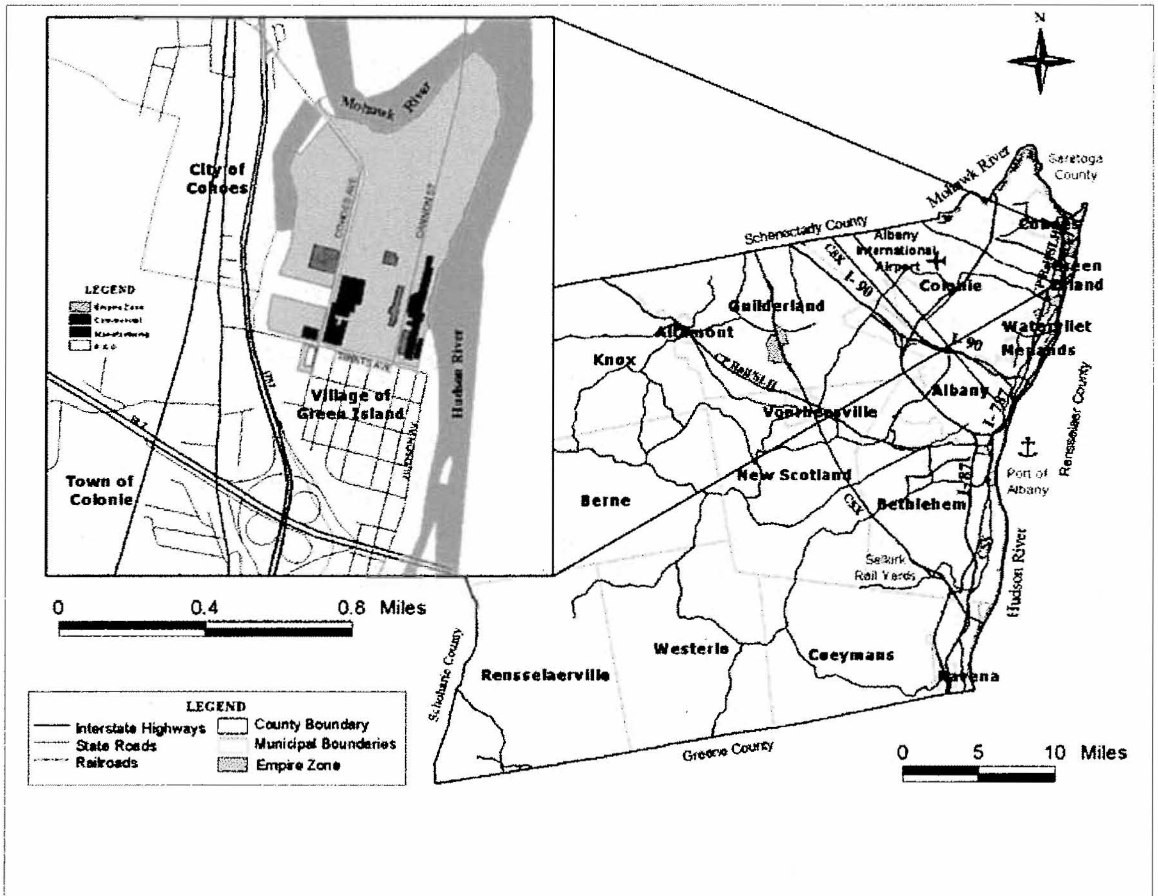

Figure 2.11 Albany County Empire Zone; Green Island, New York

Empire Zone Program. A business could qualify to become tax-free if it expands in, or relocates to, the Albany Empire Zone. Certified businesses located within the Albany Empire Zone are eligible to receive significant tax credits, benefits, and special incentives to encourage economic development, business investment, and job creation.

Sales Tax Exemptions: Qualified Empire Zone Enterprises (QEZEs) are granted a 10-year exemption from State sales tax on purchases of goods and services (including utility services) used predominantly in an Empire Zone (EZ) (effective March 1, 2001).

Credit for Real Property Taxes: QEZE are allowed a refundable credit against business or income tax equal to a percentage of real property taxes paid in the zone. The real property tax credit may reduce the QEZE's tax liability below the alternative minimum, or the fixed dollar minimum to zero. Excess credits may be returned to the QEZE as a cash refund in the year they were earned (effective for taxable years beginning on or after January 1, 2001).

Tax Reduction Credit. QEZE are allowed a credit against business or income tax equal to a percentage of taxes attributable to the zone enterprise (effective taxable years beginning on or after January 1, 2001).

EZ Wage Tax Credit. This credit is available for up to five consecutive years for companies hiring full-time employees in newly created jobs. For employees in special targeted groups, this credit equals $3,000 per year, with a credit of $1,500 per year effective 1/1/2001, for all other new hires.

EZ Investment Tax and Employment Incentive Credits. Businesses that create new jobs and make new investments in production, property, and equipment may qualify for tax credits of up to 19% of the company's eligible investment. Zone-certified businesses are eligible for a 10% tax credit on the purchase of any property or equipment utilized for manufacturing, research and development, or agri-business purposes. The business is eligible for an additional 30% tax credit if they invest and create employment. The Employment Incentive Credit is 30% of the Investment Tax Credit (ITC).

New Business Refund. Businesses new to New York State are entitled to a 50% cash refund of unused EZ-WTC and ITC amounts. Other businesses may carry forward unused credits indefinitely.

Utility Rate Savings. Special reduced electric and gas rates are available through investor-owned utilities in New York State. Businesses that locate or expand their operations in an EZ can receive significantly reduced rates. For example, Verizon offers a 5% reduction on intrastate calls. National Grid offers rate reductions for transmission costs. Certified businesses are eligible for rate reductions due to increases in annual energy usage of at least 25% or 100 kilowatts. Other energy providers offer competitive rates to Zone companies.

Zone Capital Credit. A 25% tax credit against personal or corporate income tax is available when contributing or purchasing shares in a zone capital corporation; making a direct equity investment in a certified zone business; or for contributions to approved community development projects within an EZ.

Sales Tax Refund or Credit. Purchases of building materials to be used for commercial or industrial real property located in an EZ are eligible for a refund or credit of New York State sales taxes. A similar refund or credit of local sales tax is also available from each EZ city.

Real Property Tax Abatement. EZ offers tax abatements from an increased assessment, with the abatement value based on improvements to real property for up to 10 years. The tax abatement is 100% for the first seven years of the program and is then phased out over the last three years (from 75% to 50% to 25%) for County, Municipality, and School District taxes.

Statewide Zone Capital Corporation of New York (SZCC) Loans. Zone-certified businesses can apply for below-market interest rate loans for working capital, equipment and real estate financing. Existing and new businesses can apply, even if they do not meet the requirements for traditional financing.

Section 3

FEEDSTOCK AVAILABILITY AND COST

Fat or oil used in the production of biodiesel fuel is the most important input in the process. Primary sources of feedstock for biodiesel include vegetable oils, all of the animal fats, and recycled fats and oils. This section will identify and quantify the availability of various feedstocks, as well as the impact their use would have on a potential biodiesel production facility located in the state of New York.

VEGETABLE – OILSEEDS

Vegetable oils are produced during the processing of major oilseed crops. Soybeans and palm are the largest vegetable oil sources worldwide. Other major sources of vegetable are sunflower seed, cottonseed, peanuts, rapeseed, and olive crops. The soybean is the leading source in the United States.[4]

World oilseed production in the 2002-2003 crop year was 317.89 million metric tons. World vegetable-oil production reached 91.79 million metric tons in the 2002-2003 crop year. Soybean oil and palm oil comprised 60% of the total world vegetable-oil production (See **Tables 3.1** and **3.2** on the following page).[5]

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[4]Foreign Agricultural Service USDA, *Oil Crop Situation & Outlook Yearbook Summary*, p. 2.

[5]Ibid, p. 68.

Table 3.1 World Oilseed Production, 1995/96 to Date

Item	1995/96	1996/97	1997/98	1998/99	1999/00	2000/01	2001/02	2002/03
	(Production in Million Metric Tons)							
Soybeans	124.9	132.22	158.07	159.82	159.9	175.1	183.78	184.49
Cottonseed	35.15	33.61	34.35	32.62	32.93	33.53	36.61	33.37
Peanuts	27.47	28.96	27.29	29.77	28.99	31.12	33.11	31.84
Sunflower seed	25.72	23.8	23.21	26.63	27.22	23.29	21.25	23.33
Rapeseed	34.44	31.53	33.23	35.89	42.47	37.52	35.87	32.17
Copra	5.13	6.05	5.33	4.38	5.46	5.9	5.26	5.3
Palm Kernel	4.87	5.21	5.05	5.62	6.41	6.91	7.24	7.4
Total	257.67	261.38	286.53	294.72	303.37	313.36	323.1	317.89

Source: Foreign Agricultural Service, USDA, *Oil Crop Situation & Outlook Yearbook*, p. 68

Table 3.2 World Vegetable Oils Production, 1995/96 to Date

Item	1995/96	1996/97	1997/98	1998/99	1999/00	2000/01	2001/02	2002/03
	(Production in Million Metric Tons)							
Soybeans	20.17	20.53	22.57	24.65	24.74	26.8	28.72	29.85
Palm	16.26	17.64	16.97	19.25	21.8	23.93	24.88	25.37
Sunflower seed	9.01	8.61	8.29	9.18	9.63	8.41	7.57	8.32
Rapeseed	11.24	10.52	11.43	11.81	13.64	12.96	12.2	11.41
Cottonseed	4.15	3.7	3.7	3.57	3.57	3.52	3.82	3.56
Peanut	4.15	4.38	4.18	4.44	4.15	4.3	4.75	4.51
Coconut	3.16	3.69	3.29	2.71	3.34	3.63	3.26	3.23
Olive	1.45	2.46	2.53	2.5	2.37	2.48	2.53	2.35
Palm Kernel	2.1	2.22	2.2	2.43	2.75	2.95	3.11	3.17
Total	73.08	73.76	75.16	80.54	85.97	88.98	90.85	91.79

Source: Foreign Agricultural Service, USDA, *Oil Crop Situation & Outlook Yearbook/OCS-2002*, October 2002, p. 68

Soybean Oil Production

The predominant oilseed crop grown in the United States is soybeans. The crop year 2001 produced a US record yield of 2,891-million bushels. The US exported 1,063-million bushels in the 2001-2002 crop year. In 2001-2002, the United States produced 3,850-million pounds of edible oils, of which 2,873-million pounds were from soybeans (See **Figures 3.1** and **3.2** below).[6]

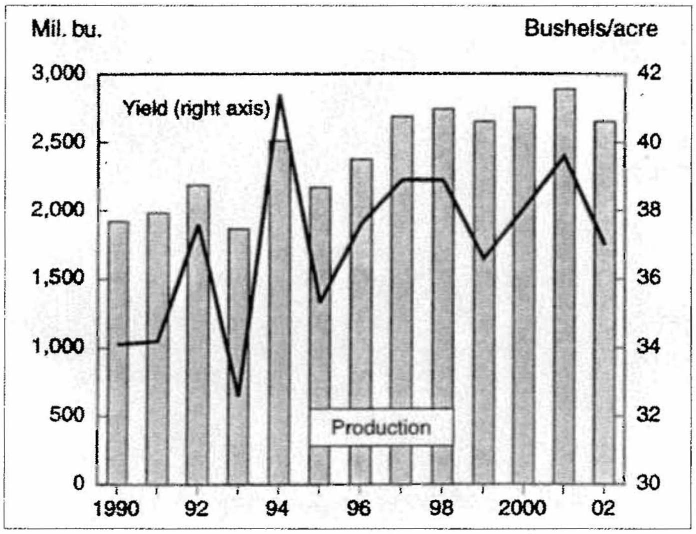


Figure 3.1 U.S. Soybeans Production and Yield

[6]National Agricultural Statistics Service USDA, *Oil Crop Situation & Outlook Year Book/OCS-2002*, October 2002, p. 6.

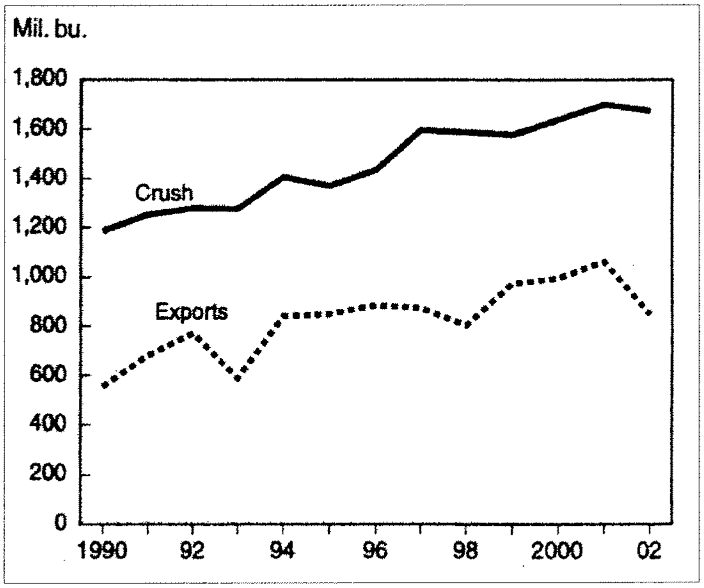


Figure 3.2 U.S. Soybeans Demand

New York State and the Northeast region of the US produced 22,758,000 bushels of soybeans in 2003.[7] New York State produced 4,608,000 bushels in 2002 (See **Table 3.3** on the following page) and 5,254,000 bushels of soybeans in 2003. The northeast region of the US is not a large producer of oilseed crops, as compared, for example, to Iowa's 2003 soybean production of 358,700,000 bushels. At 11 pounds of oil per bushel of soybean, the estimated soybean-oil resource available in the Northeast region would be 250,338,000 pounds.

[7]USDA - National Agricultural Statistics Service.

Table 3.3 Soybeans Produced in New York State/Northern Region in 2002

State	Bushels
New York	4,608,000
New Jersey	2,231,000
Pennsylvania	10,140,000
Maryland	10,810,000
Ohio	146,320,000
Massachusetts	0
Connecticut	0
Vermont	0

Source: USDA, National Agricultural Statistics Service

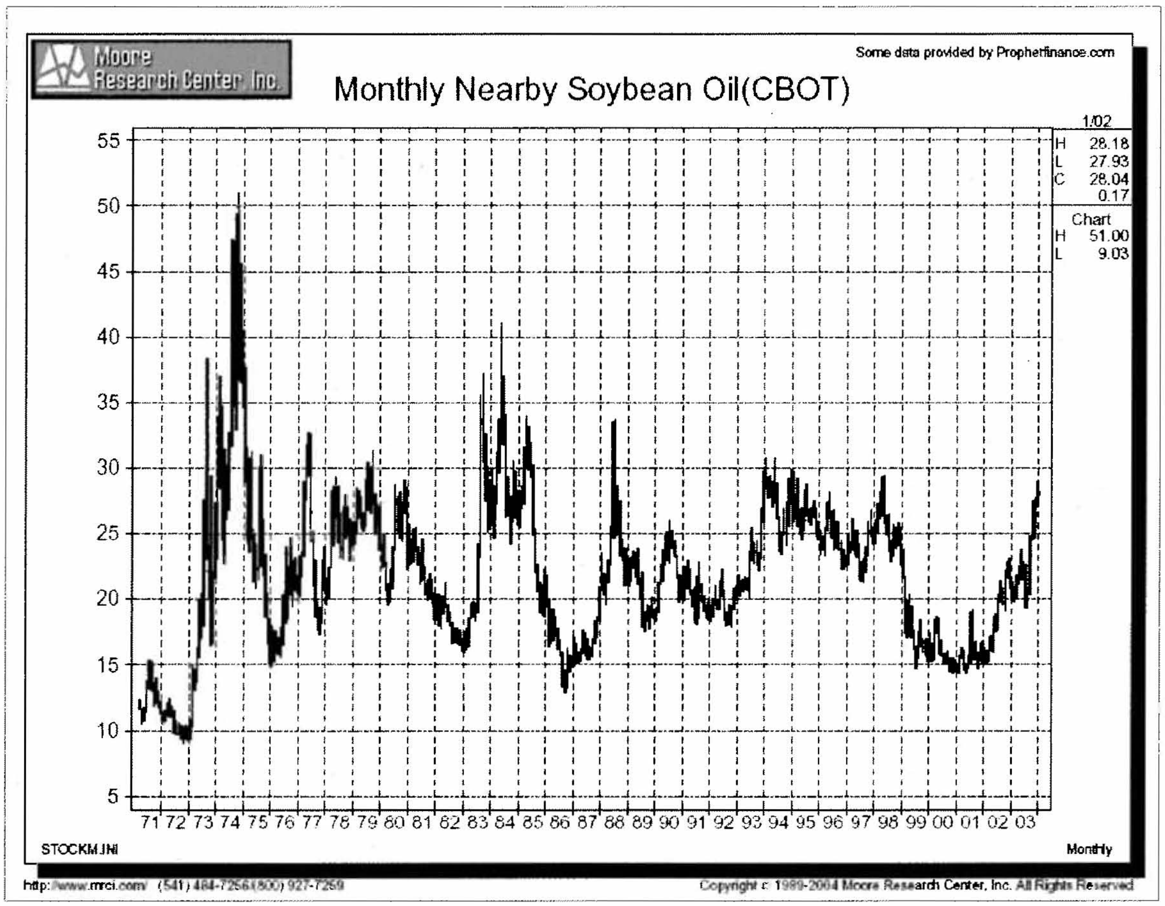
New York State has two soybean processors, neither of which refines oil. New Jersey has one solvent extraction plant with a refinery at Livingston, which could be a potential supplier to a New York State biodiesel facility. Ohio is the next closest with two large solvent extraction plants that refine soybean oil (See **Table 3.4** below).

Table 3.4 Soybean Crushing

State	Company	City	Produce	Type	Refinery
New York	Ag-Pro Ltd.	Massena	Soybean	Screw Press	Yes
	Sheppard Grains, Inc.	Phelps	Soybean	Screw Press	No
New Jersey	Best Foods	Englewood Cliffs	Soybean	Wet Milling	Yes
			Peanuts		
			Corn		
	National Starch	Bridge Water	Corn	Wet Milling	No
	Penta Mfg.	Livingston	Soybean	Solvent	Yes
			Canola		
			Corn		
			Cotton		
			Peanut		
Ohio	ADM Co.	Fostoria	Soybean	Solvent	No
	Cargill Inc.	Sidney	Soybean	Solvent	Yes
	Central Soya Co.	Belleview	Soybean	Solvent	Yes
	Central Soya Co.	Delphos	Soybean	Solvent	No
	Central Soya Co.	Marion	Soybean	Solvent	No
Pennsylvania	None				

Source: *Soy & Oilseed Blue Book*

Vegetable-oil feedstock resources in New York State are limited. Refined oil can be supplied from New Jersey and Ohio. Potential feedstock from Canada was considered, but did not price favorably compared to Ohio and New Jersey locations. For historical soybean oil prices, see **Figure 3.3**. Transportation, refining, and the spread to the Chicago Board of Trade from Belleview, Ohio are estimated to be five cents per pound.



Source: Moore Research Center, http://www.mcri.com
Figure 3.3 Historic Soybean Oil Prices (CBOT)

ANIMAL FATS

Animal fats are produced at meat packing plants and at independent rendering operations. All edible and inedible products are suitable for biodiesel production. Inedible products are priced lower than edible ones as a general rule; however, a number of packing plant items could be considered for biodiesel feedstock in the United States.

Edible and inedible animal fats are generally sub-categorized by animal species. The largest source of edible fat is generated at animal slaughter and processing plants, while the largest source of inedible fats is independent rendering operations that process packinghouse offal and dead stock. The term animal fat is generally understood to be fat from mammals. For the purpose of further discussion, the terms for fat and their definitions are listed below.[8]

Fat – Solid at room temperature.
Oil – Fat that is liquid at room temperature.
Grease – Fat product with a titer less than 40.0°C.
Tallow – Animal fat product with a titer greater then 40.0°C from beef processing.
Lard – Process and parameters are the same as for beef but with pork as the raw material.
Choice White Grease – A specific grade of mostly pork fat.
Bleachable Fancy Tallow – Primary beef tallow.
Edible – Fats produced for human consumption, which are under the inspection and processing standards of the USDA.
Inedible – Fats produced for animal and poultry consumption or for other non-edible uses.

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[8] H. W. Okerman and C. L. Hansen, *Animal By-Product Processing and Utilization*, pp. 89-98.

The nomenclature of commercial animal fats is rather complex and there are many grades and prices. Edible fats from beef are generally tallow and edible fats from hog are called lard. Grease in packing house terms, refers to inedible fat.[9] All can be utilized in the biodiesel process.

Table 3.5 US Production of Vegetable Oils/Animal Fats

(In Millions of Pounds)	
Vegetable Oils	
Edible Oils	20,106.50
Inedible Oils	2,495.90
Total Vegetable Oils	**22,602.40**
Animal Fats	
Edible Tallow	1,974.10
Inedible Tallow	3,689.50
Lard	261.8
Poultry Fat	2,215.00
Inedible Grease	2,772.10
Total Animal Fats	**10,912.50**

Source: US Census Bureau, "Fats and Oils: Production, Consumption, and Stocks," 2002

[9]Carl L. Adsberg and Alonzo E. Taylor, III, "Fats and Oils: A General View," *Fat and Oils Technology/Greases.*

Table 3.6 Oilseeds - Oil Production 2002

US Production (In Millions of Pounds)		
Product	**Edible**	**Inedible**
Caster Oil	32.7	
Coconut Oil	299	325.8
Corn Oil	(D)	(D)
Cotton Seed Oil	518.8	(D)
Fish Oil		2.4
Linseed Oil		97.7
Palm Oil	(D)	(D)
Palm Kernel Oil	(D)	(D)
Peanut Oil	285.5	
Rapeseed Oil	958.7	(D)
Safflower Oil	(D)	(D)
Soybean Oil	17,785.10	515.6
Sunflower Oil	226.6	3.6
Tall Oil		1,442.80
Tong Oil		7
Vegetable Foots		70.6
Other Fats & Oils		31
Total Production	20,106.40	2,496.50
Total Edible & Inedible		22,602.90

(D) Withheld to Avoid Disclosure for Individual Companies

Source: Data from US Census Bureau, "Fats and Oils: Production, Consumption, and Stocks," 2002

Animal fat products are valued on trading standards for tallow and grease. They are sold on the basis of their color, chemical composition, and percentage of free fatty acids, unsaponifiable matter, moisture content, and titer.[10]

[10]H. W. Okerman and C. L. Hansen, *Animal By-Product Processing and Utilization*, pp. 86-97 and Tables 3.1 and 3.2.

Table 3.7 Trading Standards for Tallow and Grease

Type	Minimum Titre[a] °C (°F)	Maximum FFA[b] (%)	MIU[c] (%)	FAC Color[d] (score)	Lovibond Color[e] (score)
Tallow					
Edible		1	0.73	1	
Fancy	41.5 (106.7)	4	1	7	10
Bleachable fancy	41.5 (106.7)	4	1		100
Prime	10.5 (104.9)	6	1	11B	125
Special	40.5 (104.9)	10	1	11C	180
No. 1	40.5 (104.9)	15	2	33	400
No. 2	40.0 (104)	35	2	No color	
Grease					
Lard		0.5	0.18	1	
Rendered pork fat		1	0.8		10
Choice White	37.0 (98.6)	4	1	11B	100
A. White	37.0 (98.6)	6	1	15	125
B. White	36.0 (96.8)	10	1	11C	180
Yellow	36.0 (96.8)	15	2	37	400
House	37.5 (99.5)	20	2	39	
Brown	37.5 (99.5)	50	2	No color	

Source: H. W. Okerman and C. L. Hansen, *Animal By Product Processing and Utilization*, p. 97.

[a] Melting temperature above 40°°C (104°°F) = tallow; below 40°°C (104°°F) = grease.

[b] Free fatty acid percentage.

[c] Moisture, impurities, and unsaponifiables.

[d] Fat Analysis Committee — standards are matched (white).

[e] Standards matched against product.

Meat Packing Industry

Meat packing plants in the United States process 35-million cattle, 98-million hogs, and 8-billion chickens per year.[11] This results in the production of over 11 billion pounds per year of animal fats. New York State does not have any large meat processors operating in the state, although Agri Processors in Brooklyn process 500 head of cattle per day. The nearest large sources of animal fats are:

Cattle

Moyer Packing – Souderton, PA – 2,400 head/day

Taylor Packing – Wyalusing, PA – 1,900 head/day

Pork

Smithfield – Gwaltney, VA – 8,800 head/day

Smithfield – Smithfield, VA – 9,500 head/day

Smithfield – Tarheel, NC – 32,000 head/day

Hatfield – Hatfield, PA – 7,800 head/day

Poultry

Tyson – 2 Plants in North Carolina

Louis Rich – 1 Plant in North Carolina

Purdue Farms – 1 Plant in North Carolina

Purdue Farms – 1 Plant in Maryland

Purdue Farms – 3 Plants in Virginia

The pork processing plants identified are potential sources of fats for a New York State biodiesel plant during periods when the fat markets are in the lower end of the price range due to freight rates. Hatfield Meats is the closest and could provide up to a million pounds annually of choice white

[11] AMS - USDA Livestock, "Summary of Statistics," *Meat & Wool Weekly*, week ending December 31, 2004, p. 3.

grease, which is their inedible grade at a slight premium to the market. Hatfield could provide more product at higher prices. Choice white grease was $0.18 to $0.19 per pound.

Taylor Packing and Moyer Packing both process beef and are the closest geographically to a potential New York State biodiesel plant.[12] The two plants kill a total of 4,300 head of cattle per day. Both plants have extensive by-product divisions for inedible rendering in addition to the plants edible rendering operations. Taylor is owned by Excel and has a feed mill integrated into the by-products operation. Taylor By-Products produces large quantities of inedible beef tallow for feed, soap, and chemical. Moyer has a very large by-product operation and can supply lower priced fats such as feed-grade animal fat, poultry fat, choice white grease, tallow, yellow grease, and blends.[13]

RECYCLED FATS AND OILS

Recycled fats and oils are used cooking oils from food service operations and the waste trap collections of independent renderers and waste trap cleaning service providers. These products are generally referred to as yellow and brown greases. They are the lowest cost alternative for a biodiesel feedstock, and also, the lowest quality; therefore, a pretreatment process with increased processing cost may be required.

[12] "Top 50 Companies," *Meat and Poultry Magazine*, web site - www.meatpoultry.com/resource center.

[13] "Rendered Production," Moyer Packing Company, web site - www.mopac.com/rendered.

Table 3.8 US Production and Consumption of Fats and Oils - 2002

US Production (In Millions of Pounds)			
Production	**Edible**	**Inedible**	**Total**
Edible Tallow	1,974.10		1,974.10
Lard	261.8		261.8
Inedible Tallow & Lard		3,689.50	3,689.50
Inedible Grease		2,772.10	2,772.10
Edible Oils	20,106.50		20,106.50
Inedible Oils		2,495.90	2,495.90
Poultry Fat**		2,215.00	2,215.00
Total US Production	**22,342.40**	**11,172.50**	**33,514.90**
Net Exports (E-I=NE)	5,906.80	1,827.90	7,734.70
Total US Production*	**16,435.60**	**9,344.60**	**25,780.20**
US Consumption (In Millions of Pounds)			
Category	**Edible**	**Inedible**	**Total**
Baking and Frying Fats	9,685.20		9,685.20
Margarine	1,300.10		1,300.10
Salads & Cooking Oils	10,925.10		10,925.10
Other Edible Products	401.8		401.8
Fatty Acids		2,177.90	2,177.90
Feed & Pet Food		2,669.50	2,669.50
Lubricants		111.7	111.7
Paint & Varnish		111.1	111.1
Resins & Plastics		138.8	138.8
Soap		373.8	373.8
Other Inedible Products		488.7	488.7
Begin Vs. End Stocks	409.3	73.4	482.7
Total Consumption	**22,721.50**	**6,144.90**	**28,866.40**

Source: Data from US Census Bureau, Fats and Oils: Production Consumption and Stocks 2002 and US Census Bureau, M311K Series, Fats and Oils.

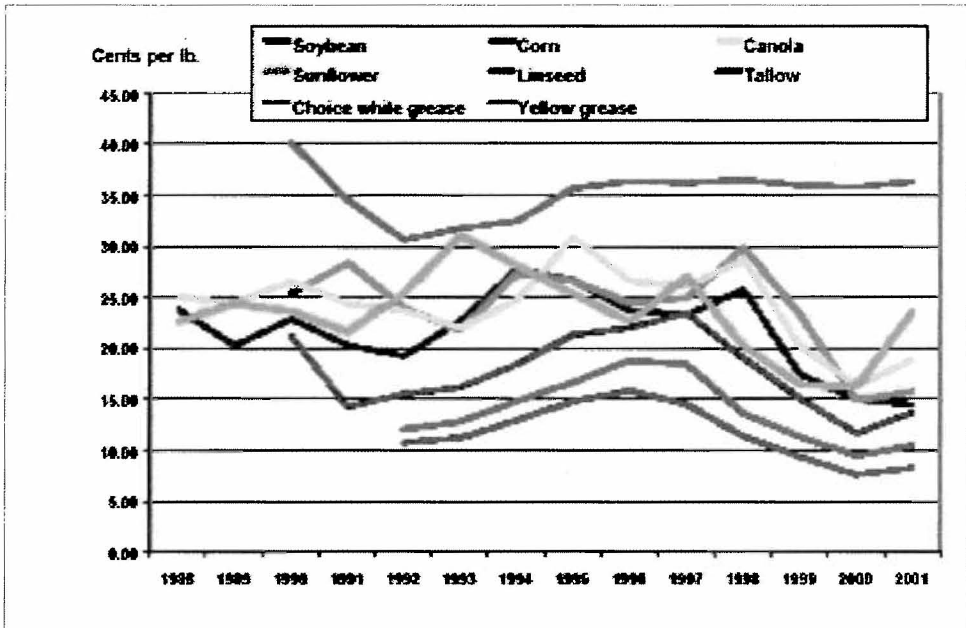
*Some production data withheld to avoid disclosure. Crude tall oil and vegetable foots production of 1,522.6 not included in total.

**Poultry fat is 2.215 million pounds.

Table 3.9 Fats and Oils – Historical Prices

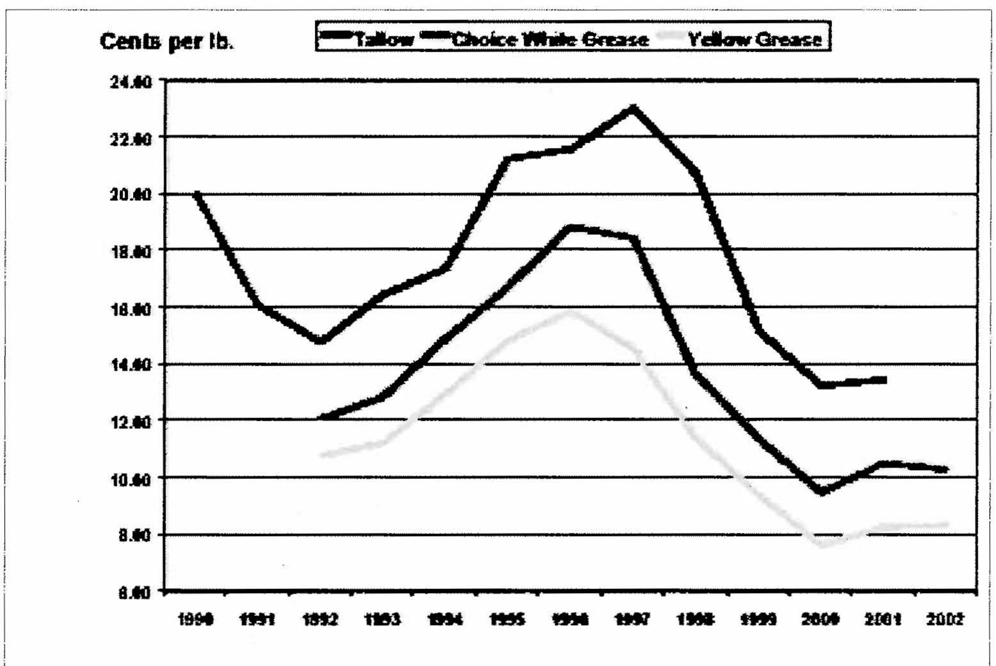
Prices 1997-2002 — Average Monthly Prices						
Costs per Pound						
Item	1997	1998	1999	2000	2001	2002
Caster Oil	41.5	45.29	48	47.42	47.9	47.5
Coconut Oil	39.4	34.48	39.89	23.33	24.14	21.01
Corn Oil	24.95	29.87	23.87	14.96	15.75	19.42
Cottonseed Oil	26.51	31.32	23.07	19.03	15.41	19.59
Linseed Oil	36.27	36.66	36	36	36.79	38.08
Palm Oil	27.25	31.89	21.1	16.28	15.73	21.63
Peanut Oil	47.2	42.91	41.56	34.53	35.04	28.77
Rapeseed Oil	88	90	80	90	92	90
Safflower Oil	59	59	59	79.33	78.75	79
Soybean Oil	23.22	25.77	17.72	15.01	14.48	17.35
Sunflower Oil	23.45	27.55	19.01	15.84	17.34	25.16
Inedible Tallow	20.75	17.71	12.98	10.18	11.5	12.6
Lard	23.42	17.86	14.91	12.25	14.93	14.21
Edible Tallow	23.45	19.05	15.11	11.66	13.71	15.15
Choice White Grease	18.46	13.69	11.4	9.45	10.78	11.17
Yellow Grease	14.65	11.41	9.38	7.7	8.26	9.33
Packer Bleachable	20.73	17.11	12.97	9.96	11.7	13.48
Renderer Bleachable	20.7	16.98	13.17	10.5	12.11	13.55
Brown Grease	NA	NA	NA	NA	NA	NA

Source: US Census Bureau M311K Series for Fats & Oils US Dept. of Agriculture, Agricultural Marketing Services, *Oil Crops Situation & Outlook Yearbook*, 2002, pp. 40-49.



Source: USDA, Economic Research Service

Figure 3.4 U.S. Fats and Oils Price Trends



Source: USDA, Economic Research Service

Figure 3.5 Animal Fat Prices in the U.S.

Waste Grease Resources – New York State

The New York City metro area has a population of 15-million people in a 13-county area surrounding New York City.[14]

A 1998 publication, "Urban Waste Grease Resource Assessment," by the National Renewable Energy Laboratory,[15] collected and analyzed data on urban waste grease resources in 30 randomly selected metropolitan areas of the United States. The report was published by G. Wiltsee and examined two major categories of urban waste grease:

1. Yellow grease feedstock collected from restaurants by rendering companies; and
2. Grease trap wastes from restaurants which can either:
   a. Be pumped into trucks for disposal (often at wastewater treatment plants) or processing at rendering plants or other facilities; or
   b. Flow through municipal sewage into wastewater treatment plants.

Yellow grease feedstock is a valuable commodity used to manufacture tallow, animal feed ingredients/supplements, and other industrial products. Grease trap waste and grease entering sewage treatment plants are zero or negative cost feedstocks at their source but are contaminated with sewage components.

In the urban waste grease resource assessment, Wiltsee concluded, after extensive research, that waste grease resources of a metropolitan area, region, state, or the US, as a whole, can be predicted from the following:

- Yellow Grease - Pounds/Year/Person = 9
- Trap Grease - Pounds/Year/Person = 13
- Total Waste Grease - Pounds/Year/Person = 22

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[14] *Rand McNally Atlas*, 2000.

[15] G. Wiltsee, Apple Consultants, Inc., "Urban Waste Grease Resource Assessment," *Report for National Renewable Energy Laboratory*, November 1998.

New York City Metro Area Population:

New York City	11,685,650	– 8 county area
Newark, NJ	3,322,284	– 5 county area
Total	15,007,934	

Calculated Waste Grease Resource:

Yellow Grease 15,007,934 x 9 = 135,071,406 Pounds/Year

Brown Grease 15,007,934 x 13 = 195,103,142 Pounds/Year

Total Waste Grease Resource NYC = 330,174,548 Pounds/Year

Note: Equivalent to 43.44 million gallons of biodiesel.

Raw Materials Collected:

Yellow grease can contain up to 25% water.

Yellow grease contains suspended solids.

Yellow grease contains free fatty acids above 15%.

Brown grease contains 85-90% water.

Brown grease contains sewage contaminants.

Brown grease contains free fatty acids above 50%.

Wide variations in raw material quality from load to load.

Estimated Raw Material Collections for Recycling:

Less than 4% of brown grease is recovered nationally.

50% to 75% of yellow grease is recovered nationally.

Raw Material Price:

Yellow Grease – Wide Variations of $0.03 to $0.08 per pound at the Source

Brown Grease – Negative Value to $0.03 per pound at the Source

Yellow Grease

Yellow grease is an inedible product. Often referred to as "feed fats," yellow grease results from spent frying oils and animal fats collected from food-processing plants and restaurants. Yellow grease is collected by independent renderers, processed to meet feed-grade specifications, and sold to the feed industry or exported for feed use. Packing houses may produce inedible grease (feed fats), which is also utilized by the feed industry.

Restaurants, commercial bakers, and snack food manufacturers are sources for yellow grease. There are over 21,000 restaurants of all sizes in New York City alone. All are required to recycle fryer grease and to trap grease prior to entering the waste treatment system. New York City only has a handful of inspectors to insure compliance.[16]

Renderers and independent haulers compete for the fryer grease. Renderers typically do not want trap or brown grease. Independent haulers collect trap grease and small quantities of fryer grease, which is mixed in the same truck; and in the case of New York City, transported out of the City to dump stations. Grease that is not recycled ends up in solid waste or in wastewater. Typically, there is a pick-up charge and a tipping fee to discharge trap and mixed grease. Regarding fryer grease, the renderers will pay when the grease price is high, and conversely, charge when grease is low, generally on a contracted basis.

Modern snack food and commercial bakery operations use frying equipment that does not require recycling of fryer grease. They add new oil as the products (potato chips, etc.) are being produced. The only oil used is that which goes out of the fryer on the product (these plants cannot afford to waste or recycle fryer oil).

Rendering Companies. Yellow grease is collected in New York City by a combination of rendering companies and independent haulers who pick up used grease at commercial food processors, food service operations, and restaurants. Rendering companies also pick up meat processing trimmings

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[16]Barry Newman, "The Sewer Fat Crisis Stirs a National Stink," *The Wall Street Journal*, June 4, 2001.

and waste. Renderers filter out the solids and then heat the spent cooking oil to drive out moisture until it meets industry specifications for yellow grease. The major market for yellow grease is for livestock feed and pet food. Yellow grease is a valuable commodity and the infrastructure for the collection of yellow grease is well established. It is estimated that 70% to 95% of the available yellow grease is now being collected in metropolitan areas.[17]

Major renderers in the Northeast United States are Darling International, Baker Commodities, Griffin Industries, and Valley Proteins. There are no renderers in New York City. Its yellow grease is exported to other states with New Jersey receiving the greatest quantity.

Darling International, with corporate offices in Irving, Texas, has a rendering operation in Newark, New Jersey that produces yellow grease for the feed and export markets. The Newark facility is capable of supplying a New York State biodiesel plant with a large quantity of yellow grease. The plant is located to take advantage of water transportation. Darling International most often uses a formula to contract with clients based on the grease market. Darling indicated that considerable volume could be generated with prices at a premium to the current markets.[18]

Baker Commodities International, with corporate offices in Los Angeles, has a rendering operation in Rochester, New York and another in Billerica, Massachusetts that serves the Boston metro area. The Billerica facility produces substantial quantities of yellow grease, much of which is exported. This amount could be easily diverted to a biodiesel site in New York State. Baker indicated they would be friendly to an annual quantity bid in the neighborhood of a $0.02 premium to the yellow sheet Chicago pricing delivered to the eastern New York (Albany) area[19]. They would not be comfortable committing all their yellow grease to a single buyer. Baker likes the prospects of the

[17]Ralph Groschen, "Feasibility of Biodiesel from Waste/Recycled Greases and Animal Fats," October 2002, p. 2.

[18]Russ Hamilton, Darling International telephone interview, Irving, Texas, December 2003.

[19]Fred Wellens, Baker Commodities, Phone Conversation, April 2004.

biodiesel market and would like to be considered as a prime supplier for a plant in the Northeast US region.

Griffin Industries, the second largest US renderer, operates 12 rendering plants, one spent cooking oil plant, and 25 transfer stations in the south and southeast US. Griffin also has a biodiesel plant in Cold Springs, Kentucky.

Valley Proteins operates nine rendering facilities and also owns Carolina By-Products, which operates five plants. Valley Proteins has four plants that could supply a New York State plant.

Rendering data for US figures are readily available in the 311K Publication and Census reports.[20] However, in the regional and state reports, data is "withheld to avoid disclosing data for individual companies." The National Renderers Association has not published any state-specific data for New York and neighboring states. There are no rendering operations in New York City, but two are located in Newark, New Jersey. One of them, American Rendering and Berkowitz Fat Company, does not collect waste grease. American Rendering picks up waste trimmings from meat processors in the New York City area and produces tallow only.

Estimated Yellow Grease Resources. The estimated yellow grease feedstock quantity from the three metro areas is 243 million pounds, sufficient for approximately 30 million gallons of biodiesel.

New York City	135 Million Pounds
Boston	54 Million Pounds
Philadelphia	54 Million Pounds

The volume sited above does not include quantities discharged to the sewer system. Yellow grease prices average 47% lower than crude soybean oil.

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[20] *Rendering and Meat By-Products Processing*, 1997 Economic Census EC97M-311GC.

The 11-year average price of yellow grease per the Jacobsen Publishing Yellow Grease Report is approximately $0.12 per pound. (See **Table 3-12**). To this has to be added a one cent premium and $0.0175 transportation cost per pound for a total cost at the site of $0.14 to $0.15 per pound.

Brown Grease

Brown grease is often referred to as "trap grease" and is collected from grease traps of animal processing plants, commercial food processors, restaurants, and municipal waste treatment plants. Water and free fatty acid content is high and may contain a large quantity of undesirable materials. As a feedstock, it is very inexpensive, but it presents a number of challenges to the biodiesel process. Brown grease has little value and cannot be used in animal feed, so it is either used in industrial processes or exported.

Trap grease is collected in 21,000 restaurants in New York City by renderers and trap cleaning service providers. It is estimated that approximately 4% of brown grease is being collected and recycled[21]. The estimated amount of waste grease being recycled in New York City can be calculated using the following National analysis:

- New York City Population: 12 Million People
- 9 Pound/Person/Year Yellow Grease Potential
- 13 Pound/Person/Year Brown Grease Potential
- 75% Recycle Rate of Yellow Grease
- 4% Recycle Rate of Brown Grease

9 Pounds x .75 x 12 Million = 81.0 Million Pounds Yellow Grease per Year
13 Pounds x .04 x 12 Million = 6.24 Million Pounds Brown Grease per Year
Total Waste Grease Recycling = 87.24 Million Pounds per Year

The balance of 176 million pounds of grease is currently not being collected.

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[21] G. Wiltsee, Apple Consultants, Inc., "Urban Waste Grease Resource Assessment," *Report for National Renewable Energy Laboratory*, November 1998.

<u>Trap Grease Collection</u>. New York City has a trap grease ordinance requiring grease traps as well as timely maintenance and clean out, but there exist compliance issues with this ordinance. There are only a handful of inspectors for the over 21,000 restaurants in the city making it difficult to enforce the ordinance.

There is only one firm in New York City that is licensed to store trap grease.[22] The balance of the collectors are independent operators who move trap grease out of the City to other collection points, primarily in New Jersey, where it is processed either for export or sent to a wastewater treatment plant. The quantity of brown grease collected is directly related to price. Normally trap grease has a negative value due to tipping fees. The client pays the hauler a fixed fee for collection, usually $25 or more. The hauler pays $0.03 to $0.12 per gallon to dump at the approved collection site.[23] Dewatered trap collections can have a $0.03 to $0.05 per pound value for industrial users.[24]

<u>Wastewater Treatment Plants</u>. Albany, New York operates two wastewater treatment plants that serve an estimated population of 100,000, and process 60 million gallons per day. Grease is skimmed to a grease pit and then into sludge where it is processed and incinerated. Grease that passes the skimmer is digested. Trap haulers and renderers of fryer grease deliver to the treatment plant. Approximately 1,000 to 2,000 gallons of grease per week is skimmed and it has very high water content.

Boston, Massachusetts has two treatment facilities. The Deer Island Treatment Plant is a 390-million-gallon-per-day plant that serves a population of 2 million. The plant uses primary and secondary skimmers and the skimmed matter is sent to digesters. Digested sludge is further processed into

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[22] G. Wiltsee, Apple Consultants, Inc., "Urban Waste Grease Resource Assessment," *Report for National Renewable Energy Laboratory*, November 1998.

[23] Tony Ruso, Passaic Valley Sewerage, 2004 and Upper Black Stone Water Pollution Abatement District, Boston, Massachusetts.

[24] Mr. Libio, A&L Cesspool Service, Long Island, New York, October 2003; and Mr. Philip Heisey, American Rendering Co., Newark, New Jersey, November 2003.

fertilizer and pelletized. Grease is about 30 parts per million in the raw influent and the design of the plant does not allow for removal of the grease.

The other Boston plant, Upper Blackstone Water Pollution Abatement District, has accepted septage and trap grease trucks in the past. The plant has experienced difficulty in handling these loads, so they will be ending the practice. The facility has averaged 1.2 to 1.5 million gallons per year of trucked-in grease with a high water content. The charge for dumping is $0.12 per gallon for grease loads.

The Passaic Valley Sewerage Commissioners (PVSC) in Newark, New Jersey, is a 330-million-gallon-per-day wastewater treatment plant. The plant is one of the largest in the country and serves a 100-square-mile area that is heavily industrial. PVSC is also responsible for pollution abatement within its service area. PVSC has recently established a liquid waste acceptance program and is capable of accepting all types of liquid waste by truck, rail, or barge. The facility has 16 dump stations for trucks and is currently receiving 27,000 gallons per day of trap grease with up to 90% water content. This is a new facility and the current processed amount is expected to double in the near future. PVSC charges $0.07 a gallon to dump trap grease and most of the trucks are from New York City. PVSC would consider teaming with a biodiesel producer to isolate the grease stock and dewater prior to shipment to a biodiesel facility.

The New York City wastewater treatment system consists of 14 plants processing 1,770 million gallons per day. The plants serve an estimated 9 to 10 million people. Each plant skims the grease, which ultimately results in a grease sludge that contains an unknown quantity of grease and other sewage components. Total sludge output for the 14 plants is 20 to 25 cubic yards per day which is land filled. Influent concentrations of grease range from 35 mg/L to 140 mg/L with the average being about 45 mg/L for the New York City system. Effluent concentrations average about 4 mg/L.[25] The grease levels do not cause any significant problems at the treatment plants. The amount of grease entering the treatment plants is 245,600,000 pounds per year or 24.5 pounds per person/year. This

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[25]Diane Hamemrman - Chief of the Division of Operations Support, Division of Pollution Control and Monitoring, New York City, New York.

is almost double the amount of brown grease resources predicted by using the 13 pounds per person/year conclusion in the Urban Waste Grease Resource Assessment.[26]

Estimated Brown Grease Resources. At first glance, brown grease appears to be a large potential feedstock source for biodiesel. That impression rapidly fades in light of the fact that the infrastructure does not yet exist to collect it.[27] According to plant managers interviewed, wastewater treatment plants do not have the capability to collect the grease, and no economic or technical reason to do so. The only material available at the plants is a grease sludge, which has an unknown grease content and is contaminated with sewage material and water. The grease that remains after skimming is digested.

New York City	195 Million Pounds
Boston	78 Million Pounds
Philadelphia	78 Million Pounds

Passaic Valley Liquid Waste Acceptance could be a major supplier of brown grease to a New York State biodiesel plant. The manager there indicated a potential to provide 1.5 to 2 million dewatered gallons in the future. There are other receiving stations in the Northeast US; however, Passaic Valley appears to be set up to be the best supplier.

A pricing mechanism does not exist for the tracking of the price of brown grease. This study arrived at the cost to the plant of approximately $0.10 per pound. This is based on a number of factors including cost at the source, dewatering, and transportation to the site. It is also based on its relative value to yellow grease.

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[26] G. Wiltsee, Apple Consultants, Inc., "Urban Waste Grease Resource Assessment," *Report for National Renewable Energy Laboratory,* November 1998.

[27] Mr. Tony Ruso, Passaic Valley Sewerage, 2004.

QUALITY OF FEEDSTOCKS

Consideration of various feedstocks for use in biodiesel production must entail not only their availability, but also the quality of the feedstocks relative to their suitability for use in biodiesel. Even though soybean oil is the most abundant feedstock nationally, inedible tallow and yellow grease represent a more plentiful biodiesel feedstock in the New York state region. It should be noted, though, that the quality of yellow grease differs from that of soybean oil. The physical and fatty acid properties of these grease supplies relative to virgin oils and the corresponding impacts of those differences are not only the biodiesel production process, but on the biodiesel itself, may limit their uses in some areas.

To assist in the definitions of specific animal fat and grease feedstock resources, the following specifications are provided for the basic categories of fat/grease used as feeding fats. These fats must be sold on their specifications, just like any other grade of fat. These specifications include: the minimum percentage of total fatty acids, the maximum percentage of unsaponifiable matter, the maximum percentage of insoluble impurities, the maximum percentage of free fatty acids, and the amount of moisture. Definitions of some of the quality characteristics of fats and oils are included below:

Titer is the solidification point of the fat in degrees Centigrade, and is a rough measure of the saturation level of the fat. The higher the titer, the more saturated the fat.

FFA (free fatty acids) is the amount of FFA contained in the product. Fats and oils are compounds containing three fatty acids each chemically connected to an oxygen on a glycerine molecule. Consequently, compounds with this structure are called triglycerides. Free fatty acids are those structures that are no longer connected to the glycerine. They are a degradation product and a measure of the quality of the fat. A high-quality fat has a low FFA level.

MIU (moisture, insolubles, and unsaponifiables) is a measure of the remaining compounds in the fat that are not fatty acids or triglycerides. It is also a measure of quality, as is the color. The lower the MIU level, the higher the quality of the fat.

Iodine value is a measure of the hardness or softness of fat and is defined as the grams of iodine absorbed by 100 grams of fat. Consequently, the higher the iodine value, the softer the fat.

Active Oxygen Method (AOM) Stability is a measure of the peroxide value after 20 hours of bubbling air through the sample. This test is intended to determine the ability of the fat to resist oxidative rancidity in storage.

Table 3.10 Common Values for Soybean Oil and Yellow Grease

Measurement	Crude Soybean Oil	Yellow Grease	Tallow	Choice White Grease
Titer	20-22	36-42	40.5	36
Free Fatty Acids	0.25-0.50	15-May	6	4
MIU	1.0-1.8	4-Feb	2	2
Iodine Value	120-140	58-79	48-58	58-68
AOM stability, hrs	40-45	20	20	20

Source: "Statewide Feasibility Study for a Potential New York State Biodiesel Industry," LECG, LLC, January 7, 2004

SUMMARY OF FEEDSTOCK SUITABILITY

A New York State biodiesel facility that is designed to utilize low-cost feedstocks, such as yellow grease and inedible animal fats, will have a significant economic advantage when compared to a facility designed to use 100% refined soybean oil. The specific advantage will be demonstrated in the financial models. This study shows that the optimal feedstock for a biodiesel production facility in New York State would be as follows:

Soybean Oil	50%
Yellow Grease	40%
Brown Grease	10%

Feedstock Cost Comparisons

Soybean Oil. It has been determined that the vegetable oil resources in New York are limited, and the Bunge facility at Belleview, Ohio is the closest location that has adequate soybean oil available. The cost delivered to the production site for this feedstock was determined by taking the ten-year-average price (Decatur) for the feedstock of $0.2157 per pound (See **Table 3.11**), and adding $0.0135 for basis, $0.0015 for degumming, and $0.025 for transportation to New York, for a total cost of $0.2557 per pound.[28]

Table 3.11 Feed Stock Cost - Soybean Oil

Year	Yearly Average cents/lb.
1993-1994	27
1994-1995	27.51
1995-1996	24.71
1996-1997	22.5
1997-1998	25.8
1998-1999	19.9
1999-2000	15.6
2000-2001	14.15
2001-2002	16.46
2002-2003	20.04
10-Year Average	21.57

Source: *2004 Soya & Oilseed Bluebook*, p. 350

[28]Per telephone conversation with Dennis Maxwell of Trade News Service and Dennis Strayer of Bunge, St. Louis, March 2004.

Yellow Grease. The price for delivered yellow grease was determined by taking the 11-year-average price (Chicago) of yellow grease of $0.12 per pound (See **Table 3.12**), and adding $0.01 for basis and $0.0175 for transportation, to arrive at an all-in cost of $0.14 to $0.15 per pound.[29]

Table 3.12 Feed Stock Cost - Yellow Grease

Year	Yearly Average cents/lb.
1993	11.8925
1994	13.8625
1995	15.3083
1996	17.1441
1997	14.4533
1998	11.43
1999	9.5558
2000	7.8066
2001	8.335
2002	9.3475
10-Year Average	11.9136

Source: "Yellow Grease," Jacobsen Publishing

Brown Grease. A market pricing system for brown grease does not exist, and data is very limited on pricing and availability. In conversations with the National Renderers Association and the Passaic Valley Sewerage Commissioners (NJ), the following conclusions were reached:

Sufficient quantities of brown grease were available in the New York City and upper New Jersey area to provide 10% of the total feedstock for a 15-million-gallon biodiesel facility. Since raw brown grease contains a great deal of water, it was assumed that if brown grease could be purchased (15% grease, 85% water) and transported to the site to be dewatered and dried, the total cost would be approximately $0.10 per pound.

[29]Per telephone conversation with National Renderers Association, March 2004.

Section 4

LOCAL MARKET IDENTIFICATION

PROJECTED DEMAND OF BIODIESEL PRODUCT

Diesel Usage in New York

Information is limited on the demand for biodiesel in New York. The New York State Fleet uses biodiesel, as do many departments of the Federal Government. The New Jersey Transit and Department of Transportation are users, as well. One of the major obstacles to wide-spread use of biodiesel in New York is the lack of a distribution system for the product.

Pure biodisel fuel is referred to as B-100, and when diesel is blended with 20% biodiesel, it is known as B-20. According to the New York State Procurement Office, which monitors biodiesel use state-wide, New York State used 1 million gallons of B-20 in 2003 and 1.6 million gallons of B-20 in 2004. Projected consumption of B-20 for 2005 is 2.0 million gallons, and as a result of expected executive orders, consumption is expected to be 3.0 million gallons for 2006.[30]

Currently there are over 30 distributors in 2004, and that number is expected to increase to over 50 in 2005.[31]

Potential Markets for Biodiesel

Potential Demand in New York. The potential market for biodiesel in New York State and the surrounding states is significant. The Energy Information Administration's (EIA) transportation fuel

[30] Russell B. Patton, Director of Purchasing, Office of General Services, Albany, New York, November 2003.

[31] Ibid.

sales report states the average daily sales of No.2 Diesel fuel in New York State for 2004 was 2,492,500 gallons per day, which would suggest an annual sales of 909.7 million gallons per year.[32]

The Energy Information Administration report on usage of No. 2 Distillate fuel oil for 2004 (See **Table 4.1** and **Table 4.2** below) shows the following annual usage for New York State and the surrounding states:

New York	1,133 million gallons/year
New Jersey	968 million gallons/year
Pennsylvania	1,022 million gallons/year
Connecticut	609 million gallons/year
Massachusetts	778 million gallons/year

The report makes it clear that there is a potential market in New York State and the surrounding states of approximately 9.014 billion gallons. If all diesel fuel used in New York State for transportation were blended with 2% biodiesel, it would create a market of 19,033 million gallons (See **Table 4.3** below). If all No. 2 Diesel fuel and No. 2 fuel oil were required to use a 2% blend in New York State, the market would be over 40.848 million gallons.

[32]US Department of Energy , *EIA, Petroleum Marketing Annual 2004*, pp. 359-360.

Table 4.1 2004 Distillate Use Average per Day (1,000 gallons)

Location	Distillate No. 2 Diesel Fuel	Distillate No. 2 Fuel Oil	Total No. 2 Distillate	Total Distillate & Kerosene
United States	129,227.60	27,135.60	156,413.10	160,716.20
Pad District I	35,285.10	20,789.10	56,074.20	58,335.90
New York State	2,492.50	3,103.10	5,595.60	6,407.50
New Jersey	3,098.60	2,651.90	5,750.50	5,960.90
Pennsylvania	4,497.60	2,801.10	7,298.70	7,536.70
Connecticut	925.60	1,668.60	2,594.20	2,670.50
Massachusetts	1,325.30	2,130.20	3,455.50	3,567.00
Total New York Area (NY, NJ, PA, CN, MA)	12,339.60	12,354.90	24,694.50	26,142.60

Source: US Department of Energy (EIA), *Petroleum Marketing Monthly*, 2004, pp. 359, 360, and 362

Table 4.2 2004 Distillate Use Annual (1,000,000 gallons)

Location	Distillate No. 2 Diesel Fuel	Distillate No. 2 Fuel Oil	No. 2 Distillate
New York State	909.763	1,132.632	
New Jersey	1,130.989	967.944	
Pennsylvania	1,641.624	1,022.015	
Connecticut	337.844	609.039	
Massachusetts	483.735	777.523	
Total New York State Area	4,503.955	4,509.153	9,013.108

Source: US Department of Energy (EIA), *Petroleum Marketing Monthly*, 2004, pp. 359, 360, and 362

Table 4.3 No. 2 Diesel Blended to B-2 (2%) Biodiesel (Units in 1,000 gallons)

Location	No. 2 Diesel Gallons/Day	Biodiesel Gallons/Day	Biodiesel Gallons/Year
New York	2,607.30	52,146	19,033
New Jersey	3,478.00	69,560	25,389
Pennsylvania	4,287.20	85,744	31,296
Connecticut	886.7	17,734	6,472
Massachusetts	1,339.50	26,790	9,778
Total Biodiesel at 2%	12,598.70	251,974	91,968
Potential Biodiesel Market in Area			91,968

Source: US Department of Energy (EIA), *Petroleum Marketing Monthly*, 2003

Biodiesel Markets. Biodiesel can currently be marketed into the channels of retail, wholesale, state and city fleets, and government or military fleets as B-20. All of these markets are growing rapidly as biodiesel becomes more available and its benefits become more widely known.[33]

The potential markets for the use of biodiesel are vast. These include premium diesel, fleets, transit, passenger cars and trucks, school buses, electrical generation, heating oil, farming, marine, and mining.[34]

Current and Future Biodiesel Demand

The US biodiesel industry is an expanding industry that has experienced tremendous growth since 1999. The National Biodiesel Board reports that US sales have increased from about 500,000 gallons in 1999 to more than 75 million gallons in 2005. In a study conducted by the USDA's Office of the Chief Economist evaluating the effects of the Renewable Fuels Standard (RFS) as proposed in the Energy Policy Act of 2002 (H.R. 4) on commodity markets, farm income, and employment, biodiesel demand was projected through 2012. The demand for biodiesel was projected to grow from 22 million gallons in 2003 to 124 million gallons in 2012.[35]

Current and Potential Biodiesel Production. Construction of production plants in the biodiesel industry has been sporadic (See **Figure 4.1** below). The first small-scale commercial biodiesel plant was built by Environmental in 1993 and had a capacity of less than 300,000 gallons per year. Since that time, 65 other plants have come on-line with a wide range of production capabilities. Current individual plant capacities range from 100,000 gallons per year to 12 million gallons per year, with the average plant size being approximately 6 million gallons per year.[36] As the demand for biodiesel

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[33]Rod Frazier, "Biodiesel Production Potential in Michigan and Ohio," 2002.

[34]Biodiesel: The official site of the National Biodiesel Board – www.biodiesel.org.

[35]"Feasibility of a New York Biodiesel Industry," LECG, LLC, January 7, 2004, p. 56.

[36]Ibid.

continues to grow, and as firms strive to lower production costs and increase market share, it is estimated that the size of dedicated biodiesel production facilities will continue to expand.

Several other companies, such as Cognis and ICI/Unichem, produce esters for internal needs, but are not actively involved in the production or marketing of biodiesel in the US. These companies are primarily involved in the manufacturing of oleo chemicals but have been involved in ester production for many years utilizing internally developed technology. Although few estimates are available to document this surplus capacity, it has been reported that up to 200 million gallons of production capacity are available through existing long-term production agreements with biodiesel marketing firms.[37] Even though these companies may be able to produce methyl esters for the biodiesel market, fuel production does not fit well with the production and marketing strategies of most of these companies. This potential capacity, therefore, cannot be guaranteed in the event that dedicated biodiesel producers lack sufficient capacity to meet market demand for biodiesel.

The oleo chemical industry also has a significant investment in methyl ester production assets; however, the primary distribution channel of the ester production from these facilities, at this time, continues to be the chemical manufacturing market, rather than the fuel market.[38]

As a result of the Minnesota Biodiesel Mandate, other proposed facilities are being announced quite frequently, including the recent groundbreaking for a 30 mmgpy facility by the Minnesota Soybean Processors at Brewster, Minnesota and the announcement by SoyMor to build a 25 mmgy facility next to the EXOL ethanol plant in Albert Lea, Minnesota.[39]

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[37] "Feasibility of a New York Biodiesel Industry," LECG, LLC, January 7, 2004, p. 56.

[38] "Statewide Feasibility Study for a Potential New York State Biodiesel Industry," LECG, LLC, January 7, 2004.

[39] *Biodiesel Magazine*, Jan/Feb 2004.

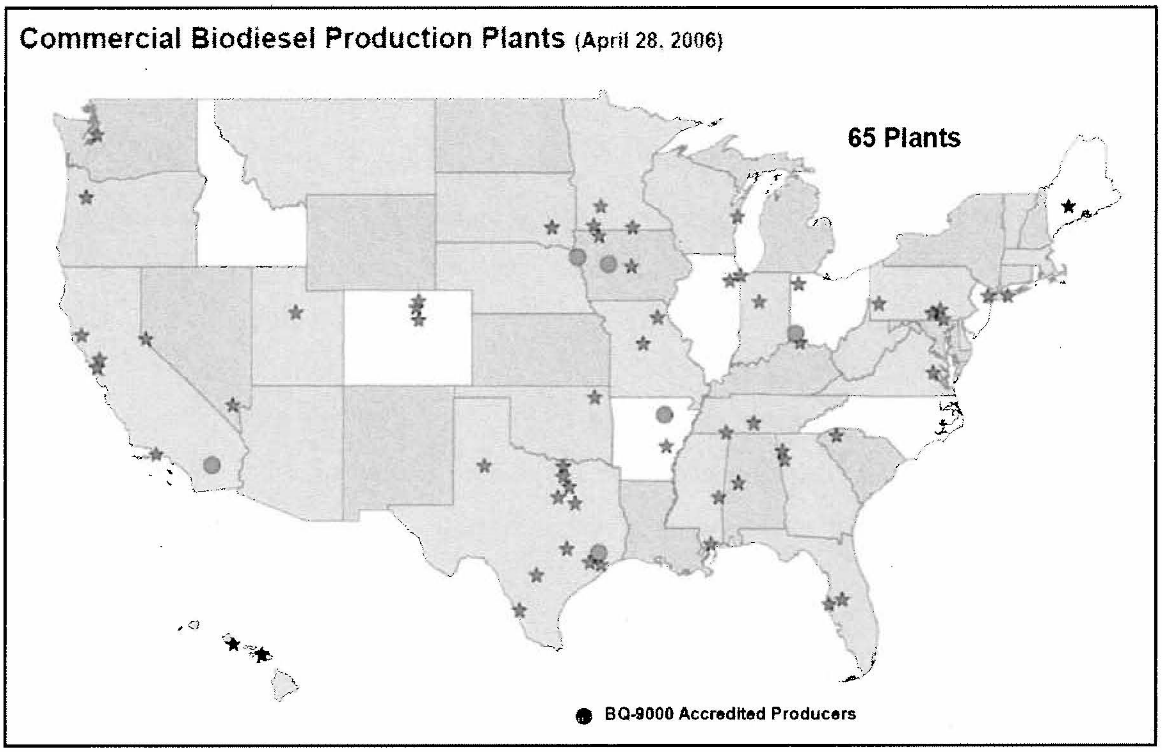

Figure 4.1 Current and Proposed Biodiesel Production Plants

<u>Biodiesel Use in New York State.</u> On August 19, 2002, the New York State Energy Research and Development Authority (NYSERDA) and NOCO Energy Corporation announced the first shipment of biodiesel into New York State. NOCO Energy Corporation received a shipment of 20,000 gallons of biodiesel that they blended with conventional diesel and marketed as B-20. B-20 is marketed to the fleets of government agencies involved in the Energy Policy Act (EPACT) state requirements and for use in diesel vehicles. Biodiesel products and blends are also sold to other users, such as agricultural. Little, if any, data exists to determine volume of sales to private users.

New York State Procurement Office provided the following data:[40]

Estimated Total Distillate Use in New York State: 3 Billion Gallons/Year

[40] Russell B. Patton, Director of Purchasing, New York State Procurement Office, Albany, New York, November 2003.

Fuel Oil:

Fuel Oil Use by all State Agencies	56,000,000 Gallons/Year
Fuel Oil Use by Political Sub Divisions/Cities	31,000,000 Gallons/Year

Diesel Fuel:

Diesel Fuel for State Agencies	6,000,000 Gallons/Year
Diesel Fuel for Political Sub Divisions/Cities	41,000,000 Gallons/Year

Biodiesel:

Including Diesel Fuel Total of 47,000,000	1,600,000 Gallons
Gallons of Biodiesel Required for the B-20	320,000 Gallons

2003 Estimated B-20	Approximately 1,000,000 Gallons
2004 Estimated B-20	Approximately 1,600,000 Gallons
2005 Estimated B-20	Approximately 2,000,000 Gallons
2006 Estimated B-20	Approximately 3,000,000 Gallons

Projected Biodiesel Required for B-20 Blends:

2003 Estimate for Biodiesel	200,000 Gallons
2004 Estimate for Biodiesel	320,000 Gallons
2005 Estimate for Biodiesel	400,000 Gallons
2006 Estimate for Biodiesel	600,000 Gallons

Clean Cities Fuels – B-20 Biodiesel Market

Energy Policy Act of 1992 (EPACT) was passed by Congress to reduce dependence on imported petroleum by requiring certain fleets to acquire alternative fuel vehicles (AFV's) capable of operating on non-petroleum fuels. In fiscal year 2000 and beyond, 75% of light-duty vehicles (LDV's), must be AFV's. Executive Order 13149, April 2000, directs federal fleets to reduce petroleum consumption by 20% in their fleet of AFV's. EPACT requirements apply to certain fleets of 20 or more LDV's that are capable of being fueled at a central location and are primarily operated in metropolitan statistical areas. Vehicles heavier than 8,500 lbs. GVWR; law enforcement and military tactical vehicles are exempt. Compliance is required by state government and alternative fuel provider fleets that control 50 or more light-duty vehicles under 8,500 lbs. GVWR. The US Department of Transportation administers the EPACT program.

EPACT – Alternative Fuels:

- Methanol, Ethanol, and other alcohols
- Blends of 85% or more of alcohol with gasoline
- Natural gas and liquid fuels domestically produced from natural gas
- Propane
- Coal derived liquid fuels
- Hydrogen
- Electricity
- Biodiesel
- P-Series

In January of 2001, the biodiesel final rule made it possible for fleets to earn EPACT credits for use of biodiesel blends of at least 20% (B-20). This rule does not make B-20 an alternative fuel but gives one credit for every 450 gallons of pure biodiesel used in biodiesel blends.[41]

Clean Cities Program New York State. Six urban areas of New York State have joined the US Department of Energy Clean Cities Program. This voluntary initiative supports regional programs which pledge to introduce alternative fuel vehicles into public and private fleets. The Clean City Organizations sponsor alternative fuel events and educate fleet owners and the public on the advantages of alternative fuel vehicles.

[41] Energy Policy Act, Federal Register Vol. 66, No. 8, January 11, 2001 Rules and Regulations.

ULSD – Ultra-Low Sulfur Diesel. In December of 2000, the EPA finalized the "Ultra-Low Sulfur Diesel" (ULSD) regulation, which requires the production of at least 80% ULSD (15 million parts sulfur per million) highway diesel between June 2006 and June 2010 with a 100% requirement for ULSD thereafter.[42]

On June 29, 2004 the EPA issued a final rule regulating emissions from non-road diesel engines and sulfur content in non-road diesel fuel. The non-road fuel market is 18% of the total distillate pool. The rule reduces diesel engine emissions by more than 90% and fuel sulfur content by 99% from current levels.[43]

ASTM D-975, the ASTM standard for diesel fuel, is being modified to include a specification on lubricity. Refining the hydro-treating process, which reduces the sulfur content of diesel blends, also removes lubricity compounds.[44] As a result, most of the diesel produced by refineries to meet the January 1, 2006 ULSD specifications will not have adequate lubricating properties to meet the new ASTM lubricity specification.

Removal of sulfur from diesel fuel decreases the lubricity of the fuel, potentially increasing wear on the fuel injectors. Biodiesel fuel has demonstrated that it contains virtually no sulfur. Pure biodiesel meets the new sulfur requirements mandated by the EPA as a blending stock; and biodiesel may play a role in reducing sulfur content. Biodiesel fuel has demonstrated excellent lubricity characteristic and the ability to improve lubricity even when blended as low as 2% in conventional diesel fuel.

In 2004, some major US finished-fuel common-carrier-pipeline companies announced that they would not allow the transport of diesel fuels already treated with lubricity improvers. This ban is due to concerns about "trail back" of the lubricity additive into jet fuel tenders following the additized

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[42]American Petroleum Institute, Overview of EPA's Low Sulfur Diesel Fuel Programs, US EPA Office of Transportation and Air Quality, New Orleans, Louisiana, November 15, 2004.

[43]Ibid.

[44]American Petroleum Institute – Ultra Low Sulfur Implementation Workshop, "Colonial Pipeline Decision," November 2004.

diesel. Jet fuel tenders are not allowed to contain these additives. As a result, most lubricity additive usage in the US will take place at the terminals.[45]

Blenders Tax Credit for Biodiesel. In October of 2004, President George W. Bush signed the American JOBS Creation Act of 2004. This bill contained a biodiesel tax incentive. The tax incentive took effect on January 1, 2005 and will last for two years.

- The biodiesel tax incentive is a federal excise tax credit.
- The credit is $1/Gallon for agra-biodiesel and $0.50/Gallon for biodiesel.
- USDA estimated biodiesel demand to increase to at least 124,000,000 gallons per year.
- Blender will receive the tax credit.
- Effect of the tax credits will be to lower the cost of biodiesel and blends to the end user.

Projections for Biodiesel in the United States

A continued expansion of biodiesel use in federal and state government fleets will augment future demand. The use of biodiesel is projected to include such fleets as the US Postal Service, US Department of Defense, US Department of Energy, US Department of Agriculture, school districts, transit authorities, parks, public utility companies, and garbage and recycling.[46]

The American Biofuels Association projects, with government incentives comparable to those that have been provided for ethanol (blenders tax credit, CCC credits, and state incentives), biodiesel sales could reach about 2 billion gallons per year or replace 8% of conventional highway diesel fuel consumption.

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[45] American Petroleum Institute – Ultra Low Sulfur Implementation Workshop, "Colonial Pipeline Decision," November 2004.

[46] Energy Policy Act, Federal Register Vol. 66, No. 8, January 11, 2001 Rules and Regulations.

The US Department of Energy/Energy Information Agency (DOA and EIA) has developed upper- and lower-band demand projections for biodiesel fuel. Lower-band projections are based on assessment of potential fleet demand for biodiesel to comply with the Energy Policy Act of 1992 (EPACT). Upper-band projections are based on biodiesels potential use as a lubricity additive.

Lower band projections for biodiesel demand are 6.5 million gallons in 2010 and 7.3 million gallons in 2020. DOE/EIA's upper-band projections recognize that the transition to ULSD will increase the need for lubricity additives in the fuel. The upper-band assumptions assume that biodiesel will be blended into ULSD at 1% by volume, resulting in a demand projection for biodiesel in 2010 of 470 million gallons, rising to 630 million gallons in 2020.

A US Department of Agriculture (USDA) study has estimated biodiesel demand will increase to at least 124 million gallons per year with the implementation of the Federal Excise Tax Credit. Higher future diesel fuel prices, combined with the Excise Tax Credits, could create much higher demand for biodiesel as it becomes more price competitive with diesel fuel.[47] [48]

Projections for Biodiesel in New York State. Demand for biodiesel in New York State will mirror market development at the national level. Significant factors driving demand are:

- Federal and state incentives and regulations
- CCC Credits
- Excise Tax Credits
- EPACT
- ULSD
- Higher Petroleum Prices

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[47] National Biodiesel Board, Press Release, October 22, 2004.

[48] LEGG LLC, NYSERDA, "Statewide Feasability Study for a Potential New York State Biodiesel Industry," Final Report 04-02, June 2003, pp. 56-57.

New York B-20 Market. The B-20 market is expected to continue to grow as infrastructure to service this market improves and grows.

Potential:

Diesel Purchases for State Fleets	20.0 Million Gallons/Year
Inter-City Busses – 2005	87.3 Million Gallons/Year
Transit Busses	74.4 Million Gallons/Year
School Busses	57.4 Million Gallons/Year
Total	239.1 Million Gallons/Year

It would require 47.820 million gallons of Biodiesel to accommodate the potential demand for B-20.

New York Ultra-Low Sulfur Diesel. This market will be driven by the real need for additional lubricity in the ULSD fuel starting in 2006. The petroleum industry originally planned to inject lubricity additives at the refinery but reversed that decision in November of 2004. Lubricity will now be added at the terminal and biodiesel, which has superior lubricity characteristics and zero sulfur, should be able to capture a significant part of that market. This market could grow to include off - road diesel and residential heating oil.

Potential:

Distillate on Highway 2005 Projections Usage	840.3 Million Gallons/Year
Farms	42.1 Million Gallons/Year
Off Highway	41.9 Million Gallons/Year
Rail	25.4 Million Gallons/Year
Vessel	15.1 Million Gallons/Year
Military	2.1 Million Gallons/Year
Total	966.9 Million Gallons/Year

Home Heating Oil	1,519.3 Million Gallons/Year
Total Potential for B-2 Market	2,725.3 Million Gallons/Year

Potential Biodiesel for Transportation	19.338 Million Gallons/Year
Potential Biodiesel for Home Heating Oil	30.386 Million Gallons/Year
Potential Biodiesel for B-20 Market	47.820 Million Gallons/Year

Total Potential Biodiesel for B-20 and B-2 Market in NY State 97.544 Million Gallons/Year

This final figure of 97.544 million gallons per year would represent blending B-20 and B-2 into 79% of the distillate used in New York State.[49]

Many factors will contribute to the future demand of biodiesel. They include:

- National, State and Local Environmental Policies
- National and State Mandates and Incentives
- Production Costs
- A proper distribution infrastructure
- Economic Impact to the local communities
- Potential revenues from By-Products

Additional new markets could be developed with innovative marketing. These include:[50]

- Develop a cogeneration power plant using biodiesel to provide electricity to power the biodiesel plant. Excess electricity can be sold back to the electrical grid to help electric companies meet the renewable portfolio standard currently pending in Congress.
- Sell biodiesel to diesel generator stations that produce power.

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[49]Blending Factor for B-20 and B-2 for New York State is calculated at 97.544 Million Gallons Blended into 2,725 Million Gallons of Distillate.

[50]Frazier, Barnes, and Associates, *Statewide Biodiesel Feasibility Study Report*, The Mississippi Biodiesel Council, October 20, 2003.

- US Postal Service is required to use competitively priced alternative fuels, aggressively pursue this business.
- Develop market for biodiesel solvents.
- Market biodiesel additive products for use in diesel engines (i.e., additives to reduce NOx, improve cold weather performance, and improve gas mileage).
- Utilize production facilities such as USDA research facility, to test alternative such as rapeseed, fish-fat waste, etc.
- Develop market for biodiesel as home heating oil.
- Develop biodiesel school bus program to reduce the exposure of school children to airborne contaminants.
- Convince university fleets to utilize biodiesel blends.

FORECASTING THE SELLING PRICE OF BIODIESEL

The relative price of diesel and biodiesel fuels has a substantial impact in determining the demand for biodiesel. Acting as a direct substitute for diesel fuel in many applications, biodiesel typically has a higher price, which has limited the adoption of the fuel among some users. Not surprisingly, the lower price of diesel has been noted as being the greatest single barrier to increased biodiesel use in the market.[51]

Various factors will determine what price a biodiesel facility will receive for their product in the future. Many are the same factors that will drive demand:

- Diesel Fuel Prices
- National and State Mandates and Incentives
- National, State, and Local Environmental Policies
- Production and Feedstock Costs
- A proper distribution infrastructure

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[51] Overview of The Feasibility of Biodiesel from Waste/Recycled Greases and Animal Fats. Economic Analysis of Alternative Indiana State Legislation on Biodiesel.

- Potential revenues for By-Products
- Fuel Taxes

While the relationship between diesel-fuel prices and biodiesel prices is recognized as a major limitation to biodiesel usage, all the factors listed above contribute to the demand for biodiesel, as well as to its selling price. Feedstock costs may vary considerably because of the range of feedstocks available to make biodiesel and the market price for those inputs. Markets for fuels may cause the price of biodiesel to differ among geographical regions or separate user segments of demand. The price estimates for blended biodiesel are complex because price reports often do not specifically address whether the quoted price is for blended or pure forms of the fuel. Federal subsidies for biodiesel may also not be incorporated into the price estimates.

The Alternative Fuels Data Center publishes a quarterly report called the Alternative Fuel Price Report, which gives regional prices on a quarterly basis for various regions of the country. Below in **Tables 4.4** and **4.5** are the regional prices for diesel fuel and B-20 biodiesel.

Table 4.4 Diesel Fuel Prices

Region	**Week of**		
	12/8/03	**3/8/04**	**6/14/04**
New England	$1.61	$1.76	$1.81
Central Atlantic	$1.59	$1.74	$1.78
Lower Atlantic	$1.43	$1.58	$1.64
Midwest	$1.45	$1.59	$1.66
Gulf Coast	$1.43	$1.57	$1.64
Rocky Mountain	$1.53	$1.62	$1.88
West Coast	$1.64	$1.85	$2.00
Nationwide Average	**$1.48**	**$1.63**	**$1.71**

Source: US Department of Energy, *Alternative Fuel Data Center: The Alternative Fuel Price Report*

Table 4.5 Biodiesel (B-20) Fuel Prices

Region	Week of 12/8/03	3/8/04	6/14/04
New England	No info	No info	No info
Central Atlantic	$1.84	No info	$2.08
Lower Atlantic	$1.65	$1.69	$1.84
Midwest	$1.55	$1.65	$1.73
Gulf Coast	No info	No info	No info
Rocky Mountain	$1.75	$1.83	$2.11
West Coast	$1.78	$2.21	$2.06
Nationwide Average	**None given**		

Source: US Department of Energy, *Alternative Fuel Data Center: The Alternative Fuel Price Report*

If you compare diesel fuel and biodiesel fuel prices from the tables above, you can see that outside of the Midwest (where the bulk of soybeans are grown), the price of biodiesel is significantly more expensive than regular diesel. Since B-20 is 20% biodiesel and 80% diesel, it suggests that 100% biodiesel is significantly more expensive than diesel fuel.

While a number of other studies have suggested B-20 prices from $1.30 to $1.70, the best gauge of biodiesel prices can be obtained by referencing **Table 4.4** and **4.5** above. This data has been corroborated by a Minnesota study which suggests that a B-2 blend would cost $0.02 more per gallon than regular diesel.[52] It was further corroborated by a University of Arkansas researcher who stated that the prices for B-5 and B-20 blends would be from $0.05 to $0.10 per gallon more expansive than regular diesel.[53]

These conclusions are best illustrated in **Table 4.6** below. It suggests comparing the historical trading prices of B-20 and regular diesel. As an example, if the average rack price of diesel is $1.00 per gallon and 100% biodiesel is $1.50 per gallon, then $0.10 per gallon is added to a 20% blend of biodiesel.

[52]Douglas G. Tiffany, "Biodiesel: A Policy Choice for Minnesota," May 2001, p. 15.

[53]"Biodiesel: Potential and Possibilities for the Arkansas Economy."

Table 4.6 Added Cost to Retail Prices of Diesel Fuel when Blended with 20% Biodiesel

No. 2 Diesel	Rack Diesel Prices Per Gallon								
	$0.80	$0.85	$0.90	$0.95	$1.00	$1.05	$1.10	$1.15	$1.20
Biodiesel	Added Cost In Cents Per Gallon								
$1.40	0.12	0.11	0.1	0.09	0.08	0.07	0.06	0.05	0.04
$1.50	0.14	0.13	0.12	0.11	0.1	0.09	0.08	0.07	0.06
$1.60	0.16	0.15	0.14	0.13	0.12	0.11	0.1	0.09	0.08
$1.70	0.18	0.17	0.16	0.15	0.14	0.13	0.12	0.11	0.1
$1.80	0.2	0.19	0.18	0.17	0.16	0.15	0.14	0.13	0.12
$1.90	0.22	0.21	0.2	0.19	0.18	0.17	0.16	0.15	0.14
$2.00	0.24	0.23	0.22	0.21	0.2	0.19	0.18	0.17	0.16

The Selling Price of Biodiesel

The high price of biodiesel relative to diesel fuel prices has been the limiting factor in the demand for biodiesel. Two events in 2004 have positive implications for the use of biodiesel products: A rapid increase in the price of crude oil and a corresponding rise in diesel fuel prices in 2004. In 2004, crude oil rose from $32/barrel to nearly $53/barrel before settling back to $43/barrel in December of 2004. The price of rack diesel New York Harbor started the year at $0.9864, rose to $1.53 in October, and ended the year at $1.29. Pump prices rose to well over $2.00 in the 3rd quarter of 2004.

In late October, President Bush signed into law HR 4520, also known as the American JOBS Creation Act of 2004, which contains the first biodiesel tax incentive. The biodiesel tax incentive, which is structured as a Federal Excise Tax Credit, amounts to a penny per percentage point of biodiesel blended with petroleum diesel for first-use oils like soybean oil, and a half penny per percentage point of biodiesel made from other sources like recycled cooking oils. The USDA estimated that the incentive will increase biodiesel use by over 100,000,000 gallons per year. However, other factors, including the rise in crude oil prices, could push demand much higher.[54]

On March 1, 2005, crude oil was again above $53/barrel with crude oil and distillate prices at near records. Due to the lack of historical data for biodiesel, 2004 will be bench marked and the Energy Information Agency (EIA) short-term projections will be utilized for price projections. Currently, the EIA's long-term projections for crude oil are well below current levels. EIA's short-term

[54]National Biodiesel Board, October 22, 2004 Press Release.

projections indicate crude oil to maintain the same range from 2004 into 2006, approximately $35/barrel to $55/barrel.

Currently, there is no shortage of speculation as to where petroleum prices may go from here and in the long term. 2005 is starting off as the reverse of 2004, with relatively low soy oil prices and relatively high distillate prices. It can be concluded that with the Federal Incentive in place, crude oil prices of $45 or higher will dramatically increase biodiesel demand assuming soy oil prices stay at or below historical averages. Applying the Federal Tax Incentive to the last four months of 2004 resulted in biodiesel being lower than rack distillate.

Biodiesel Price History

Biodiesel prices are currently being reported by the Energy Management Institute and Alternative Fuels Index (DTN). The Alternative Fuels Index began reporting Biodiesel, B-20, B-2, and No. 2 Diesel prices at 50 US locations in March of 2003.

Table 4.7 DTN Reported Biodiesel Prices US No. 2 Diesel in NYC/NJ

Month	Biodiesel	No. 2 Diesel
March 11/04	2.095	0.9899
April 22/04	2.37	0.9847
May 13/04	2.395	1.3772
June 24/04	2.398	1.0451
July 29/04	2.398	1.1874
Sept. 02/04	2.398	1.1982
Sept. 30/04	2.523	1.472
Oct. 21/04	2.523	1.6286
Jan. 20/05	2.648	1.3795
Average	2.38	1.2514

Source: DTN Energy's Alternative Fuels Index
Note: No. 2 Diesel Prices Do Not Include Taxes

As indicated in **Table 4.7** above, DTN Biodiesel prices averaged $1.13 per gallon over No. 2 diesel rack prices. Application of the Federal Incentives of $1.00 per gallon would imply that biodiesel is much closer to being competitive with No. 2 diesel.

ULSD is expected to be $0.07 higher than No. 2 diesel, thus any further increase in petroleum price or additional state incentives could make biodiesel competitive with pump diesel in the future.

Effect of Combined Federal and State Incentives

Using the state of Illinois as an illustration, it can be shown that a combination of federal and state incentives, in conjunction with a rise in petroleum prices, could make biodiesel competitive with diesel fuel.

Sales and use tax on the sale of biodiesel blends containing more than 10% biodiesel is zero. This sales tax rate, combined with the $1.00/gallon Federal Incentive, results in $2.50/gallon biodiesel, to be competitive with $2.00/gallon pump No. 2 diesel fuel per the following example:

Assume:	Rack Diesel Cost (Chicago)	$1.30/Gallon
	Biodiesel Cost (Chicago)	$2.50/Gallon
	Less Federal Incentive	$1.00/Gallon
	Net Biodiesel Cost (Chicago)	$1.50/Gallon

	No. 2 Diesel	B-2 Diesel	B-11 Diesel
Rack Diesel Cost (Chicago)	1.30	1.30	1.30
Net Biodiesel Cost (Chicago)		1.50	1.50
Net Blended Cost	1.30	1.304	1.322
Excise Tax	.467	.467	.467
Cost with $1.50 Margin	1.917	1.921	1.939
Applicable IL State Tax Rate	6.25%	5%	0%
Sales Tax Per Gallon	.12	.096	0
Net Gallon Price	$2.037	$2.017	$1.939

Marketers of biodiesel expect that the use of biodiesel will increase dramatically when pump price of No. 2 Diesel approaches the $2.00/gallon threshold.

Biodiesel Price Projector 2005-2006

The EIA Short Term Energy Outlook for March 2005 is forecasting the following average prices for crude oil and No. 2 diesel pump prices:

	2005	2006
WTI Crude Oil per Barrel[55]	$48.95	$47.05
No. 2 Diesel Retail	$ 2.04	$ 2.02
Federal & NYS Fuel Taxes	$ 0.47	$ 0.47
NYS Estimated Rack No. 2 Diesel	$ 1.57	$ 1.55
Projected Biodiesel Prices	$ 2.50	$ 2.50

In 2004, Biodiesel prices of $2.50/gallon in New York State reflected rack-diesel prices in the $1.47 to $1.62 area. Biodiesel prices in December of 2004 to March of 2005, were in the $2.65 area. The average price in 2004 for Biodiesel was $2.38, while rack-diesel prices ranged from $0.99 to $1.63.

DTN Reported Prices for March 11, 2005

Biodiesel in New York City is $2.65/gallon with a $1.00 Federal Tax Credit reducing blenders cost to $1.60/gallon. Rack No. 2 Diesel on the same report is $1.60. Crude oil is close to an all time record of $55/barrel.[56]

Projected Biodiesel Prices for 2005 and 2006

Agri Biodiesel	$2.40 - $2.60 per gallon
Biodiesel	$1.90 - $2.10 per gallon

[55]EIA Short Term Energy Outlook, March 2005, Table A4.

[56]Energy Management Institute, Alternative Fuels Index, March 10, 2005.

PROJECTED DEMAND AND SELLING PRICE OF BIODIESEL BY-PRODUCTS

Glycerine

The term glycerine is used for US products where the principal component is glycerol. The term glycerine is used for purified commercial products containing 95% or more glycerol.[57]

Of the three methods used to produce biodiesel, the base catalyzed transesterification of the oil with alcohol is the most commonly used due to economics. In order to produce glycerine and methyl esters or biodiesel, a fat or oil is reacted with an alcohol, such as methanol, in the presence of a catalyst. Next, the methanol is charged in excess to assist in quick conversion and recovered for reuse. The catalyst is usually sodium or potassium hydroxide and is usually pre-mixed with the methanol.[58]

High-quality glycerine that is derived from vegetable, animal origin, or synthetically is identical. Buyers for a number of years, however, have differentiated between vegetable- or animal-based glycerine. Recently, demand for vegetable glycerine has gained prominence compared to traditional forms of natural glycerine. For consumer products such as cosmetics and toiletries, a natural or vegetable origin product is seen as a positive promotional term. The contaminated beef products scare in Europe, and the resulting increase in public concern, has contributed to companies specifying vegetable or synthetic glycerine.[59]

Glycerine has more than 1,500 known end uses. The manufacturing process of many pharmaceutical, food and oral care products uses refined glycerine. Of the glycerine produced in 2001, 24% was used in food products; 23% in personal care products (including skin, hair, and soap products); 17% in oral care products (toothpaste and mouthwash); 11% in tobacco; 8% for polyether polyols for urethanes;

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[57]Economic Research Service, USDA, Industrial Uses, September 1996.

[58]National Biodiesel Board, Fuel Facts Sheet, Biodiesel Production.

.[59]Michael Heming, *Chemical Market Reporter*, PDG – HB International and the Economic Feasibility of Producing Biodiesel in Tennessee.

7% for drugs; 7% for miscellaneous (cellophane, explosive, and miscellaneous plasticizer, and humectant and lubricating uses); and 3% for alkyl resins.[60]

Gylcerine Use in New York. Determining the usage in the state of New York is very hard to ascertain. According to the most recently available Economic Census for New York State, the total value of shipments of soap and other detergents (including glycerin) in New York was $187.3 million, or roughly one percent of total US shipments of soap and detergents.[61]

Potential Market for Glycerine Products. Major worldwide applications for glycerine include drugs and personal care products, foods and beverages, tobacco, polyether polyols, alkyl resins, cellophane, and explosives.

The glycerine market saw a dramatic swing in market conditions during 1998 to 2001, and into early 2002, particularly in pricing. Supplies were tight in 2000; but by 2001, the global recession reduced demand in traditional industrial uses. Although 2002 started with glycerine prices at 25-year lows, supplies are now declining as a result of low biodiesel capacity utilization. As a result, the glycerine market is stabilizing.

US consumption grew at an average annual rate of 2% to 4% during 1998 to 2001, with strong gains in glycerine demand for personal care offset by declines in demand for polyether polyols and alkyl resins. Glycerine demand is expected to increase at an average annual rate of 2% to 3% for 2001 through 2006, reaching over 200 thousand metric tons by 2006.[62]

Current and Future Demand for Glycerine. Glycerine prices vary widely depending on supply and demand conditions. Annual average kosher-grade, refined-glycerine prices have declined steadily

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[60]Chemical Market Reporter and the Economic Feasibility of Producing Biodiesel in Tennessee.

[61]US Department of Commerce, Economics and Statistics Administration, US Census Bureau, Economic Census, "Soap and Other Detergent Manufacturing," 1997.

[62]*CEH Report*, Glycerin Abstract, March 3, 2004.

from $1.08 per pound in 1996 to $0.80 per pound in 2000 (See **Table 4.8** below, which shows a comparison of glycerine prices by type).[63]

Table 4.8 Glycerine Prices by Type

Glycerine Type	Price $/pound
Non-kosher 99.7% tank truck, bulk, delivered	0.6
Kosher 99.7% tank truck, bulk, delivered	0.66
Non-kosher 99.5% vegetable grade, FCC grade Tanks, delivered	0.6
99.5% liquid, USP, bulk drums, delivered	0.75
Synthetic, 99.7% tanks, delivered	0.8

Source: FCC – Food Chemical Code; USP – United States Pharmacipeia

Forecasted Selling Price for Glycerine. In an attempt to establish a price that a biodiesel facility would receive for the glycerine they produced, two biodiesel producers were contacted and asked what a conservative price would be if a new biodiesel facility were to go on line. The answer received from both was 10 cents a pound, 15 cents at the very most. This price is in line with conversations with officials of Peter Cremer Company in the summer of 2003 and in March 2004, that suggested if the US were to increase biodiesel production significantly, glycerine prices would be further suppressed.

Based on this information, 10 cents a pound was used as the price that a biodiesel facility would receive for glycerine products.

Potassium Sulfate

Potassium sulfate is a white, powdery, crystalline product with a bitter salt taste. It is soluble in water and insoluble in alcohol. Highly concentrated, with 50% potassium and 18% sulfur, potassium sulfate is virtually chlorine-free and has the lowest salt index among the potash fertilizers, as compared to potassium chloride or potassium nitrate.

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[63] Statewide Feasibility Study for a Potential New York State Biodiesel Industry, LECG, LLC dated January 7, 2004, p. 32.

Salinity levels in soil directly affect a crops' yield and quality. In irrigated systems, the detrimental effect of salinity is enhanced because the nutrient solution is applied close to the roots. Therefore, potassium sulfate is the recommended potash source for fertigated crops, especially in arid climates. Potassium sulfate is sold as fertilizer for crops requiring drip irrigation and crops that are sensitive to chlorine, such as tobacco and citrus fruits. It is also employed, to a lesser extent, in manufacturing glass and as a food additive.[64]

Potassium Sulfate Use in New York. It is difficult to project a market size for potassium sulfate in New York State. However, since 91% of potassium sulfate is used for specialty fertilizers on non-grain crops, including grapes and potatoes, a fair amount of potassium sulfate could be sold in New York State. New York State ranks third in the country behind California and Washington in wine and grape production.[65] New York State planted over 22,000 acres of potatoes in 2003.[66]

Potential Markets for Potassium Sulfate. Potassium Sulfate has a number of uses but is generally considered a specialty fertilizer. The breakdown of its uses is as follows: specialty fertilizer (non-grain uses, e.g. tobacco, citrus fruits, grapes, and potatoes), 91%; potassium supplement to animal feeds, 8%; and industrial applications (accelerator in gypsum board, flash suppressant in explosives and pharmaceuticals), 1%.[67]

Current and Future Potassium Sulfate Demand. Demand for potassium sulfates is dependent on the strength of the niche agricultural sector that requires chloride-free potash. The challenge for distributors of potassium sulfate is to convince agriculturists that potassium sulfate is worth the extra cost – as a fertilizer, it produces heartier yields than the more prevalent potassium chloride (MOP). MOP makes up 85% of the world potash market, selling for between $110 and $125 per ton, while

[64]Ercros S.A., web site: www.ercros.es/eng/dret/3product/agroquim.

[65]New York State Department of Agriculture & Markets, web site: www.agrmkt.state.ny.us.

[66]National Agricultural Statistics Service, web site: www.nass.usda.gov;81/ipedb/report.

[67]Web site: www.the-innovation-group.com/ChemProfiles/Potassium.

potassium sulfate sells for as much as $200 per ton. Based on historical data outlined in **Table 4.9**, growth through 2006 is projected at 1.8% per year.

Table 4.9 Potassium Sulfate and Potassium-Magnesium Sulfate (Historical Demand)

Year	Thousands of Short Tons	$/Short Ton
1997	820	190
1998	837	190
1999	844	200
2000	866	209
2001	879	209
2002	896	200

Source: Web site: www.the innovation-group.com/ChemProfiles/Potassium

<u>Forecasted Selling Price for Potassium Sulfate</u>. Based on the data contained in **Table 4.9** above, this report will use a selling price of $0.10 per pound for potassium sulfate.

Section 5

SITE-SPECIFIC PRELIMINARY PROCESS AND PLANT DESIGN

REVIEW OF PROCESS TECHNOLOGY SELECTED TO PRODUCE BIODIESEL

After reviewing various biodiesel processes, the Energea Umwelttechnologie GmbH (ENERGEA) biodiesel technology was chosen as the process technology for the proposed biodiesel facility.

ENERGEA, an Austrian based company, has completed a six-year research and development program culminating in the establishment of a 40,000 metric ton, continuous-flow refinery at Zistersdorf, Austria, owned by Biodiesel Raffinerie GmbH. The new Continuous Trans-Esterification Reactor (CTER) biodiesel technology, which is patented, was tested successfully in 1999. The first industrial-sized installation in Austria commenced production in the fall of 2001.

With its CTER technology, ENERGEA was successful in optimizing the conversion of biogenic fats and oils, a method known since the thirties. The significant advantage of this technology is the acceleration of the transformation process; within a few minutes, high-quality standardized biodiesel is produced from biogenic fats and oils.

The EU-Commission granted ENERGEA, and its research partners, 50% of 1,400,000 euros for a research program to develop and further improve the technology; and consequently, the cost-effectiveness of the biodiesel technology. The program started June 1, 2003.

<u>Advantages of ENERGEA CTER Technology</u>

1. The continuous conversion process saves space.
2. The CTER installation is made up of several industry container-sized frames.
3. Savings of up to 50% are possible in comparison to conventional technologies.

4. The use of multi-feedstock technology by processing used frying oils and animal fats.
5. Problematic waste materials are turned into precious raw materials.
6. Less energy is required due to the continuous process.
7. The oil for the biodiesel process must be degummed but not neutralized.

The biodiesel plant converts virgin or waste vegetable oil or animal fats into Fatty Acid Methyl Ester (FAME) or biodiesel. FAME is the main product, which after its synthesis, is washed in several steps. Some of the fuel parameters, such as Cold Filter Plugging Point (CFPP), oxidation stability, phosphorus and sulfur content, iodine number, and distribution of fatty acids, are dependent on the raw material and cannot be influenced by the process.[68]

Process Description

Transesterification. The fat or oil feedstock with a free fatty acid (FFA) content up to 5% is processed through a three-stage, continuous process using a pre-transesterification stage and a two-stage transesterification with the patented reactors in the process. Fats or oils with an FFA content in excess of 5% are pre-esterified. Following separation, the oil phase is processed through the transesterification module.

Fatty Acid Methyl Ester (FAME). Biodiesel product from the transesterification process is separated from the glycerine-soap phase and evaporated to extract excess methanol and water. The product is filtered, additives, and oxidation stabilizers can be added if necessary.

Process Recycling. The glycerine-soap phase is neutralized and separated. The fatty-acid phase is acid esterified to produce biodiesel product. Glycerine, methanol, and water phases are separated and concentrated through evaporation for recycling back into the process.

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[68] Energea Umwelttechnologie GmbH, Energea Biodiesel Processing Units, November 2003.

Potassium Sulfate. Potasium sulfate, a resulting by-product of the process, is purified and dried to be marketed as a fertilizer.

Crude Glycerine. The glycerine generated from the process is concentrated through evaporation and is marketed as a by-product. The glycerine product is approximately 80% pure.

PERMITTING AND ENVIRONMENTAL ISSUES

Air Construction Permit

The biodiesel manufacturing facility would be required to submit an air construction permit application with the New York Department of Environmental Conservation (NYDEC). The application would include potential emissions for the proposed facility including potential boiler emissions, storage tank emissions, fugitive emissions, and road emissions. Criteria pollutants would need to be modeled as directed by the NYDEC.

Wastewater Permits

The proposed biodiesel manufacturing facility will be required to apply for storm water and waste water permits through the NYDEC. The application would include the chemistry and dosage levels for the water treatment system proposed, including an assessment of water quality at the discharge point. An authorization for construction to proceed would be required from the State Pollution Discharge Elimination System (SPDES).

Section 6

FINANCIAL MODEL-COMMERCIALIZATION PLAN

COMMERCIALIZATION PLAN FOR A BIODIESEL PRODUCT

In general, there are two commercialization options available when considering the development of a biodiesel facility. One is to have an integrated facility where soybeans or other oilseeds are processed from New York State grown oilseeds into virgin oil and other co-products such as soybean meal. The virgin soybean oil could then be further processed into biodiesel and its co-products in an on-site biodiesel production facility. In New York State, this option is not feasible because of the lack of sufficient oilseed grown in the State. The second, and more practical option for New York State, is a stand-alone production plant where the facility purchases virgin oils and recycled fats and grease on the open market and has these products delivered to the facility for further processing into biodiesel and its co-products.

Research determined, based on price, supply, and availability of feedstock, the best combination of feedstock for a 15-million-gallon-per-year biodiesel facility in New York is as follows:

Feedstock	Amount (Pounds)	% of Total
Soybean Oil	57,855,000	50%
Yellow Grease	46,284,000	40%
Brown Grease	11,571,000	10%

ASSOCIATED RISK FACTORS

The commercialization of a biodiesel process involves inherent substantial risks that could cause the project to be non-profitable, or even lead to suspension of operations and possibly loss of investment in the facility. Outlined below are some of the major risks involved in the development and commercialization of a biodiesel facility.

Cost of Feedstock

Feedstock is by far the major cost in the operation of a biodiesel facility, representing 75% to 85% of the cost of operation. If the cost of feedstock were to increase substantially above historical averages, it would have a very negative financial impact on the project, creating substantial losses or even termination of the business.

Supply of Feedstock

If the supply of adequate feedstock were to be interrupted or terminated, it would force the facility to suspend operations, thereby having a negative financial impact on the facility.

Market for Biodiesel

If the demand for biodiesel were not to develop, or the supply of biodiesel were to saturate the market, the revenues generated by biodiesel sales could be substantially less than anticipated, thereby creating a negative financial impact and possible termination of the project.

Incentives

If there were not adequate government incentives, or if existing incentives for biodiesel production, such as the Federal Government's CCC 850 Program, were to be terminated or suspended, it could create a negative financial impact to the project and possibly cause the project to be terminated.

Distribution System

If an adequate distribution system is not developed to get the biodiesel to the customer, the demand for the product will probably be insufficient to justify continued operations.

Co-Product Demand

If the glycerine market becomes saturated due to increased glycerine production, the price received for glycerine will be less than projected, having a negative financial impact on the profitability of the facility.

INCENTIVES

While we have discussed various incentives, mandates, tax, and job credits in the report, the only incentive included in the following financial model is the USDA Bioenergy Program (CCC 850). The other incentives were not included to maintain negotiating leverage for the final site selected. See Pages 24-26 of the Financial Model (**Appendix 6-A**) for details.

SENSITIVITY ANALYSIS

Table 6-1 Financial Model - Biodiesel Prices vs. Feedstock Cost

	Biodiesel Price per Gallon								
$(000's)	1.85	1.95	2.05	2.15	2.25	2.35	2.45	2.55	2.65
Feedstock Cost (Blended per lb.)									
0.156	2,251	3,759	5,267	6,775	8,283	9,791	11,299	12,807	14,315
0.168	862	2,370	3,878	5,387	6,895	8,403	9,911	11,418	12,927
0.1799	(526)	982	2,490	3,998	5,506	7,014	8,522	10,030	11,538
0.1895	(1,625)	(117)	1,391	2,899	4,407	5,915	7,423	8,931	10,439
0.1975	(2,551)	(1,043)	465	1,973	3,481	4,989	6,497	8,005	9,513
0.208	(3,824)	(2,316)	(808)	700	2,208	3,716	5,224	6,733	8,241
0.2181	(4,923)	(3,415)	(1,907)	(399)	1,109	2,617	4,125	5,633	7,141
0.2276	(6,022)	(4,514)	(3,006)	(1,498)	10	1,518	3,026	4,534	6,042
0.2361	(7,122)	(5,614)	(4,106)	(2,597)	(1,089)	419	1,927	3,435	4,943

Note: In-house Calculations

Other sensitivities were run as follows :

Capital Costs:	Base Case IRR:	20%
	+10% EPC Cost:	18%
	-10% EPC Cost:	23%

Biodiesel Sales Price:	Base Case IRR:	20%
	+5% Biodiesel Price:	28%
	-5% Biodiesel Price:	9%
Brown Grease Cost:	Base Case IRR:	20%
	+5%/-5%	negligible
Yellow Grease Cost:	Base Case IRR:	20%
	+5%/-5%	negligible

SUPPORTING INFORMATION

In preparing the commercialization plan, a multitude of sources were accessed and referenced. The majority of these sources have been footnoted throughout the text of this document, while others may be referenced in the text of the document itself. Listed below are the sources used in establishing the information that makes up the financial model for this commercialization report:

Various biodiesel feasibility studies and reports
United States Department of Agriculture (USDA)
National Agricultural Statistics Service
United States Department of Energy (DOE)
United States Census Bureau
United States Department of Commerce
National Biodiesel Board
New York State Department of Agriculture
Ercros S.A.
The Innovation Group
SRI Consulting
Soya & Oilseed Handbook
Chemical Market Reporter

Methanex

National Renders Association

Darling International

Bunge

Peter Cremer

Ag Processing

Stetson Chemical

Norfalco

Linweld

Jacobsen Publishing

The information garnered from these sources was obtained from written reports, websites, or in telephone calls with representatives of the various organizations.

Section 7

RECOMMENDATIONS

PROJECT FEASIBILITY

Profitabilty

The biodiesel plant is expected to average approximately $35 million in sales revenue per annum over the ten years following plant startup. Net income is expected to average $3.2 million per year, an average net margin of 9.1%. Cumulative revenue and net income over the ten-year period are $363.4 million and $35.7 million respectively. On a cash basis, the project will yield a 20% internal rate of return based on a conservative 60/40 leverage ratio.

Possible State Incentives

Any initiative by the State of New York towards the promotion of biodiesel production will have a positive economic impact for New York, as well as for the country. Some of these are:

- Create jobs and enhance economic development;
- Create expanded agricultural markets;
- Reduce reliance on foreign energy sources;
- Improve trade balance; and
- Help address environmental issues (tailpipe emissions).

Mandate. A 2% biodiesel mandate on all transportation diesel fuel sold would create a biodiesel market in the state of New York of approximately 19 million gallons. If this mandate were applied to other No. 2 distillate fuels, the market would be substantially larger.

Incentive. An incentive similar to one in the state of Missouri, where producers are eligible for a total grant of $0.30 per gallon for the first 15 million gallons of qualified biodiesel produced, should be enacted.[69] This grant would have to apply to biodiesel made from yellow and brown grease, as well as oils produced from agricultural products.

Possible Federal Incentives

USDA Bioenergy Program. The USDA Bioenergy Program (CCC 850) is the only incentive included in the financial model. Under the Bioenergy Program, the Commodity Credit Corporation (CCC) will make incentive payments to bioenergy producers who increase their purchases of agricultural commodities over the previous fiscal year's purchases and convert the commodities into increased bioenergy production. (See pages 24-26 of the financial model under Subtask 6.4 for details of how this program affects the financial model).

HR 4520. On October 22, 2004, President Bush signed into law HR 4520, also known as the American Jobs Creation Act of 2004.

HR 4520 provides a biodiesel tax incentive which is structured as a Federal Excise Tax Credit. The credit amounts to a penny per percentage point of biodiesel blended with petroleum diesel for first use oils, such as soybean oil, and a half penny per percentage point for biodiesel made from other sources, like recycled cooking oil. The tax credit will lower the cost of biodiesel to consumers in taxable and tax-exempt markets.

The incentive is expected to increase biodiesel demand from the estimated 30 million gallons in 2004 to 124 million gallons per year based on a United States Department of Agriculture study.

The tax incentive will take effect January 1, 2005, and lasts for two years.

EPA Regulations. While not an incentive, two EPA rules will have a positive impact on the production and use of biodiesel. These are: 1) EPA Sulfur regulations that will require the reduction of sulfur emissions from *on-road* vehicles from 500 parts per million (ppm) to 15 ppm in 2006; and,

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[69]Missouri Revised Statutes: Chapter 142, Motor Fuel Tax, Section 142.031.

2) EPA sulfur regulations that will require the reduction of sulfur emissions from non-road vehicles in phases. Phase I becomes effective in 2007, and requires sulfur emissions to be reduced to 500 ppm (excluding industrial boilers, home heating, and aircraft). Phase II becomes effective in 2010, and requires sulfur emissions to be reduced to 15 ppm (same as on-road level).[70]

Tax Credits, Job Credits, and Business Incentives

Nearly all taxes in New York State have been cut in recent years, with substantial reductions achieved in business, estate, sales, property and personal income taxes. New York State now has one of the lowest corporate income tax rates in the Northeast.

In addition to lower taxes, New York State offers a variety of incentives[71] to companies expanding or relocating in the Empire State. These include:

- Investment Tax Credit (ITC): Businesses that create new jobs and make new investments in production property and equipment may qualify for tax credits of up to 10% of their eligible investment. New businesses may elect to receive a refund of certain credits and all unused credits can be carried forward for 15 years.

- Research and Development Tax Credit: Investments in research and development facilities are eligible for a 9% corporate tax credit. Additional credits are available to encourage the creation and expansion of emerging technology businesses, including a three-year job creation credit of $1,000 per employee and a capital credit for investments in emerging technologies.

- Sales Tax Exemptions: New York State offers exemptions for purchases of production machinery and equipment, research and development property, and

[70] Statewide Biodiesel Feasibility Study Report, The Mississippi BioMass Council.

[71] New York Web Site: www.nylovesbiz.com/Tax_and_Financial_Incentives/Taxes_and _Incentives/default.asp.

fuels/utilities used in manufacturing and R&D. Other exemptions may be available through local Industrial Development Agencies (IDA).

- Real Property Tax Abatement: To encourage development, expansion, and improvement of commercial property, a 10-year property tax abatement is available to offset increased assessments due to improvements to business and commercial property.

- No Personal Property Tax: Unlike many other states, which tax both real property and personal property, property taxes in New York State are imposed on real property only. Personal property, whether tangible or intangible, is exempt from state and local taxes.

- Economic Development Zone/Empire Tax Credits: New York State has designated 66 zones as Economic Development Zones/Empire Zones (EZ), which offer a host of benefits. These include discounts on electricity, enhanced tax credits for investment and job creation, and additional sales and property tax exemptions. The 2002 State budget expanded this highly successful program by allowing the designation of new zones – bringing the total to 72 Empire Zones across New York State.