Biofuel Development in New York City and the Mid-Hudson

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ABSTRACT

Biofuel and specifically biodiesel (BD) used for transport or space heating offers significant environmental and economic benefits as a green 'niche' fuel capable of production throughout the Northeast U.S. Biodiesel use is particularly beneficial given the region's reliance on heating oil (88% of oil heat in the U.S. takes place east of Pittsburgh and north of Washington, DC.) The advantages of BD over methanol/ethanol follow from its positive caloric value and the inherent efficiencies of diesel over internal combustion engines. Given increased transport costs for fuel inputs from both the U.S. Midwest and offshore sources, a combination of waste vegetable oil (WVO) feedstocks and regionally suitable cool weather crop production using water-borne transport such as the Hudson River could potentially revivify regional agriculture while providing a secure and sustainable supply of BD stocks for urban as well as non-urban uses.

This paper outlines the role of BD in sustainable development and certain initial considerations that could frame a networked system of production and processing benefiting New York's agricultural producers and generating crops and byproducts (meal from soybean crushing, etc.) for both local and 'downriver' use. Though a number of ethanol plants are under development or in planning stages in New York, ethanol will serve primarily as a fleet or vehicle fuel and will enter a national distribution chain: it (ethanol) offers negligible benefits for the agricultural sector or for space heating in residential, commercial or institutional settings. Selection and adoption of proven small-scale refining technologies currently utilized in the European Union could also generate new manufacturing and distribution jobs in New York State, where the Upstate economic terrain has long been desperate for new and sustainable employment opportunities offering a livable wage. New York production of crushing equipment is another avenue for growth, as a local New York entrepreneur now seeking farm-scale crushing equipment can choose from Brazilian, Chinese or European equipment- little is produced (or licensed) within in the U.S.[1]

Biodiesel and Sustainable Development

This paper outlines and discusses the range present trends that both expand and constrain the development of a biofuel industry in New York State. Keeping in mind this conference's theme of 'Improving competitiveness, adapting to volatile markets while dealing with global trends and environmental constraints', such a review of current biofuel initiatives can hopefully advance the overall discussion of whether this 'green' economic activity can promote a sustainable economic sector that benefits the environment and new enterprises that could generate activity and livable wage jobs.

The paper focuses on biodiesel (BD) to the exclusion of ethanol, for several basic reasons. First, diesel (and BD) has a caloric value per volume roughly 2X that of ethanol.

[1] Communication with Jason Masters, Pres., Northern Biodiesel, Inc., December 2006.

Second, as a fleet fuel in autos and light trucks, ethanol (and methanol) primarily fuels internal combustion engines, which are 25-35% *less* efficient than diesel engines. Third, many fleet vehicles (buses, construction vehicles, agricultural machinery, etc.) and physical plant facilities rely largely on diesel and distillate fuels: in New York this offers a unique opportunity for BD fuel development. Fourth, BD can take in a wider range of feedstock sources *capable of production in New York State*, including waste vegetable oil and a wide range of cool weather crops in addition to soybeans. There will clearly be efforts and industrial investment and development of ethanol as a biofuel for vehicle use by New Yorkers, but this paper presents the argument that the primary focus of a new biofuel industry in New York should focus on BD production and use in light of the factors outlined above: ethanol production has been highly visible, publicly and nationally promoted and hugely subsidized- it is, in fact, a hugely subsidized method for brewing 'weak beer'. The focus of the paper on New York City and the Mid-Hudson region is one attempt to examine the linkages and connections between New York City, the locus of significant demand for oil potentially served by biofuels and the Mid-Hudson, the locus of potentially nearby supply for a portion of that biofuel that could serve proximate urban and small community markets.

The increasingly visible national and global trends in biofuel use confirm large-scale shifts in production that parallel increasing market volatility throughout the industry. In the U.S., corn-based ethanol production has literally exploded, with year-on-year increase projected for 2007 to be the largest in over 60 years. The estimated 'lag' in reporting of plants under construction or planned recently led the Earth Policy Institute to challenge current USDA demand projections of 60 million tons of corn, instead projecting actual overall demand at 139 million tons. This figure represents roughly equal *half* the 2008 harvest, providing 15 billion gallons of ethanol, a seemingly large number but merely 6 percent of U.S fleet vehicle needs[2]. As the current decade-high rise in corn prices drives farmer planting decisions toward corn and away from soybeans and other food crops, this rise in corn production toward ethanol also removes cropland from wheat and soybeans with direct impact on prices for a range of food products reliant upon corn or corn syrup as an input from cereals, eggs, poultry, beef and yogurt to milk.[3] Overall price volatility in the global food system becomes increasingly likely whenever global supply drops below 60 days for a given commodity: commodity prices for a bushel of corn and a barrel of oil follow similar patterns in this regard. Recent events this past March around the 'international market for ethanol' proposed by the Presidents of Brazil and the U.S. reveals a supply chain moving increasingly offshore and characterized by industrial-scale cultivation that increasingly affects Third World economies and environment and carbon emission levels of Brazil, Indonesia and other targeted production centers.

Large-scale subsidies for ethanol are not solely the work of agricultural and farm interests, for Detroit's 'Big Three' automakers have also been closely involved in pressing for biofuel regulations for vehicles utilizing a mix of 85% ethanol (E85) achieve higher mileage than cars using straight gas: such conversions are a minimal cost for auto manufacturers, while allowing two fuel-inefficient cars for each so-called 'hybrid'.[4] Such convoluted intervention in the market (and in physics) stands in stark contrast to the clear potential for an across the board increase in CAFÉ (Corporate Average Fuel Efficiency) that would obviate the need for ethanol at

[2] 'Distillery Demand for Grains to Fuel Cars Vastly Understated', Earth Policy Institute, Jan. 4, 2007.
[3] 'Food Prices to rise as biofuel demand grows', Kevin Morrison, Financial Times, Mar. 5, 2007.
[4] 'Ethanol Subsidies Threaten Michigan's Food and Farmers', Viewpoint by Kenneth Dahlberg, Professor Emeritus, Western Michigan University.

a (much) lower public cost. The emerging pattern of biofuel energy development is not sustainable, but represents a market-driven shift in production to somebody else's arable land base. Well meaning but inconsiderate goals and mandates for a certain percentage of contributions from biofuels are generating public responses from a wide range of environmental, pubic policy and governmental figures[5]. Overall trends in production and environmental impact at the global scale frame the development of a BD market in New York State, for these crop-based inputs are both internationally traded commodities and sought-after inputs for local and regional industrial development by New York producers. A careful examination of the path toward sustainable biofuel use for New York State takes place in a built environment and a society heavily committed to certain patterns of resource use, with the adaptability of markets often quite constrained by the special interests involved.[6] Put simply, our economy and society represents a big ship with a high moment of inertia that we are being called upon to turn within the next dozen years, as that is all the time we have.

The question of whether sustainable development can be market-based is a pressing and critical one that has generated an increasingly engaged public debate around measures as local communities, governments and world organizations try to deal with global warming and the challenge of motivating investors and 'moving the market'. Given the almost total absence of conscious energy policy at the Federal level, current government initiatives within New York State (Governor Spitzer's '15 by 15 Plan' to reduce greenhouse gases (GHG) 15% by 2015) and New York City (Mayor Bloomberg's '30 by30' goal, released on Earth Day 2007 as part of a plan to cut the City's GHG emissions by 2030) can jumpstart such innovation and investment, a posture proven by California's longstanding role in reducing energy use throughout that State's substantial economy.

Obeying the Second Law

Though we view our economic activity as dynamic and highly productive, according to The Second Law of Thermodynamics (the entropy law) all such 'production' is really 'consumption' that contributes to a constant increase in global net entropy (disorder): this Law emerges as the ultimate regulator of economic activity, leading to a definition of sustainable development as "development that minimizes resource use and the increase in global entropy".[7] If we're to develop a New York State-based biofuel industry that adheres to the rules, we must begin by admitting that most, if not all biofuels are slightly better (less carbon dense) than petrol but are not in fact 'carbon neutral' and further that minimizing resource use means attention to both life cycle costs in production, distribution and end use efficiency and attention to 'sunshine limits'.

The reality of 'sunshine limits to growth' in the world's food supply should be kept in mind throughout this and future discussions around the potential for biofuels. William Rees importantly cited a thermodynamic analysis of food production that estimated that about 900 square meters (~ .1 hectare) of cropland is required to produce the average per capita food energy requirements assuming year round cropping. With an average growing season of 180 days, each

[5] 'Dutch to Consider tough biofuels criteria', Arthur Maz, Associated Press, April 26, 2007 as reported in The Boston Globe.
[6] 'Environmental Scarcity and Global Security: Headline Series, Thomas Homer-Dixon, Foreign Policy Association, New York, 1993.
[7] William Rees, University of British Columbia School of Community & Regional Planning

hectare of agricultural land can therefore theoretically support about 5.5 people. As the present, the world population density is about 3 persons per arable hectare, so we are therefore within one population doubling of this 'sunshine limit' to growth and at present rates of population growth will come up against that limit in 35 years. Rees's article appeared in *The Ecologist* in 1996[8], with the analysis cited in his paper drawn from 1986, so *1986+35 years= 2021*. When the same area of cropland needed produce a tankful of pure ethanol for an SUV (450 lbs. of corn) contains the same number of calories that can feed a person for one year[9], can we ethically make policy decisions regarding fuel supply that effectively compromise our capacity to grow food? The biosphere within which all life takes place, interacts and flourishes is an environment of quite close tolerances, a layer around the earth at the scale of the peel to an apple: the room for maneuver (and miscalculation) isn't very big. Looking at the ethanol question from another perspective, a 'non technical' policy change that increased the portion of vehicles nationally that used diesel to EU levels (50% or more for autos, with current U.S. use at ca. 3-4%) would immediately improve that part of the fleet's fuel efficiency by roughly 30%, help reduced demand and allow biofuels in general and BD in particular to make a larger overall contribution to overall fuel demand at both New York and national levels.

Supply and Demand

Studies continue to demonstrate both that it's impossible to 'grow' our way out of a reliance on petroleum fuels and that the exclusive (and delusional) focus by the current administration in Washington on supply and a solution to 'energy dependency' based on new crops, technical innovation and global cultivation cannot resolve our domestic energy situation. While the most recent State of the Union address hiked the goal for alternative fuels to 35bn gallons in 2017, a multiple of the 7.5bn gallon target in the 2005 Energy Act[10], scientists from Europe to South America find such a supply-driven focus akin to a 'dog chasing a car down the block. With 540 million autos worldwide (2002) and vehicle use growing at 2X population rate, the overall projected increase in auto-based demand represents a figure that no amount of biofuels (or petrol stocks) can ever sustain. In China alone, auto ownership is projected to grow from 25 million cars (2005) to exceed U.S. auto ownership at 200 million autos before 2025![11] Offshore demand for fuel feed stocks from China, India and elsewhere- both petroleum and plant-based- directly affects the viability and potential for BD industrial development in New York as these products continue to be traded and exported on a worldwide scale.

Why is this important for a New York-based biofuel industry? Securing fuel feed stocks while reducing demand from both national and New York measures and policies can take advantage of broad-based and community- focused practices that temper demand and reinforce 'daily practices' by large numbers of households to aggregate savings in a measurable way. We're often unaware of the massive scale of our state and national economies as our day-to-day existence takes place within it, and we often miss how such seemingly small measures adopted widely can make a measurable difference. Past responses to resource scarcity has traditionally found leaders seeking new supplies and technical innovation: now, real action on the demand

[8] 'The Ecology of Sustainable Development', William Rees, *The Ecologist 20*: 1, pp. 18-23, 1990.
[9] 'How Biofuels Could Starve the Planet', C.F. Runge & B. Sanauer, *Foreign Policy*, May/June 2007.
[10] 'Why worries surround rural America's biofuels surge', K.Morrison & Doug Cameron, Financial Times, March 26, 2007.
[11] Goldman Sachs/Economist in 'China car firms gear up for booming sales', BBC Mar. 25, 2007.

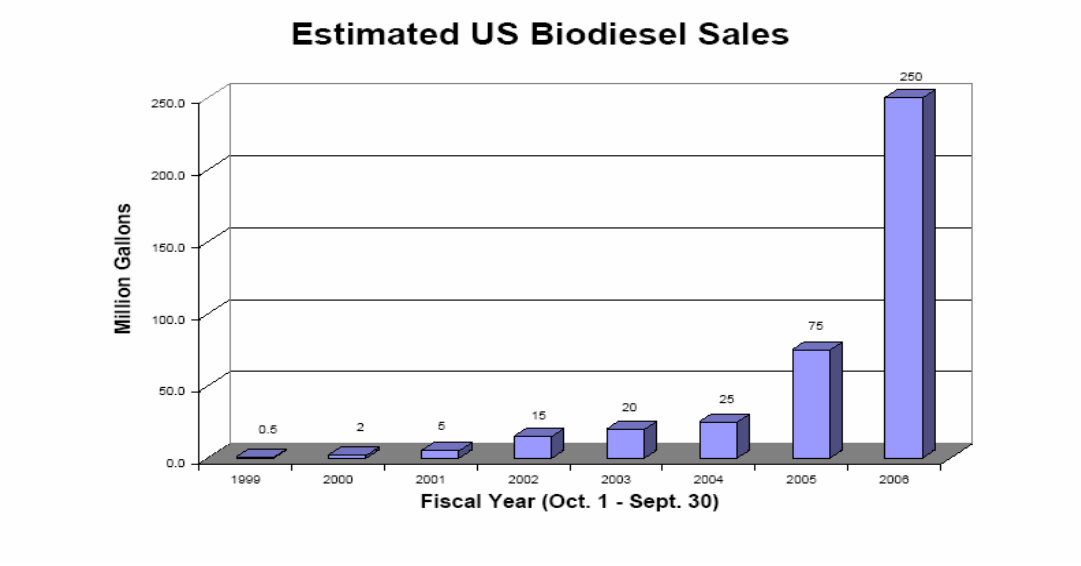
side of the scarcity equation becomes crucial. [12] In Fall 2005, public perception of oil shortages from the back-to-back hurricanes and the resulting drop in oil production in the Gulf of Mexico led to a brief but measurable drop in oil use of 1 million gallons/day. Citizens are fully capable of 'reading' such signals and of responding, especially when there is leadership around the issue. During the California 'energy crisis' in 2001, State leaders made a public declaration that overall utility demand needed to drop by 6%- during that summer, residents cut demand between 9 and 14% from June through August of that year. To cite another example, it's known that fully 18% of all tires on America's trucks, vans and cars are under inflated and that proper pressure in every tire could *immediately* yield annual savings equal to what may lie under Alaska's North Slope. To verify this point, Carnegie Mellon students recently examined a student parking garage on the campus and in fact found that the 81 parked cars there had under-inflated tires (yes, 18% of the total), with each car burning 144 extra gals/year. The annual parking garage's Σ savings= 11.670 gals. or 1.8T Carbon.[13]

Situation and Location of New York State

New York has been a center for water-borne commerce from the early growth and development of New York City and its harbor to the Erie Canal (1828) and St. Lawrence Seaway (1959). Examining New York's access to biofuel supplies, domestic grain crops historically landed in Buffalo (the architecture of massive grain elevators still remains), and the Port of Oswego on Lake Ontario is now seeing increased trade in soybeans, mainly to Quebec for processing. For both major biofuels- ethanol and BD, the source remains the Midwest with few operating bio-refineries east of Illinois. Corn-based ethanol production in New York relies on imported feedstock with the Fulton ethanol plant's drawing 75% of its feedstock outside New York [14]. By energy efficiency (and delivery cost) water, then rail then road are the modes of transport and there is increased 'sourcing' of feedstocks such as soy oil into New York harbor by barge from Mid-Atlantic states (Maryland, Delaware and Virginia). Unless com-parable development of biorefineries in those states and Pennsylvania draw down sources for new plants, BD feedstock 'sourced' from Mid-Atlantic producers and delivered by barge will offer comparative advantage over Midwest supplies and rail delivery.

Though fleet provides the largest demand for biofuels, New York is in a unique situation to use BD for space heating: fully 88% of oil-fired space heating in the U.S. takes place in the Northeast, east of Pittsburgh and north of Washington, DC. In New York City, approx. half (or 1.96 million) of all dwelling units (apartments and homes) rely on oil for space heating [15]. A rough benchmark of 700 gals/apartment/ year[16] trans-lates into a total heating fuel demand for NYC dwellings that would require *266 million* gallons of 'neat' BD (B100) blended as B20 (20% soybean oil blended with #2 heating oil) or *133 million* gallons of B100 as B10: either figure representing a significant portion of estimated U.S. production of BD in 2007 of ca. 864 million gals[17].

[12] Ibid., Thomas Homer-Dixon
[13] Steinbrenner Institute for Environmental Education & Research, Carnegie-Mellon Univ., Pittsburgh, PA.
[14] Conversation with Public Information Officer for Fulton, NY project, Spring 2006.
[15] Housing Vacancy Survey, NYC Dept. of Housing, Preservation & Development (NYC HPD), 1997.
[16] Personal communication, Dick Koral, Apartment House Institute, NYC Technical College.
[17] 'Corn Exchange to Make Biodiesel from Animal Fat', Financial Times, April 19. 2007.



Source: National Biodiesel Board, 2007

Even with projected growth in production, in 2007 BD production will equal only 1/6 of domestic ethanol production levels. Beyond residential demand, institutional use (hospitals, universities and large coop complexes) also demand #2 as well as heavy distillate (#6) oil that can be blended into BD at levels up to B20. In addition to residential usage, large institutions from hospitals to universities are potential users: the NYC Housing Authority alone uses oil heat for 80+% of its 170,000 units and many large complexes have dual fuel or 'interruptible service' and switch from natural gas to oil when the temperature goes below 15ºF. These facilities present the basis for a program using BD for institutional heating power generation fuel.

Perhaps the most promising benefit of BD use in the New York metropolitan region is an environmental one: the Clean Air Task Force in its February 2005 Report [18] found that sulfur generated by use of home heating oil will continue to grow even with tightened vehicle and power plant emission standards: the report shows that New York City has the third highest death rate- at 25 per 100,000 people from diesel fine particles- just behind the refinery centers of Beaumont, Texas and Baton Rouge, LA. While asthma rates within NYC have decreased overall, childhood rates remain well above national rates (5.4 per 1000 vs. 3.1), especially in poor communities in Harlem, The Bronx and Brooklyn. Home heating system oil exhaust contains between 2-3,000 ppm of sulphur, well above the new 15ppm vehicle standards. Recent lab tests by a biorefinery in New York harbor[19] showed 'neat biodiesel (B100) that blended at 20% (B20) with #6 heating oil yields a blend with <270ppm sulfur, measurably below the levels for #6 and of clear benefit in a region where 104,000+ tons of sulfur were generated (2002): in 2004, home heating produced almost as much SO2 (11,321 tons) as did power plants (12,184 tons).

In the public health realm, diesel use by school bus fleets presents an immediate opportunity for mitigating pollution at the curb and during operation: numerous studies continue to show that the poorly sealed buses can have higher pollution levels *inside* the bus than out [20]. Despite a better than average 'grade' (B), New York State's school buses still emit 60% more

[18] 'Diesel and Health in America', Clean Air Task Force, February, 2005.
[19] Fuel:Bio, Inc., Elizabeth, NJ. Field visit and discussion with corporate officers Spring 2007.
20'Vehicle Self-Pollution Intake Fraction: Children's Exposure to School Bus Emissions', J.Marshall and E. Behrentz, UC Berkeley and UCLA, respectively, Amer.Chem.Soc. 2005/

soot per mile than a tractor-trailer, and students spend 1/2 day per week going to and from school. [21]

Optimizing Biofuel Development in New York

In New York and nationally the emerging BD industry grapples with issues of scale and transport, cultivation, land suitability and processing: many of these concerns are particular to biomass-based fuels. This means we need to assess the overall suitability of arable land for production, the advantages and disadvantages of our physical location, and the present level of infrastructure and development. Production is taking place in a new environment of energy policies and tax benefits: for residential homeowners (and cooperative owners) that can reduce the overall cost of greener niche fuels. A snapshot of BD development efforts mid-2007 in New York as well as new perspectives on production and refining is summarized below to highlight the range of efforts underway and the potential for new breakthroughs and innovation.

There is increased activity by biofuel suppliers and refiners statewide, with blending operations operating in Albany and similarly scaled blending under development in Long Island (Oceanside) and in NYC. Several refiners are planning new projects in Brooklyn (Newtown Creek) and in NY Harbor (Fuel:Bio in Elizabeth, NJ which opened on May 4, 2007). From late 2005-07, the number of fuel dealers offering B20 as a heating fuel has grown from 2 to over a dozen. [22] The present small scale of BD production in New York State has been partly attributed to the presence of only one soybean processor, a situation requiring 80% of all New York State's 7.9 million bushels of soybeans to be exported for processing, then imported in the form of meal for animal feed and BD.[23] The 6 ethanol plants presently under development will generate a substantial increase in dried distiller grains, but farmers will require a higher quality meal, which may lead to increases in soybean and canola production. Looking to a higher producing oilseed, farmers may select canola *if* there's a guaranteed takeoff for the oil. Cornell Coop Extension and Northern Biodiesel have proposed providing small scale processing on-farm, to show potential for meal production and sale/use of the oil; BD production in the U.S. has been predominantly soybean-based (in the EU, primarily rapeseed (canola)). Soybeans are the #1 U.S. export crop, outdistancing corn: while New York holds the middle rank (25th of 50) in state production, the potential for other cool weather crops should be more fully investigated. In Colorado, the 'Blue Sun B20' BD brand utilizes a mixture of flax-, rape- and mustard seed, with B20 profiles for 3 of 4 main pollutants (CO2, particulate and Sox) much better than soy-based BD.[24]

Refining utilizing waste vegetable oil (WVO) is a clear resource in institutional and urban settings where the economies of collection and processing can be used. A 2005 study by Cornell Cooperative Extension/New York City [25] to assess the volume and nature of WVO in Brooklyn had two primary findings. First, the potential supply of WVO generated by retail food businesses in Brooklyn alone was estimated at 1.65 to 1.82 million gals annually; second, over 90% of that WVO amount is being 'taken off' by renderers and processed for animal feed and

[21] National Pollution Report Card Find NY School Buses 'Above Average', Union of Concerned Scientists/ National Lung Association press release, May 24, 2006.
[22] Time sensitive B20 dealer/supplier list available from author.
[23] 'Increasing Biomass to energy production via Small-scale, Farmer-operated Oilseed Crushing', proposal to NY State Energy & Development Authority (NYSERDA) in response to PON 1073, Jan. 2007, J.Masters, J.Nettleton and C.Kyle.
[24] Communication with Blue Sun B20 staff, Spring 2007.
[25] Study available from author or Cooperative Extension/NYC webpage, http://nyc.cce.cornell.edu.

related industrial uses. Given a change in price and/or market, these regional rendering companies- most located on the waterfront in New York Harbor, represent potential biorefinery operators in their own right. Following this study, a 3 million gal./year biorefinery is under development by Tri-State Biodiesel in the Red Hook district of Brooklyn, using waste vegetable oil (WVO) as its primary feedstock.

The relatively high truck-borne transport costs (relative to rail and water-borne freight) for a biofuel feedstock and the correlated need to provide meal byproduct to local agricultural users has resulted in a scale around 50 million gal/year and with truck-based feedstock collection within 30-45 miles;

Interest in/demonstration of on-farm processing may yield a model where dairy operations in the 500 acre range can grow their own soybeans, crush and sell or use the oil and control feedstock costs for their herds[26];

With WVO as a feedstock, many small town/city facilities (Community Colleges, hospitals, congregate care centers, etc.) can potentially use locally-produced BD from cafeteria/restaurant WVO for onsite power generation[27], while in Brazil, modular generators take in nearby BD feedstock[28];

Large institutional such as community colleges and State University (SUNY) units to public agencies (State Corrections Department, etc.) could utilize their own cafeteria-generated waste vegetable oil (WVO) supplies to generate BD feedstock for their facility generation and fleet uses: the largest domestic organization producing BD from WVO is the US Marine Corps, which recycles mess hall WVO directly into the non-combat vehicles in motor pools throughout the U.S. and oversees- they produce and reuse over 1 million gals./year. [29]Campuses with land-based resources could lease vacant land to produce field crops for BD production. On a larger scale, the NY State Thruway Authority has control over 600+ miles of right-of-way: this accessible land planted in canola could potentially yield ~1 million gallons of BD annually, assuming double cropping and an average available ROW of 100ft.

Inauguration of the Regional Greenhouse Gas Initiative (RGGI) with state allowances of carbon credits provided in 2009 provides further impetus for application of BD as a heating and power generation fuel: Taken together, power plants in the region including New York City and Long Island emit a total of 20.5 million tons of carbon annually[30], and blending of BD with all grades of oil used for heating and power generation opens the possibility for large-scale introduction of BD throughout the building and utility industry. Last year's New York Power Authority (NYPA) test runs at the Polleti plant, an 885mw generating station in October 2006 successfully introduced BD starting at B5 and going up to B20[31]- such plants burn 80gals/mw/hour, an indication of the market and the potential for reduction of particulates and other pollutants and bodes well for equally large-scale use of BD for space heating, with

[26] Proposal to PON 1073, Ibid.
[27] Presentations by Cornell University Professors Norman Scott and Larry Walker, NY Association of Energy Engineers, October 17, 2006, available from AEE website, http://www.aeeny.org.
[28] Conversation with Ray Hensen, Ag Marketing Resource Center, Iowa State University in Chicago, Illinois, December 5, 2006.
[29] National Biodiesel Board (www.nbb.org) press release.
[30] 'When Carbon is Currency', Hannah Fairfield, New York Times, May 6, 2007.
[31] 'NYPA Tests Feasibility of Using Biofuel at Queens Power Plant for Green Energy', NYPA press release, Nov. 6, 2007.

apartment buildings along with large institutional users (universities, medical centers and public buildings).

These and similar issues of fuel selection and production must be addressed via sustainable polities, plans and education, keeping in mind that biofuels including BD are not inherently 'green' or sustainable. Such fuels must earn their 'green stripes' via a rigors a life cycle cost analysis addressing efficient production, distribution and end use. Growing corn for ethanol to add to the tank of an SUV violates the Second Law. The controversy and debate to date has centered on the cultivation phase as to whether ethanol have better input/output profile when compared with biodiesel and or other fuels, especially petroleum, etc. is beside the point. While the recent studies show a slight net energy gain from both crops, when one factors in fertilizer, national transport and other inputs the score drops, especially for biofuels utilizing a 'heavy feeder' like corn. Recent (and promising) research on regionally produced and utilized biofuels as opposed to international commodity trade in a given crop involves low-input high diversity grassland biomass: using such native grassland perennials has shown yields 238% above monoculture(s) after a decade via a design mimicking prairie ecology and utilizing degraded lands to move biofuel production away from competition with food production.[32] Once again, locally based and diverse supply can be sustainable, while monoculture industrial production is inefficient and unsustainable.

Summing Up: Mid-Range Projections for Biodiesel in New York State

In the near-term (5 years out), the following trends deserve attention and promotion in order for a truly sustainable BD industry continues to develop in New York State. BD can, when produced and distributed on a regional and attentive scale, emerge as a positive and 'green' niche fuel that provides measurable health and environmental benefits and particularly in urban communities of color where asthma rates are the highest and environmental concerns most pressing. Such medium-scale production and use can also maximize employment throughout all phases of production from cultivation and pressing to blending and community-based use. Though BD and biofuels overall do not represent a "magic bullet", these fuels can contribute to a sustainable economy when reduced and carefully managed demand for transport, space heating and power generation are included I the mix of policies and programs.

The balance between demand and supply needs to constantly be in the forefront of investment and development decisions. What do we need to look for? Field research and tests to demonstrate the potential for an increase in on-farm production of crops for BD applications is a first step, using locally grown livestock feed and accompanying the production program with State-level support for investment in processing to retain New York's soybean crop and use both feed and seed oils for in-State use. Even as NYSERDA has provided R&D dollars, there has been a decade long 'disconnect' between early research and any accompanying economic funds for commercialization of the resulting innovations and technologies. At the land grant university level, the need to both field test and then evaluate 'cool weather' crops suitable for NY should include the complete range of cool weather crops to include canola, flaxseed and mustard seed and many others (castor bean) that may offer small- and medium-scale agricultural producers a menu of alternative cash crops for non-prime land.

[32] 'Carbon-Negative Biofuels from Low-Input High-Diversity Grassland Biomass', D.Tillman, J.Hill and C.Lehman, University of Minnesota, Science, Vol. 314, 8 December 2006.

What can we look forward to in the next five years? Expanding processing facilities and the use of WVO in urban (New York City) and Upstate settings by large and mid-sized institutions can 'prime the pump' for new production, helping build a market for institutional use of BD for #6 and #4 as well as #2 fuels. The public visibility of Mayor Michael Bloomberg's PlaNYC generated by its release this past Earth Day (April 22) emphasized public health and environmental goals along with the need to reduce the City's 'carbon footprint' 30% by 2030- City government actions will generate parallel initiatives in the real estate and building industries as well as through university and medical center 'green campaigns'. As increased public visibility and coverage of biofuels and especially BD use takes hold, demand-driven initiatives that take advantage of the statewide coverage and network of non-governmental organizations (NGOs) and Cooperative Extension Association offices can develop and provide 'success stories' in each sector and audience (agricultural, building association and manufacturing) to generate interest and involvement in a nascent BD industry. Continued development of state-level initiatives that begin to link economic development and lending programs with research can provide a long-needed consistency to an overall job creation and economic policy framework allowing local and regional networks to form and more importantly begin to build marketing relationships. The underutilized regional resources available for water-borne transport, from Mid-Atlantic sources and for Mid-Hudson production can begin to help move oilseed feed stocks to urban markets where refinery capacity will increase significantly in the next few years. Though major urban markets in New York State and the Northeast will continue to rely on imported feedstock (hopefully to be increasingly grown in a sustainable manner), but New York's economic actors, pubic sector agencies and educational institutions should work together to ensure that the New Yorkers maximize and increase their share of this important and critical environmental resource.