



CALIFORNIA SUSTAINABLE FREIGHT ACTION PLAN PILOT PROJECTS

1. Name and contact information:

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2. Descriptive project title:

Sustainable California Transportation Powered by Viridis Fuels

3. Location of project:

Our Oakland, CA project is at the foot of the new San Francisco Bay Bridge, adjacent to the Port of Oakland. Viridis has a 30-year lease, with subsequent 5-year extension intervals, on former Oakland Army Base property currently owned by the East Bay Municipal Utilities District. We sit at the hub of Bay Area rail, highway and freight infrastructure on a four (4) acre, CEQA approved site.



4. Executive Summary:

Viridis is building what may be America's most visible biodiesel refinery with today's most advanced yet proven multi feedstock, waterless, continuous flow technology in a revolutionary manner. Biodiesel, the renewable, clean-burning diesel fuel from organically-sourced oil, grease and fat, has the best carbon score among all liquid fuels. It's the first and only EPA-designated, commercial-scale-produced advanced Biofuel. Its use reduces greenhouse gas emissions from between 57% to 86% compared to petroleum diesel. The

Viridis plant will produce 20 million gallons per year (MMGY) of 100% biodiesel (B100) and approximately 4 MMGY of technical grade glycerin from sustainable primarily waste feedstock, and will make significant amounts of biodiesel available to the thousands of trucks serving the 5th largest container port in the US. It must be noted that children in West Oakland are seven times more likely to be hospitalized for asthma than children in the rest of California. Creation of this biodiesel facility is a way to have an immediate impact on the air quality of West Oakland without stopping commerce. Viridis-produced commercial-grade biodiesel will meet strict ASTM specifications to insure proper performance as well as comply with the more stringent European EN 14214 standard. Viridis has in place a long-term agreement with a credit-worthy company that guarantees provision of adequate feedstock for full plant capacity operation and purchase of up to all finished product.

Our core team is California-centric. The project reflects the Viridis commitment to local empowerment and economic development by delivering entry level employment with on-site training in the emerging green industry sector and paying livable wages with good benefits. As part of Viridis' community commitment, West Oakland residents will have recruitment and hiring preference. Viridis will partner with local job training, preparedness and placement organizations to assist with local employee recruitment, reserve jobs for both individuals reentering society from incarceration and current and former public assistance recipients.

5. Incorporation of advanced technologies, alternative fuels, freight and fuel infrastructure, local economic development, transition to zero-emissions, and increased competitiveness of California's freight system.

The Viridis project delivers positive impacts on the environment, air quality and climate emissions, enables alternative and renewable fuels use; and constructively impacts employment and economic development of disadvantaged populations.

How This Project Exemplifies/Promotes Advanced Technology Biofuels

The Viridis project features the latest in advanced biodiesel technology including feedstock pretreatment that does away with the use of sodium methylate, distillation to recapture valuable commodities such as water, continuous-flow processing that helps to assure consistent quality, final cleansing with a reusable resin as opposed to a wash requiring large quantities of water, and glycerin purification to increase the value and beneficial usefulness of the one bi-product of biodiesel processing.

Unlike a number of biodiesel plants in the US that can only handle feedstock with relatively low Free Fatty Acid (FFA) content, the Viridis technology can handle a wide variety of feedstocks with up to 100% FFA content. Thus, Viridis will be able to process a wide array of low cost feedstocks, including some considered as waste materials, such as brown and yellow grease, which many plants today cannot handle. Viridis technology will also be fully capable of using future feedstocks, such as algae, as they become commercially viable.

How This Project Delivers Positive Environmental Impacts

In addition to positive air quality impacts described below, the use of biodiesel that is produced by Viridis delivers other significant environmental benefits.

Biodiesel energy life cycle analysis, also known as "energy balance," accounts for the amount and type of energy used in the production of a fuel and compares that to the amount of energy contained in the resulting fuel. Biodiesel has a positive energy balance, helping to preserve and protect natural resources. For every unit of energy needed to produce a gallon of biodiesel, at least 4.5 units of energy are gained, the best of any U.S. fuel.

Biodiesel is biodegradable and nontoxic. These attributes make it less likely to harm the environment if an accidental spill occurs. Biodiesel degrades about four times faster than petroleum diesel; within 28 days, pure biodiesel (B100) degrades 85 to 88 percent in water. In fact, dextrose (a test sugar used as the positive control when testing biodegradability) degraded at the same rate. Positive environmental benefit is also realized when biodiesel is blended with petro diesel fuel as the blend biodegrades faster than petro diesel alone. For example, blends of 20 percent biodiesel and 80 percent petro diesel degrade twice as fast as #2 diesel alone. Biodiesel won't pollute streams and rivers, ground water, or the soil, or stay around creating long-term contamination as do petroleum based fuels. A related benefit is the reduced danger of an environmental disaster. Unlike the 2010 Gulf of Mexico underwater oil well disaster that released millions of gallons of highly contaminating and damaging oil, causing an unknown amount of damage biodiesel is safer.

Biodiesel reduces waste. The production of biodiesel results in less waste than petroleum based fuels and those parts of a barrel of oil that cannot be used as fuels or lubricants, and the barrels themselves at some point must be disposed of somewhere and present not only a waste of energy in the process itself but a danger to the environment in the process of their disposal.

Also, nothing is wasted when making biodiesel. Water that is removed from feedstock in the Viridis processing front end will be recaptured and used for irrigation and other non-potable applications. A reusable resin is used for the final biodiesel cleansing step. The only production by product is crude grade glycerin. Viridis will refine its crude glycerin output to high quality "technical grade", a product that is in demand for the manufacture of myriad consumer products including those for cleaning, auto maintenance, painting, furniture finishing, and many more. Further, the use as a Viridis biodiesel feedstock of used cooking and other high acid containing oils such as yellow grease, inedible tallow, and trap grease will help to divert these materials from landfills and/or low-value uses.

Both 100% and blended biodiesel reduce the net amount of carbon dioxide in the biosphere as compared to petro diesel. Crops that provide plant-sourced oils used in biodiesel production absorb carbon dioxide from the atmosphere when they grow. Then, when vegetable oil based biodiesel is combusted carbon dioxide is released, resulting in this net zero impact.

The Viridis project reduces wastewater and hazardous waste production. Older generation biodiesel technology required a water wash as the last step in the production process, resulting in many gallons of contaminated water to be treated and discharged. The Viridis technology design includes a final stage ion resin "wash" that does not produce the hundreds of gallons of contaminated water typical of older generation, water wash biodiesel production technology.

How This Project Impacts Air Quality and Climate Emissions

Biodiesel use has documented air quality benefits. In June 2000, biodiesel became the first and only alternative fuel to have successfully completed the Tier I and Tier II Health Effects testing requirements of the Clean Air Act Amendments of 1990. Results of the related health effects testing concluded that the middle exhaust concentration, a far higher level of exhaust concentration than would ever be observed in the field, was the “No Observable Adverse Effects Level (NOAE)”, indicating that biodiesel exhaust poses no threat to human health. In addition to showing reductions in particulate matter, a known health threat that aggravates asthma and other ailments, the findings also showed a reduction in cancer cause compounds.

As reported by the National Biodiesel Board (NBB), biodiesel contains virtually no sulfur or aromatics, and use of biodiesel in a conventional diesel engine results in substantial reduction of unburned hydrocarbons, carbon monoxide and particulate matter. A U.S. Department of Energy study showed that the production and use of biodiesel, compared to petroleum diesel, resulted in a 78.5% reduction in carbon dioxide emissions.

Biodiesel reduces particulate, carbon monoxide, and sulfur dioxide emissions compared to diesel fuel. The EPA targets these three emissions because they pose public health risks, especially in urban areas where they can affect more people. Because transportation emissions contribute significantly to urban concentrations of these pollutants, reducing tailpipe emissions is a powerful tool for improving air quality.

More specifically, the use of B20 (20% biodiesel blended with 80% conventional diesel fuel) reduced total hydrocarbons by up to 30%, Carbon Monoxide up to 20%, and total particulate matter up to 15%. Typically, emissions of nitrogen oxides are slightly increased with B100 depending on the duty cycle of the engine and testing methods used, however biodiesel blends of 20 percent and lower have no measurable NOx increase compared to US EPA approved diesel fuel.

NBB further reports that research documents the fact that the ozone forming potential of the hydrocarbon emissions of pure biodiesel is nearly 50% less than that of petroleum fuel. Pure biodiesel does not contain sulfur and therefore reduces sulfur dioxide exhaust from diesel engines to virtually zero.

Average Biodiesel Emissions Compared to Conventional Diesel Without Advanced Emissions Controls, According to EPA		
Emission Type	B100	B20
Regulated		
Total Unburned Hydrocarbons	- 67%	-20%
Carbon Monoxide	-48%	-12%
Particulate Matter	-47%	-12%
NOx *	+10%	0%
* No increase in NOx in diesel vehicles sold after model year 2009		
Non-Regulated		
Sulfates	-100%	-20%
PAH (Polycyclic Aromatic Hydrocarbons)	-80%	-13%
nPAH (nitrated PAH's)	-90%	-50%

Ozone potential of speciated HC	-50%	-10%
Lifecycle CO2 Emissions	-76%	-15%

The Viridis project is located in West Oakland, an area that includes a large residential area immediately adjacent to the Port of Oakland. The Oakland Tribune has reported that in Alameda County the asthma hospitalization rate is 20.3 per 10,000 children – almost twice the state average; with certain neighborhoods in the area experiencing even higher rates, such as Emeryville at 72.3 per 10,000 children and the port areas of West Oakland at 64.7 per 10,000 children.

Given that use of biodiesel and its various blends reduce hydrocarbon emissions, lower particulate matter, reduce smog and makes our air healthier to breathe, the immediate and convenient availability of biodiesel containing truck fuel, as described below, will help to improve local air quality and positively impact child health in this geographic area.

How This Project Impacts Freight and Fuel Infrastructure

According to the California Air Resources Board, California hopes to meet its Low Carbon Fuel Standard goals through 2020 by gaining a significant share of increasing US production of biodiesel and other sustainable fuels. California currently has 7 biodiesel production plants, with 3 plants under construction, and major expansion underway at several of the state's largest plants. In 2014, in-state production reached 25.96 million gallons per year (MGY) in comparison to a total in-state demand of 126 MGY. Increased in-state production will assure more readily available biodiesel. As an additional benefit, locally produced and sold biodiesel eliminates the need to import product from as far as the mid-west or Canada, thus reducing the overall carbon impact that occurs as a result of long-distance transport.

Viridis will currently be the only large-scale, commercial producer of ASTM standards-compliant biodiesel in the San Francisco Bay area. The project is located immediately adjacent to the Port of Oakland with its constant and concentrated movement of diesel powered trucks every day. As more than 75% of current diesel engine and vehicle manufacturers approve the use of up to 20% biodiesel, with many supporting higher blends up to B100, our product will be readily available to truck drivers servicing the Port.

Currently, no large volume biodiesel fueling outlets are in or near the Port area. A full service truck stop is being developed directly across the street from the Viridis plant. Viridis has a signed supply agreement with the project owner and discussions are underway to construct a pipeline across the street to deliver B100 to the truck stop for blending and retail sale. As a result, the Viridis project will make biodiesel containing fuel readily and conveniently available to the entire compliment of diesel trucks operating in this area.

How This Project Impacts Local Economic Development

The Viridis project is a job creator that delivers entry level employment and on-site training in the emerging green industry sector. The project is located in West Oakland, an area that has traditionally suffered from a disproportionately high level of unemployment. Providing job opportunities to employment-challenged local populations is a priority of the project proponents. As part of Viridis' community commitment, West Oakland residents will have recruitment and hiring preference so that money stays in the community in addition to

reducing impact on the local environment. Viridis jobs will pay livable wages and provide good benefits and Viridis will partner with local job training, preparedness and placement organizations to assist with local employee recruitment.

Further, up to 10% of available jobs are targeted for individuals reentering society from incarceration and an additional 10% of available jobs are targeted for current and former public assistance recipients. Viridis principals have met with the Alameda County Departments of Probation and Social Services about these initiatives and they are interested in working in partnership to assure success of these initiatives.

How This Project Increases Competitiveness of California's Freight System

Operational cost is a major component of competitiveness and biodiesel can have a beneficial impact on those expenses, especially by extending the useful life of engines and reducing maintenance costs.

More specifically, the injection system of many diesel engines relies on the fuel to lubricate its parts. In addition to a more complete combustion, biodiesel has better lubricating properties. The result is biodiesel reduces fuel system wear, and increases the life of the fuel injection equipment that relies on the fuel for its lubrication whereas petroleum based diesel relies on the environmentally undesirable sulfur compounds to provide lubricity. Even biodiesel levels as low as one percent can provide up to a 65 percent increase in lubricity in distillate fuels.

Biodiesel is one of the best tested, high performance, high quality, and most sustainable fuels available today. Modern as well as older diesel vehicles require no after-market modifications to operate on blends up to B20 and often up to B100. Biodiesel is a much more economical solution to lowering diesel engine emissions compared to the cost of retrofitting older diesel engines to accomplish this goal.

6. Estimated cost for implementation and existing funding commitments by stakeholder and amount.

The total development and operational startup cost of the Viridis project is approximately \$61 million.

To date project proponents and early project supporters have invested cash in excess of \$1.2 million, a \$3.4 million grant has been received from the California Energy Commission, \$6 million in additional equity investment has been pledged, and acquisition of an additional \$7.5 million in equity investment is in process. Once the total \$18.1 million is raised, debt funding of \$42.9 million will be pursued through the California Pollution Control Finance Authority (CPCFA).

7. Timeline

Pre-construction engineering of the Viridis plant is essentially completed and applications are currently being prepared to secure all required environmental and operating permits. Completion of entitlements is anticipated in 4 - 6 months. A detailed development and construction plan has been Gantt charted by the project's development and construction manager.

Sufficient initial equity has been invested to support the above-described project development activities to date. The full equity funding completion goal is Spring - Summer 2016. It is anticipated that debt funding will require 2 - 3 months following completion of equity funding. Construction is programmed to begin 2 months following the close of debt financing and is expected to take approximately 10 months.

Below are critical activities and their projected durations:

EXECUTIVE SUMMARY - CRITICAL PATH SYNOPSIS	
Preconstruction Financing	16 Weeks
Design and Engineering - Site Infrastructure	45 Weeks
Building Permit - Site and Infrastructure	15 weeks
Site Construction	26 Weeks
Install and Commission Process Facility	12 Weeks

8. Means for measuring progress toward meeting goals over time

The Viridis project sets forth multiple goals and mechanisms are available to monitor progress, manage and confirm success with each. To manage progress towards project development goals, pre-construction and construction activities and related tasks have been defined in detail through Gantt charting. The Viridis team, consisting of the project owners, top Viridis staff, project manager, construction contractor, and technology and civil engineers meet weekly to report and track progress against the detailed schedule. Any deviations or alterations are discussed and solutions or responses discussed when needed.

Once the plant is built and operating, measuring the success of getting biodiesel into local trucks can be easily determined through review and analysis of sales and delivery records.

Determining success in hiring, training and retaining workers representing employment challenged populations is simply a matter of creating a robust human resources database, and monitoring and tracking employee demographics.

In the past, the Lawrence Berkeley National Lab measured air quality in West Oakland, resulting in considerable and reliable data that could serve as a baseline for continually and over the long-term identifying and quantifying any East Bay, and specifically West Oakland and Emeryville, air improvement once Viridis biodiesel is incorporated into the fueling of Port-serving trucks. Going forward, Viridis would welcome an opportunity to partner with the Bay Area Air Quality Management District to continue periodic measurement activities by Berkeley Lab or any other suitable resource.

9. Potential roles each of the interagency partner to support project implementation

There is no limit to the use of biodiesel in replacing other fuels. Biodiesel is used in standard diesel engines and can be used alone, or blended with petroleum-based diesel. According to the Department of Transportation, the demand for biodiesel is growing rapidly as consumers and industry seek greener more efficient fuel sources. When weighing the environmental, economical, and mechanical advantages of biodiesel, justification for the long-term use is clear. Viridis would look forward to playing a role in

transforming California's freight transport system through an integrated effort between various state entities including California's Transportation, Environmental Protection, and Natural Resources Agencies the Air Resources Board, Department of Transportation, Energy Commission, and Governor's Office of Business and Economic Development, as each of these has a unique and valuable role in moving our state towards more environmentally beneficial transportation system and its component parts.

A large disparity exists between market demands for diesel and available alternatives and it could take a significant push in biodiesel production to help close the gap and reduce the amount of traditional diesel consumed each year. Since in-state production of biodiesel is far below demand and the few plants currently operating are insufficient to meet demand, new plants must be built. However, one of the major challenges to increasing biodiesel production in state is the ability to fund projects, especially those that are start-ups. The California Energy Commission has taken an initial step to address this barrier by awarding grants through its Alternative and Renewable Fuel and Vehicle Technology Program (ARFVTP). However more funds need to be made available in the form of grants or low interest loans from this program as well as other, similar programs through this and other related state agencies.

Another challenge to production development is the permitting process and related costs, especially for air and water permits. Perhaps the appropriate state agencies could evaluate the permitting process, as it generally relates to getting biodiesel plants up and operating, with an eye towards specific classification of biodiesel plants that take into consideration the positive benefit derived from their construction and operation within the state. Further, a permit fees reduction or rebate would help to alleviate the financial challenges of a startup.

To increase demand and marketability, each of the state entities listed above could promote legislation that mandated ever increasing inclusion of biodiesel in overall diesel engine fuel.

Over the longer term, state entities could take a lead in publicly promoting the use of biodiesel generally, and marketing its benefits while debunking outdated myths specifically to the trucking industry.

We further believe that numerous other opportunities exist to craft meaningful and productive partnerships with the related state entities, and would recommend convening a small working group that includes representatives of the biodiesel industry, especially producers, to mutually explore and identify constructive partnership roles and initiatives.

ADDITIONAL INFORMATION ATTACHED:

Viridis Fuels PowerPoint presentation