

WORK STATEMENT

Glossary

Specific terms and acronyms used throughout this work statement are defined as follows:

| Acronym | Definition | Acronym | Definition |
|----------------|--|----------------|--|
| ASTM | American Society for Testing and Materials | POTW | Publicly Owned Treatment Works |
| CARB | California Air Resources Board | PB Tech | Pacific Biodiesel Technologies |
| BGB | Black Gold Biodiesel fuel | RSI | Recovery Solutions Incorporated |
| CPM | Energy Commission Project Manager | SFPUC | San Francisco Public Utilities Commission |
| CPR | Critical Project Review | SPT | Superior Process Technologies |
| EPA | Environmental Protection Agency | SSO | Sanitary Sewer Overflow |
| FOG | Fat, Oil and Grease; a.k.a. "restaurant trap grease," "brown grease" | SWRCB | State Water Resources Control Board |
| MIU | Moisture, Insolubles, Unsaponifiables | URS | URS Corporation |
| NREL | National Renewable Energy Laboratory | WWTP | Wastewater Treatment Plant |
| PIER | Public Interest Energy Research | | |

Task List

| Task # | CPR | Task Name |
|---------------|------------|---|
| 1.0 | N/A | Administrative Tasks |
| 2.1 | N/A | Establish WWTP Performance Baseline |
| 2.2 | N/A | Design FOG Conversion Facility and Site Modifications |
| 2.3 | X | Construct and Install FOG Conversion Facility |
| 2.4 | X | Start-Up FOG Conversion Facility |
| 2.5 | N/A | Design Biodiesel Facility and Site Modifications |
| 2.6 | X | Construct and Install Biodiesel Facility |
| 2.7 | X | Start-Up Biodiesel Facility |
| 2.8 | X | Develop Demonstration Test Program |

| | | |
|------|-----|--|
| 2.9 | X | Conduct 612 -Month Demonstration Test Program |
| 2.10 | N/A | Conduct Technology Transfer Activities |
| 2.11 | N/A | Prepare Production Readiness Plan |
| 2.12 | N/A | Prepare Input for Public Relations Program |

PROBLEM STATEMENT

Introduction

Pressure from both regulatory actions and energy needs will lead municipal wastewater agencies to seek methods to reduce their reliance on fossil fuels, collect and reuse waste streams, and establish waste-to-energy programs. In order to implement these programs, municipal agencies will require guidance from successful projects to use as a foundation in their decision-making processes.

Energy Needs

Wastewater Treatment Plants (WWTPs) consume large amounts of energy. According to the Environmental Protection Agency (EPA), WWTPs consume approximately 3% of the available annual U.S. electricity supply. This equates to a large share of the available energy supply and a financial burden on the WWTP; energy costs alone can account for 30% of the WWTP's total annual operation and maintenance costs. The amount of energy consumed by WWTPs is projected to increase as populations grow and environmental requirements become more stringent. EPA expects that demand for electricity as such will grow by approximately 20% over the next 15 years (EPA).

Regulatory Actions

There are also regulatory actions that may drive WWTPs to develop waste-to-energy programs. Legislative attempts to slow global warming may affect heavy energy users like WWTPs, if legislation targets them as large energy consumers. In September 2006, California passed the Global Warming Solutions Act which requires a 25% cut in the State's greenhouse gas emissions by 2020 and an 80% cut by 2050. The majority of the State's anthropogenic greenhouse gas emissions are generated from energy production and transportation.

WWTPs also face a specific set of regulatory requirements that may drive them to develop alternative energy programs. WWTPs face increasing pressure to provide a disposal mechanism for brown grease, and the use of brown grease as a source of renewable energy is an attractive solution.

“Brown grease” refers to the waste fats, oils, and grease (FOG) removed from restaurant grease traps and interceptors. The National Renewable Energy Laboratory (NREL) estimates that on average 13 pounds of brown grease per capita is generated on an annual basis. In theory, brown grease should be regularly removed from traps and interceptors so that it does not enter the sewer. However, this has not always been the case in practice, with grease discharges from restaurants leading to sewer backups and overflows.

In response to this situation, on May 26, 2006, the California State Water Resources Control Board (SWRCB) finalized its statewide approach to reducing sanitary sewer overflows (SSOs) and issued General Order No. 2006-0003 (Order). The Order identifies grease blockages as one major cause of SSOs. Under the Order, most agencies that deal with wastewater conveyance and treatment are required to develop and implement a system-specific Sewer System Management Plan (SSMP). It is likely that many agencies regulated under the Order will develop a FOG

control program as part of their SSMP, with the goal of preventing waste grease from entering, and clogging the sewer.

Furthermore, on August 28, 2006, the Governor of California approved Assembly Bill 1333, making the improper disposal of brown grease from grease traps or interceptors an offense. In addition, the bill prohibits reinserting any of the grease removed from a trap or interceptor back into the trap or interceptor (decanting) unless specific conditions are met. The bill also requires grease haulers to completely remove all grease, greasy liquids, water, and solids from a trap or interceptor each time it is pumped.

The regulatory pressure from the General Order and AB 1333 will lead to the increased (**indirect**) removal of brown grease from sewerage systems. However, the means of disposal for all of this grease is still undetermined. The public may pressure WWTPs to begin accepting waste FOG. If WWTPs become the ultimate destination for waste FOG, they will need a method of disposing of it or reusing it.

A Model is Needed

WWTPs face the combined challenge of meeting increasing energy needs and providing a disposal option for brown grease. The idea of using brown grease as a source of renewable energy is simple enough, but there are still hurdles in the way of wide-spread implementation of this idea. WWTPs have historically been slow to adopt new technologies due to the responsibility they bear for providing an essential service, and the fact that they rely on public funds. Although some agencies have begun to experiment with energy recovery programs, limited data is available. Additionally, smaller WWTPs may not have the funds to conduct experiments on their own. A public model is needed that can demonstrate the feasibility of brown grease recovery programs and that can provide WWTPs with the information they need to establish alternative energy programs of their own.

Problems

- Municipal WWTPs have large energy needs, and these needs may increase over time.
- As a result of regulatory drivers (like AB 1333 and the SWRCB General Order No. 2006-003), there will be an increase in the volume of brown grease collected from grease traps and/or interceptors requiring proper disposal.
- There are currently limited options for the disposal of brown grease.
- Municipal WWTPs may receive public pressure to accept brown grease from within their service areas, but may not have a system for disposing of this grease.
- There is a lack of knowledge on how to develop a brown grease energy recovery program.
- WWTPs need access to information on the technical and financial aspects of developing a program to convert brown grease to energy.

Solution

The proposed project will demonstrate that, by implementing the proposed technologies, a municipal WWTP may meet its dual obligations to reduce energy consumption and provide a disposal option for grease removed from grease traps and interceptors. It will provide a starting point for individual agencies to develop their own custom brown grease recovery and reuse program that complements their existing infrastructure and needs. WWTPs may have several potential options for end uses of brown grease depending on their situation, such as a source of biogas via co-digestion or as biofuels that can be used in their boilers, generators, and vehicles. The project will demonstrate that by initiating a brown grease recovery program, WWTPs will be able to decrease their reliance on fossil fuels, thus saving money and reducing greenhouse gas emissions. Economic data from the project will help WWTPs to analyze the feasibility of developing their own brown grease recovery programs.

Overall Project Goals

The overall goals of this project are to:

- Demonstrate the conversion of waste FOG to a high quality brown grease feedstock containing less than 2% moisture, insolubles, and unsaponifiables (MIU).
- Demonstrate the conversion of brown grease feedstock to a biodiesel product.
- Demonstrate that the biodiesel product can be blended to meet American Society for Testing and Materials (ASTM) standards and California Air Resources Board (CARB) requirements for biodiesel.
- Demonstrate that brown grease feedstock can be used as a biofuel.
- Introduce, and make market-ready, a standardized package brown grease recovery/ and biodiesel production plant.
- Demonstrate that the co-location of FOG waste recovery/conversion and/or biofuel generation facilities at Publicly Owned Treatment Works (POTWs) can provide POTWs with a source of alternative non-fossil fuel.
- Demonstrate that the co-location of FOG waste recovery/conversion and/or biofuel generation facilities at POTWs can reduce the POTW's reliance/demand on the public's energy grid.
- Demonstrate that operation of FOG recovery/conversion facilities by municipal agencies provides those agencies with one solution for encouraging brown grease reuse while offering a proper disposal route to grease haulers.
- Demonstrate whether there is a net increase or decrease in biosolids production when co-digesting brown grease (based on demonstration program data).

- Demonstrate a net increase in anaerobic digester gas production resulting from the co-digestion of brown grease or select demonstration facility waste stream(s) (based on demonstration program data).

OBJECTIVES OF THE AGREEMENT

Technical Objectives

The technical objectives of this project are to:

- Demonstrate that up to 10,000 gallons per day of FOG waste collected from grease traps and/or interceptors can be processed and converted to up to 300 gallons per day of brown grease product.
- Demonstrate that up to 300 gallons per day of brown grease product can be converted to up to 300 gallons per day of biodiesel product.
- Design and construct a 10,000 gallon per day FOG recovery and brown grease conversion facility at the SFPUC's Oceanside WWTP.
- Design and construct a 300 gallon per day facility that will convert up to 300 gallons per day of brown grease feedstock containing less than 2% MIU into a biodiesel product.
- Demonstrate multiple uses for the brown grease product including as an additive fuel to WWTP anaerobic digesters to boost digester gas production.
- Establish the relative percent increase in digester gas production resulting from the discharge of brown grease and/or select demonstration facility waste streams to anaerobic digester(s) – target: 5-15% net increase in digester gas production.
- Establish the optimum operating range for co-digestion of brown grease and/or select demonstration facility waste streams at the SFPUC's Oceanside WWTP (in terms of anaerobic digester loading rate and hydraulic retention time).
- Make available technical data that may be used by other municipal agencies interested in developing their own program.

Economic Objectives

Cost estimates for the production of biodiesel from brown grease are shown in Table 1. In addition to calculating costs for the 100,000 gallon per year demonstration plant, a cost estimate was also prepared for biodiesel production at a 5 million gallon per year commercial plant. The demonstration plant would operate at a cost disadvantage to a commercial-sized plant due to economies of scale in the larger facility.

Table 1. Cost Estimates for Biodiesel Production Using Proposed Technology

| | <i>100k gallon per year demonstration plant</i> | <i>5 million gallon/yr commercial biodiesel plant</i> |
|---|---|---|
| | \$/gal | \$/gal |
| PLANT AND MANUFACTURING COST | | |
| Cost of Dewatered Brown Grease and Methanol | 0.99 | 0.99 |
| Process Materials and Chemicals | 0.15 | 0.15 |
| Utilities | 0.31 | 0.24 |
| Repair and Maintenance | 0.05 | 0.05 |
| Labor | 3.05 | 0.27 |
| Depreciation and Interest | 0.00 | 0.04 |
| TOTAL MANUFACTURED COST | \$4.55 | \$1.74 |
| OTHER ITEMS | | |
| Transportation Costs | 0.24 | 0.08 |
| Blending and Handling Costs | 0.32 | 0.15 |
| Fed Excise Tax Credit | -0.50 | -0.50 |
| TOTAL OTHER ITEMS | \$0.06 | (\$0.27) |
| NET COST FOR BIODIESEL | \$4.61 | \$1.47 |

The cost estimates shown above are based on the following assumptions:

- Trap grease consists of materials pumped from standard restaurant grease traps and is delivered to a public wastewater treatment facility. The materials are approximately 3% degraded trapped cooking oils, 96% water, and 1% is suspended solids.
- Grease and water are separated through a process such as dissolved air flotation combined with settling, decanting, and evaporation of water. The resulting product meets standard brown grease commodity specifications with approximately 98% fats and oils, suitable for use as a biodiesel feedstock using the new process.
- Standard quality brown grease is delivered or transferred from a wastewater processing facility with most of the water removed through the reclamation process.
- The processing system used is that of Black gold Biodiesel and can process grease with a free fatty acid content as high as 100% and MIUs as high as 2%. (MIU is total content of moisture, insoluble impurities, and unsaponifiable [unreactable] substances.)

- The brown grease product is available from the reclamation process at a price equal to the processing costs which are approximately \$0.73 cents per gallon. Additional raw materials such as methanol bring the total raw materials costs to \$0.99 per gallon.
- Biodiesel is sold at a price not higher than the current petrodiesel price. The Federal Excise Tax incentive for biodiesel is currently available through the end of 2008. Congress is expected to extend this incentive through the end of 2010 and also to enact a biodiesel use mandate in the form of a carve-out for biodiesel in a national Renewable Fuels Standard.
- Local transportation, handling, and blending is completed by a qualified fuel distributor registered to receive the Federal Excise Tax credit on biodiesel blends.

This project will demonstrate a pathway for the conversion of brown grease to biodiesel. This could lead to the widespread implementation of the proposed technology with benefits both for the individual producers and for the entire State of California. The cost estimate for the commercial facility validates the economics of a larger facility that could process a significant amount of trap grease wastes into a viable fuel supply. Given that the current rack price for Ultra Low Sulfur Diesel fuel in California is approximately \$2.20 per gallon, a commercial plant capable of producing biodiesel at a cost of \$1.47 per gallon could mean significant cost savings for the consumer.

Based on current census data and a 1998 report issued by the National Renewable Energy Laboratory¹, California generates almost 70 million gallons of trap grease annually. The opportunity exists to reclaim enough of this material to have at least ten commercial plants, each capable of processing 5 million gallons per year, throughout California. Depending on private or public ownership, the 50 million gallons per year of new diesel capacity could reduce the diesel price for consumers by about \$0.60 per gallon, for a total savings of about \$30 million statewide.

The proposed technology would be particularly well suited for municipal agencies. Co-locating a biodiesel plant at a wastewater treatment plant would help the agency to meet its significant energy needs. Additionally, by keeping grease out of the sewer, those agencies that are responsible for maintaining sewerage systems could benefit from reduced maintenance costs and a lessened threat of regulatory action. This project will also demonstrate a viable business model suited for public agencies that is targeted at revenue generation and rate stabilization.

Municipal wastewater treatment plants would also benefit from increased digester gas production resulting from the co-generation of process waste streams. The demonstration project has set a target increase of 5% in digester gas production. However, it is worth noting that this is partially in consideration of the Oceanside Wastewater Treatment Plant's already high volatile solids reduction of 70%. Other wastewater treatment plants with less optimal performance may experience even higher percent increases in their digester gas production with the addition of brown grease feedstock and/or demonstration facility-type waste streams.

The wide-spread application of this technology could result in additional, indirect benefits for the State of California. First, the use of brown grease as a biodiesel feedstock could lead to reduced

¹ "Urban Waste Grease Resource Assessment," NREL/SR-570-26141 (1998)

importation of the foreign oils that are currently used for this purpose. At present, the State of California relies heavily on imported tropical oils like palm and coconut for biodiesel feedstock. Of the 43 million gallons feedstocks used each year, approximately 29 million gallons are imported from Malaysia as palm and coconut oils. Developing a locally produced feedstock would save on the costs – both financial and environmental - of importing these oils.

In light of these points, the economic objectives for the demonstration project are to:

- Demonstrate a viable pathway for the conversion of brown grease to biodiesel that can be replicated on a commercial scale.
- Produce biodiesel from a brown grease feedstock at a demonstration plant level with a cost of about \$5.00 per gallon (includes cost of dewatered brown grease and methanol). The target production cost at a commercial scale is \$1.74 per gallon.
- Increase digester gas production at the Oceanside WWTP by about 5%, thereby decreasing the amount of natural gas that the plant would need to purchase (target natural gas use reduction in the WWTP's boilers and cogeneration facilities by approximately 3%).
- Achieve production of 300 gallons per day of biodiesel, equivalent to fueling 25-40 SFPUC trucks that were previously run on diesel.
- Demonstrate a business model for municipal agencies that are interested in developing their own renewable energy programs, but unaccustomed to dealing with the financial and environmental aspects of such a program.
- Demonstrate the production of biodiesel from an alternative feedstock that could allow California to reduce its dependence on palm and coconut oils imported from abroad.
- Develop a Pro Forma and cost/benefit analysis based on demonstration program data.

The following are the specific required tasks to complete this project.

ADMINISTRATIVE TASKS

Task 1.1 Attend Kick-off Meeting

The goal of this task is to establish the lines of communication and procedures for implementing this Agreement.

The Recipient shall attend a “kick-off” meeting with the Energy Commission Project Manager, the Grants and Loan Officer, and a representative of the Accounting Office. The Recipient shall bring their Project Manager, Grant Officer, Accounting Officer, and others designated by the Energy Commission Project Manager to this meeting. The administrative and technical aspects of this Agreement will be discussed at the meeting. Prior to the kick-off meeting, the Energy Commission Project Manager will provide an agenda to all potential meeting participants.

The administrative portion of the meeting shall include, but not be limited to, the following:

- Terms and Conditions of the Agreement
- CPRs (Task 1.2)
- Match fund documentation (Task 1.7)
- Permit documentation (Task 1.8)

The technical portion of the meeting shall include, but not be limited to, the following:

- The Energy Commission Project Manager’s expectations for accomplishing tasks described in the Work Statement
- An updated Schedule of Products
- An updated Gantt Chart
- Progress Reports (Task 1.4)
- Technical Products
- Final Report (Task 1.5)

The Energy Commission Project Manager shall designate the date and location of this meeting.

Recipient Products:

- An Updated Schedule of Products
- An Updated Gantt Chart
- An Updated List of Match Funds
- An Updated List of Permits

Energy Commission Project Manager Products:

- Final Report Instructions

Target Date: 6/26/08 ~~3/19/08~~ (Kick-off Meeting)

Task 1.2 CPR Meetings

The goal of this task is to determine whether the project should continue to receive Energy Commission funding to complete this Agreement, and if it should, whether any modifications are necessary to the tasks, products, schedule or budget.

CPRs provide the opportunity for frank discussions between the Energy Commission and the Recipient. CPRs generally take place at key, predetermined points in the Agreement, as determined by the CPM and as shown in the Technical Task List above and in the Schedule of Products. However, the CPM may schedule additional CPRs as necessary, and any additional costs will be borne by the Recipient.

Participants include the CPM and the Recipient, and may include the Energy Commission Grants and Loan Officer, the PIER Program Team Lead, other Energy Commission staff and Management as well as other individuals selected by the CPM to provide support to the Energy Commission.

Critical Project Reviews shall take place at key points in a given project. These generally occur at predetermined points to see if the overall project goal is being achieved. The Energy Commission will conduct Critical Project Reviews during or at the conclusion of the following tasks:

| Task # | Task Description |
|---------------|---|
| 2.3 | Construct and Install FOG Conversion Facility |
| 2.4 | Start-Up FOG Conversion Facility |
| 2.6 | Construct and Install Biodiesel Facility |
| 2.7 | Start-Up Biodiesel Facility |
| 2.8 | Develop Demonstration Test Program |
| 2.9 | Conduct 426-Month Demonstration Test Program |

The Energy Commission Project Manager shall:

- Determine the location, date and time of each CPR meeting with the Recipient. These meetings generally take place at the Energy Commission, but may take place at another location.
- Send the Recipient the agenda and a list of expected participants in advance of each CPR. If applicable, the agenda shall include a discussion on both match funding and permits.
- Conduct and make a record of each CPR meeting. One of the outcomes of this meeting will be a schedule for providing the written determination described below.
- Determine whether to continue the project, and if continuing, whether or not to modify the tasks, schedule, products and budget for the remainder of the Agreement, including not proceeding with one or more tasks. If the CPM

concludes that satisfactory progress is not being made, this conclusion will be referred to the Commission's Research, Development and Demonstration Policy Committee for its concurrence.

- Provide the Recipient with a written determination in accordance with the schedule. The written response may include a requirement for the Recipient to revise one or more product(s) that were included in the CPR.

The Recipient shall:

- Prepare a CPR Report for each CPR that discusses the progress of the Agreement toward achieving its goals and objectives. This report shall include recommendations and conclusions regarding continued work of the projects. This report shall be submitted along with any other products identified in this Work Statement. Submit these documents to the CPM and any other designated reviewers at least 15 working days in advance of each CPR meeting.
- Present the required information at each CPR meeting and participate in a discussion about the Agreement.

Recipient Products:

- CPR Report(s)
- CPR Products identified in the Work Statement

Target Date: CPR Reports and CPR Products identified in the Work Statement shall be submitted to CPM 15 working days in advance of each CPR meeting

Energy Commission Project Manager Products:

- Agenda and a List of Expected Participants
- Schedule for Written Determination
- Written Determination

Target Date: CPM shall provide Recipient with the agenda and a list of expected participants at least 21 working days in advance of each CPR.

Task 1.3 Final Meeting

The goal of this task is to closeout this Agreement.

The Recipient shall meet with the Energy Commission to present the findings, conclusions, and recommendations. The final meeting must be completed during the closeout of this Agreement.

This meeting will be attended by, at a minimum, the Recipient, the Energy Commission Grants and Loan Officer, and the Energy Commission Project Manager. The technical and administrative aspects of Agreement closeout will be discussed at the meeting, which may be two separate meetings at the discretion of the Energy Commission Project Manager.

The technical portion of the meeting shall present findings, conclusions, and recommended next steps (if any) for the Agreement. The Energy Commission Project Manager will determine the appropriate meeting participants.

The administrative portion of the meeting shall be a discussion with the Energy Commission Project Manager and the Grants and Loan Officer about the following Agreement closeout items:

- What to do with any equipment purchased with Energy Commission funds (Options).
- Commission's request for specific "generated" data (not already provided in Agreement products).
- Need to document Recipient's disclosure of "subject inventions" developed under the Agreement.
- "Surviving" Agreement provisions, such as repayment provisions and confidential products.
- Final invoicing and release of retention.

The Recipient shall prepare a schedule for completing the closeout activities for this Agreement.

Products:

- Written documentation of meeting agreements and all pertinent information
- Schedule for completing closeout activities

Target Date: ~~4/2/10~~ **September 2, 2011**

Task 1.4 Monthly Progress Reports

The goal of this task is to periodically verify that satisfactory and continued progress is made towards achieving the research objectives of this Agreement.

The Recipient shall prepare progress reports which summarize all Agreement activities conducted by the Recipient for the reporting period, including an assessment of the ability to complete the Agreement within the current budget and any anticipated cost overruns. The Progress Report Format included within this Agreement provides the recommended specifications.

Product: Monthly Progress Reports

Target Date: Within 10 working days after the beginning of each month during the approved term of the Agreement

Task 1.5 Final Report

The goal of this task is to prepare a comprehensive written Final Report that describes the original purpose, approach, results and conclusions of the work done under this Agreement. The CPM will review and approve the Final Report. The Final Report must be completed on or before the termination date of the Agreement. The Final Report Contents and Format (accessible at

www.energy.ca.gov/contracts/pier/contractors/index.html) provides the recommended specifications.

The Final Report shall be a public document. If the Recipient has obtained confidential status from the Commission and will be preparing a confidential version of the Final Report as well, the Recipient shall perform the following subtasks for both the public and confidential versions of the Final Report.

Task 1.5.1 Final Report Outline

The Recipient shall prepare and submit a draft outline of the Final Report. The CPM will provide written comments back to the Recipient on the draft outline within 10 working days of receipt. Once agreement has been reached on the draft, the Recipient shall submit the final outline to the CPM. The CPM shall provide written approval of the final outline within 10 working days of receipt.

Product: Draft Outline of the Final Report

Target Date: ~~3/11/09~~ **February 23, 2011**

Product: Final Outline of the Final Report

Target Date: ~~4/22/09~~ **March 25, 2011**

Task 1.5.2 Final Report

The Recipient shall:

- Prepare the draft Final Report for this Agreement in accordance with the approved outline.
- Submit the draft Final Report to the CPM for review and comment. The CPM will provide written comments within 10 working days of receipt. Once agreement on the draft Final Report has been reached, the CPM shall forward the electronic version of this report to the PIER Technology Transfer Group for final editing. Once final editing is completed, the CPM shall provide written approval to the Recipient within 14 working days.
- Submit one bound copy of the Final Report.

Product: Draft Final Report

Target Date: ~~5/20/09~~ **July 29, 2011**

Product: Final Report

Target Date: ~~1/27/10~~ **September 30, 2011**

Task 1.6 Identify and Obtain Matching Funds

The goal of this task is to ensure that the match funds planned for this Agreement are obtained for and applied to this Agreement during the approved term of this Agreement.

The costs to obtain and document match fund commitments are not reimbursable through this Agreement. While the PIER budget for this task will be zero dollars, the Recipient may utilize match funds for this task. Match funds shall be spent concurrently or in advance of PIER funds during the term of this Agreement. Match funds must be identified in writing, and the associated commitments obtained before the Recipient can incur any costs for which the Recipient will request reimbursement.

The Recipient shall prepare and submit a letter documenting the match funding committed to this Agreement at least 2 working days prior to the kick-off meeting that includes:

- A list of the match funds that identifies the:
 - Amount of each cash match fund, its source, including a contact name, address and telephone number and the task(s) to which the match funds will be applied.
 - Amount of each in-kind contribution, a description, documented market or book value, and its source, including a contact name, address and telephone number and the task(s) to which the match funds will be applied. If the in-kind contribution is equipment or other tangible or real property, the Recipient shall identify its owner and provide a contact name, address and telephone number, and the address where the property is located.
- A copy of the letter of commitment from an authorized representative of each source of cash match funding or in-kind contributions that these funds or contributions have been secured.
- Discuss match funds and the implications to the Agreement if they are significantly reduced or not obtained as committed, at the kick-off meeting. If applicable, match funds will be included as a line item in the progress reports and will be a topic at CPR meetings.
- Provide the appropriate information to the CPM if during the course of the Agreement additional match funds are received.
- Notify the CPM within 5 working days if during the course of the Agreement existing match funds are reduced. Reduction in match funds may trigger an additional CPR.

Product: A letter regarding Match Funds or stating that no Match Funds are provided

Target Date: ~~3/14/08~~ **August 2008**

Product: A copy of each Match Fund commitment letter

Target Date: ~~3/14/08~~ **August 2008**

Product: Letter(s) for New Match Funds
Target Date: As necessary, within 5 days of change in match funds

Product: Letter that Match Funds were Reduced (if applicable)
Target Date: As necessary, within 5 days of change in match funds

Task 1.7 Identify and Obtain Required Permits

The goal of this task is to obtain all permits required for work completed under this Agreement in advance of the date they are needed to keep the Agreement schedule on track.

Permit costs and the expenses associated with obtaining permits are not reimbursable under this Agreement. While the PIER budget for this task will be zero dollars, the Recipient shall show match funds for this task. Permits must be identified in writing and obtained before the Recipient can incur any costs related to the use of the permits for which the Recipient will request reimbursement.

The Recipient shall prepare a letter documenting the permits required to conduct this Agreement and submit it to the Commission Project Manager at least 2 working days prior to the kick-off meeting:

1. If there are no permits required at the start of this Agreement, then state such in the letter.
2. If it is known at the beginning of the Agreement that permits will be required during the course of the Agreement, Recipient shall provide:
 - A list of the permits that identifies: 1) the type of permit and 2) the name, address and telephone number of the permitting jurisdictions or lead agencies.
 - The schedule the Recipient will follow in applying for and obtaining these permits.

The list of permits and the schedule for obtaining them will be discussed at the kick-off meeting, and a timetable for submitting the updated list, schedule and the copies of the permits will be developed. The implications to the Agreement if the permits are not obtained in a timely fashion or are denied will also be discussed. If applicable, permits will be included as a line item in the progress reports and will be a topic at CPR meetings.

If during the course of the Agreement additional permits become necessary, the Recipient shall provide the appropriate information on each permit and an updated schedule to the Commission Project Manager.

As permits are obtained, the Recipient shall send a copy of each approved permit to the Commission Project Manager.

If during the course of the Agreement permits are not obtained on time or are denied, the Recipient shall notify the Commission Project Manager within 5 working days. Either of these events may trigger an additional CPR.

Product: A letter documenting the Permits or stating that no Permits are required.
Target Date: 3/14/08 **February 6, 2008**

Product: A copy of each approved Permit
Target Date: Within 5 days of receiving each permit.

Product: Updated list of Permits as they change during the Term of the Agreement.
Target Date: As necessary, within 5 days of change.

Product: Updated schedule for acquiring Permits as it changes during the Term of the Agreement.
Target Date: As necessary, within 5 days of change.

TECHNICAL TASKS

Task 2.1 Establish WWTP Performance Baseline

The goal of this task is to collect historical baseline data and background performance information for the Oceanside WWTP (project site) specifically related to current energy generation and consumption, performance of select wastewater treatment unit operations, and water quality characteristics. Successful completion of this task will be measured by collection of a minimum of 12 months of historical WWTP operating/performance data summarized in a “*WWTP Baseline Performance Summary Report*.” This goal helps to achieve the project objectives by establishing a WWTP performance baseline from which impacts to the WWTP resulting from co-location of the demonstration plant can be measured.

The Recipient shall:

- Compile a summary of select historical WWTP baseline operating data.
- Develop and submit a *Draft WWTP Baseline Performance Summary Report*.
- Develop and submit a *Final WWTP Baseline Performance Summary Report*.
- Develop and submit a *Draft Work Plan* for additional baseline monitoring if needed (all analytical testing to be in accordance with applicable EPA Methods).
- Develop and submit a *Final Work Plan* for additional baseline monitoring if needed.
- Conduct additional WWTP baseline monitoring and analytical work per *Final Work Plan*.
- Provide Draft Amended *WWTP Baseline Performance Summary Report*.
- Provide Final Amended *WWTP Baseline Performance Summary Report*. Key elements from this document shall be included in the project’s Final Report.

Product: Draft WWTP Baseline Performance Summary Report
Target Date: ~~3/19/08~~ **March 23, 2009**

Product: Final WWTP Baseline Performance Summary Report
Target Date: ~~4/9/08~~ **March 11, 2011**

Product: Draft Work Plan for additional baseline monitoring (if needed)
Target Date: 4/16/08

Product: Final Work Plan (if needed)
Target Date: 4/30/08

Product: Amended WWTP Baseline Performance Summary Report
Target Date: 5/14/08

Product: Final Amended WWTP Baseline Performance Summary Report
Target Date: 6/11/08

Task 2.2 Design FOG Conversion Facility Site Modifications and Prepare Equipment Installation Instructions

The goals of this task are **is** to prepare a set of construction drawings and required contract documents for the design and installation of a 10,000 gallon per day FOG conversion facility at the Oceanside WWTP. Successful completion of this task will be measured by delivery of a final set of 100% Design Drawings “issued for construction” and required contract documents to the CPM and acquisition of select system components. This goal helps achieve the project objectives by providing construction drawings and instructions to guide field installation work. Overall, these goals helps achieve the project objectives by allowing the FOG conversion facility construction and installation phase of the project to proceed.

The Recipient shall:

- Prepare and submit 35% Design Drawings for a 10,000 gallon per day FOG conversion facility.
- Prepare and submit draft 65% Design and Construction Drawings for a 10,000 gallon per day FOG conversion facility.
- Prepare and submit final 65% Design and Construction Drawings.
- Develop and submit draft Equipment and Site Modification Specifications for a 10,000 gallon per day FOG conversion facility.
- Modify and submit Final Equipment and Site Modification Specifications.
- Solicit bids for select system components based on Final Equipment and Site Modification Specifications.
- Purchase select equipment and system components.
- Prepare and submit 100% Design Drawings and required contract documents for a 10,000 gallon per day FOG conversion facility.

Product: 35% Design Drawings of 10,000 gallon per day FOG conversion facility
Target Date: 3/19/08

Product: Draft 65% Design Drawings
Target Date: 4/9/08

Product: Final 65% Design Drawings
Target Date: 6/4/08

Product: Draft Equipment and Site Modification Specifications
Target Date: 4/9/08

Product: Final Equipment and Site Modification Specifications
Target Date: 5/21/08

Product: Select equipment and system components
Target Date: 6/18/08

Product: 100% Design Drawings and required contract documents
Target Date: ~~6/18/08~~ January 31, 2011

Task 2.3 Construct and Install FOG Conversion Facility

The goals of this task are to construct the 10,000 gallon per day FOG conversion facility, install the equipment purchased under Subtask 2.2, prepare construction observation field notes, and submit a letters of completion certifying 25%, 50%, 75%, and 100% completion of construction/installation activities. During this task, the Monthly Progress Report (required in Task 1.4) shall include a copy of the construction observation field notes and photos. Successful completion of this task will be measured by completion of the FOG conversion facility construction and installation of equipment after the first CPR meeting. These goals help to achieve the project objectives by providing the FOG conversion facility that is ready to start-up and test.

The Recipient shall:

- Construct 10,000 gallon per day FOG Conversion Facility and Install Equipment.
- Prepare construction observation field notes and submit with Monthly Progress Reports under Task 1.4.
- Prepare and submit letters of completion to the CPM certifying 25%, 50%, 75%, and 100% completion of construction/installation activities. Letter Certifying 100% completion of construction will include certification that facility is ready for start-up.

Product: Letter certifying 25% completion of construction/installation activities.
Target Date: 7/02/08

Product: Letter certifying 50% completion of construction/installation activities.

Target Date: 7/16/08

Product: Letter certifying 75% completion of construction/installation activities

Target Date: 7/30/08

Product: Letter certifying 100% completion of construction/installation activities and notification that FOG facility is ready for start-up.

Target Date: ~~8/12/08~~ **January 31, 2010**

Task 2.4 Start-Up FOG Conversion Facility

The goals of this task are to commission the facility, test the equipment, bring the 10,000 gallon per day FOG conversion facilities to the point that the Test Program developed under Subtask 2.8 can begin, and prepare monthly Start-Up Activity Reports that includes a monthly bill of materials and labor, a summary of field activities and field notes. Successful completion of this task will be measured by consistent and reliable operation of the demonstration FOG conversion plant at full output for seven days, which shall be reported in writing to the CPM certifying readiness to operate and delivered at the second CPR. A copy of the monthly Start-Up Activity Reports shall be included as part of the Monthly Progress Reports required in Task 1.4.

The Recipient shall:

- Conduct preliminary start-up testing of 10,000 gallon per day FOG conversion facility to ensure that all equipment and data acquisition are working properly
- Prepare and Submit Monthly Start-Up Activity Reports
- Calibrate test equipment and install data acquisition system.
- Prepare Outline of Start-Up Activities and Field Notes.
- Provide written notification to the CPM certifying readiness to operate for Test Program.

Product: Monthly Start-Up Activity Reports

Target Date: Within 10 working days after the beginning of each month during start-up activity period (~~8/12/08 – 9/08/08~~).

Product: Written Notification Certifying Readiness to Operate

Target Date: ~~9/9/08~~ **November 30, 2010**

Task 2.5 Design Biodiesel Facility

The goals of this task are to perform as-needed bench-scale testing to confirm equipment sizing, design the 300 gallon per day biodiesel facility, develop needed equipment specifications, and acquire select system components. Further, a set of plans to support biodiesel plant installation at the Oceanside WWTP will be developed. Successful completion of this task will be measured by delivery of a final set of 100% Design Drawings “issued for construction” and required contract documents to the CPM and acquisition of select system components. This goal helps achieve the project objectives by providing construction drawings and instructions to guide field installation

work. Overall, these goals help achieve the project objectives by allowing the biodiesel facility construction and installation phase of the project to proceed.

The Recipient shall:

- Conduct Bench-Scale Testing as Needed.
- Prepare and submit memorandum documenting Bench-Scale Testing Results.
- Prepare and submit 35% Design Drawings for a 300 gallon per day biodiesel facility.
- Prepare and submit draft 65% Design Drawings for a 300 gallon per day biodiesel facility.
- Prepare and submit final 65% Design Drawings.
- Prepare and submit draft Equipment and Site Modification Specifications.
- Prepare and submit final Equipment and Site Modification Specifications.
- Solicit bids for select system components based on Final Equipment and Site Modification Specifications.
- Purchase select equipment.
- Prepare and submit 100% Design Drawings and required contract documents.

Product: Memorandum documenting Bench-Scale Testing Results

Target Date: ~~9/24/08~~ **January 3, 2011**

Product: 35% Design Drawings

Target Date: 10/01/08

Product: Draft 65% Design Drawings

Target Date: 10/15/08

Product: Final 65% Design Drawings

Target Date: 12/10/08

Product: Draft Equipment and Site Modification Specifications

Target Date: 12/24/08

Product: Final Equipment and Site Modification Specifications

Target Date: 2/4/09

Product: Select Equipment and System Components

Target Date: 4/15/09

Product: 100% Design Drawings and required contract documents

Target Date: ~~4/15/09~~ **January 31, 2011**

Task 2.6 Construct and Install Biodiesel Facility

The goals of this task are to construct the 300 gallon per day biodiesel facility, install the equipment acquired under Subtask 2.5, prepare construction observation field notes, and submit letters of completion certifying 25%, 50%, 75%, and 100% completion of construction/installation activities. During this task, the Monthly Progress Report (required in Task 1.4) shall include a copy of the construction observation field notes and photos. Successful completion of this task will be measured by completion of biodiesel facility construction and installation of equipment after the third CPR meeting. These goals help to achieve the project objectives by providing the completed biodiesel facility that is ready to start-up and test.

The Recipient shall:

- Construct 300 gallon per day Biodiesel Facility and Install Equipment.
- Prepare construction observation field notes and submit with Monthly Progress Reports under Task 1.4.
- Prepare and submit letters of completion to the CPM certifying 25%, 50%, 75%, and 100% completion of construction/installation activities. Letter Certifying 100% completion of construction will include certification that facility is ready for start-up.

Product: Letter certifying 25% completion of construction/installation activities.

Target Date: 5/19/09

Product: Letter certifying 50% completion of construction/installation activities.

Target Date: 6/02/09

Product: Letter certifying 75% completion of construction/installation activities

Target Date: 6/16/09

Product: Letter certifying 100% completion of construction/installation activities and notification that FOG facility is ready for start-up.

Target Date: ~~6/30/09~~ **January 2011**

Task 2.7 Start-Up Biodiesel Facility

The goals of this task are to commission the facility, test the equipment, bring the 300 gallon per day biodiesel facility to the point that the Test Program developed under Subtask 2.8 can begin, and prepare Monthly Start-Up Activity Reports that include a summary of field activities and field notes. Successful completion of this task will be measured by consistent and reliable operation of the demonstration biodiesel plant at full output for seven days and providing written notification certifying readiness to operate which will be submitted to the CPM at the fourth CPR. A copy of the monthly Start-Up Activity Reports shall be included as part of the Monthly Progress Reports required in Task 1.4.

The Recipient shall:

- Conduct preliminary start-up testing of 300 gallon per day biodiesel facility to ensure that all equipment and data acquisition are working properly.
- Prepare Monthly Start-Up Activity Reports.
- Calibrate test equipment and install data acquisition system.
- Provide written notification to the CPM certifying readiness to operate for Test Program.

Product: Monthly Start-Up Activity Reports

Target Date: Within 10 working days after the beginning of each month during start-up activity period (~~6/30/09~~ 7/13/09).

Product: Written Notification Certifying Readiness to Operate for Test Program

Target Date: ~~7/14/09~~ **January 3, 2011**

Task 2.8 Develop Demonstration Test Program

The goal of this task is to develop a performance and certification-testing program. Successful completion of this task will be measured by the Recipient's and Energy Commission's agreement on the test plan after the second CPR. This goal helps achieve the project objectives by organizing and scheduling the test program activities and properly and accurately documenting all test and inspection data.

The Recipient shall:

- Prepare the draft Performance Certification Test Plan which shall include, but is not limited to, the parameters to be measured, number of hours of operation, type of monitoring, a site security plan, and the manner in which the data will be validated, analyzed, and reported. Parameters may be continuously measured include, but may not be limited to: batch volume, input flow (water, sodium methoxide, sodium hydroxide, and acids), output flows (biodiesel, glycerin, and methanol), operational parameters throughout the biodiesel production units, and electric and heating usage. Secondary parameters, such as increased heating value from the digester and grease percentage of the FOG waste may also be monitored.
- Conduct three (3) site visits and three (3) demonstration team meetings and prepare and submit meeting minutes.
- Review test plan internally and submit the Draft Performance Certification Test Plan. The document shall include, but not be limited to: a description of the process to be tested; rationale for required tests; test objectives and technical approach; a description of facilities, equipment, and instrumentation required to conduct the tests; a description of test procedures, including parameters to be controlled and control methods; parameters to be measured and instrumentation to measure them, calibration procedures to be used, recommended calibration interval, and maintenance of the test log; description of data analysis procedures; description of quality assurance procedures; and contingency measures to be

considered if test objectives are not met.

- Prepare and submit the Final Performance Certification Test Plan Key elements from this document shall be included in the Final Report.
- Prepare and submit meeting minutes to CPM.

Product: Meeting minutes

Target Date: ~~Within 10 working of CPR~~ Included with monthly progress reports

Product: Draft Performance Certification Test Plan – Brown Grease

Target Date: ~~9/10/08~~ May 10, 2010

Product: Final Performance Certification Test Plan – Brown Grease

Target Date: ~~10/22/08~~ December 15, 2010

Product: Draft Performance Certification Test Plan – Combined Facilities

Target Date: ~~7/15/09~~ May 10, 2010

Product: Final Performance Certification Test Plan – Combined Facilities

Target Date: ~~8/19/09~~ December 15, 2010

Task 2.9 Conduct 6 ~~12~~-Month Demonstration Test Program

The goal of this task is to successfully complete a **6** ~~12~~-month demonstration test on the brown grease recovery and biodiesel production facility. Successful completion of this task will be measured by collection of **up to six** ~~twelve~~ months of data and operating experience. Other measures of success will be demonstrating that consistent product quality can be achieved at various throughput rates and that energy recovery from demonstration plant waste streams can be accomplished by WWTP operations. This goal helps to achieve the project directives by successfully demonstrating the economics and viability of co-locating a waste grease recovery and biodiesel production facility at a POTW.

The Recipient shall:

- Conduct routine operations and maintenance of the demonstration plant including daily status checks.
- Conduct an on-site plant inspection on a daily basis and make non-routine repairs.
- Conduct all routine monitoring and special testing and inspections per approved test plan.
- Develop and study performance trends.
- Troubleshoot performance and reliability problems.
- Prepare and submit **monthly** ~~quarterly~~ performance summary reports indicating the performance parameters identified in the test plan.

Product: ~~Quarterly~~ **Monthly** Performance Summary Reports

Target Date: Due **monthly during demonstration period** ~~within 15 calendar days after 3, 6, 9, and 12 months of operation.~~

Task 2.10 Conduct Technology Transfer Activities and Prepare Public Relations Program

The goal of this task is to develop a plan to make the knowledge gained, experimental results and lessons learned available to key decision-makers.

The Recipient shall:

- Prepare and submit draft Technology Transfer Plan. The plan shall explain how the knowledge gained in this project will be made available to the public. The level of detail expected is least for research-related projects and highest for demonstration projects. Key elements from this report shall be included in the Final Report for this project.
- Prepare and submit final Technology Transfer Plan.
- Conduct technology transfer activities in accordance with the final Technology Transfer Plan. These activities shall be reported in the Monthly Progress Reports under Task 1.4 and letters certifying that the technology transfer activities are 50% and 100% complete will be submitted to the CPM.
- Prepare and submit documents including electronic copies of the Power Point presentations for Public Relations Program. Internal educational materials will be prepared for use in early project meetings and workshops where WWTP personnel and other stakeholders are educated on what the project is, how long the program will operate, etc. Materials will include a minimum of two (2) targeted Power Point presentations that will be presented during two separate half-day workshops for WWTP personnel and other stakeholders.

Product: ~~Draft~~ Technology Transfer Plan

Target Date: ~~7/15/09~~ **June 24, 2011**

Product: ~~Final~~ Technology Transfer Plan

Target Date: ~~8/12/09~~

Product: Electronic Copy of Power Point Presentation No. 1

Target Date: ~~3/19/08~~ **January 31, 2011**

Product: Electronic Copy of Power Point Presentation No. 2

Target Date: ~~5/6/09~~ **January 31, 2011**

Task 2.11 Prepare Production Readiness Plan

The goal of the plan is to determine the steps that will lead to the manufacturing of the technologies developed in this project or to the commercialization of the project's results.

The Recipient shall:

- Prepare and submit a ~~draft~~ Production Readiness Plan. The plan will define the steps that will lead to manufacturing of the technology developed in this project.
- ~~Prepare and submit a final Production Readiness Plan. The plan will define the steps that will lead to manufacturing of the technology developed in this project.~~

Product: ~~Draft Production Readiness Plan~~
Target Date: ~~3/11/09~~

Product: ~~Final~~ Production Readiness Plan
Target Date: ~~5/6/09~~ **September 30, 2011**