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Biodiesel and Fuels Demonstration

Mississippi State University Sustainable Energy Research Center

Bill Batchelor, Mississippi State University

Project Summary: Overall, the project is progressing on schedule. There have been no major setbacks or schedule delays. Variances were reported under the biodiesel, ethanol, biomass utilization, distributed generation, chemicals and feedstocks portions of this project. Minor delays were reported due to obstacles encountered in research methods and new software packages. The environmental sustainability portion of the project is progressing ahead of schedule. This project's spending is on schedule with the originally proposed budget.

The purpose of this project is to conduct research needed to develop and support an economically and environmentally sustainable renewable energy industry in Mississippi. Research in this project has been organized into three research platforms: Fuels, Value-Added Chemicals, and Power. The Fuels platform consists of multidisciplinary teams focused on developing improvements in production and use of biodiesel, ethanol, bio-oil, and gasoline from syngas. Each of these fuels can be developed from biomass produced in MS. The biodiesel group is conducting research to develop biodiesel from lipids derived from biomass grown in MS. They will develop extraction techniques, test physical properties, and evaluate the use of these new formulations. The ethanol group is focusing on the development of more efficient microbes to convert organic carbon compounds from biomass to ethanol, as well as microbes that can convert synthesis gas to ethanol. The bio-oil group is developing more efficient pyrolysis techniques to

develop bio-oil. They are conducting research on the use of bio-oil, including blending with diesel fuel and development of high valued chemicals.

The gasoline group is studying the catalytic conversion of bio-derived synthesis gas to methanol and gasoline. The Value-Added Chemicals and Products group is conducting research to derive high valued compounds from waste products resulting from the generation of renewable energy. The Power group is conducting research in developing and improving power generation from biomass. The syngas team is conducting research to understand linkages between syngas feedstock properties and resulting gas composition. The utilization group is developing methods and tools to gain improved understanding of combustion processes for biomass fuels.

Oxydiesel Demonstration in California and Nevada

Thomas Sopko, O2Diesel Inc.

Project Summary: The current e-diesel project with O2Diesel Inc. is titled, "Ethanol-Diesel Test Program." Using congressionally mandated funds, the objective of this program is to conduct a thorough evaluation of e-diesel use in on- and off-road vehicles and equipment while operating in regular service. This work effort builds on previous e-diesel activities and focuses on testing that addresses safety and regulatory requirements for development of this fuel technology. Current activities include CARB/EPA Diesel Engine Control Strategy (DECS) verifications as well as soil and water (multimedia) studies. Progress to date includes tests on two engines, three fuel blends, and five different after-treatment devices as part of the DECS. Test plans are being finalized for the multimedia study.

E diesel Test & Research Project
Nathan Fields, National Corn Growers Association

Project Summary: The recipient stopped the project due to unfavorable results. All three of the John Deere diesel engines (8.1L, 6.8L, and 12.5L) experienced premature fuel system failure during the 2,000 hr durability tests. As a result of a status meeting between the recipient and John Deere on May 11, 2006 the project was discontinued due to the failures encountered. The scope is currently being revised. (Note that the discussions regarding the revision of scope are underway and are therefore not to be disclosed unless NCGA specifically agrees. As of July 2, 2007, the Congressional sponsor's concurrence with the revised scope has been received and NCGA has been asked to expedite submitting the remaining information needed to formalize the scope revision.)

John Deere & Company became part of the program as the result of E diesel testing done on one of their combines in central Illinois. After over 800 hours of use on a 10% E diesel blend (using the GE Betz additive package), the engine was removed and dismantled by Deere engineering staff. No indications of failure or unusual wear were found. Subsequent meetings between Deere, Illinois DCEO, and Illinois Corn Growers led to the development of this program, which is very similar to the testing that would be performed by John Deere in bringing a new engine to the market.

Of course, the overall objective of the program is to commercialize E diesel fuel as a cleaner-burning substitute for conventional #2 diesel fuel. This testing program, if successful, could lead to John Deere extending warranty coverage to the fuel for use in its engines. It is also conceivable that John Deere could use E diesel to substitute for #1 diesel as "factory-fill" in some of its equipment and or machinery.

The John Deere E diesel Test & Research Program is separated into three distinct phases: Phase 1 – Laboratory Studies, Phase 2 – Laboratory Studies, and Phase 3 – Field Tests and Evaluations. Phase 1 consists of regulated and unregulated emission test and a 2,000-hour durability test with engine emission degradation tests performed at 500-hour intervals. Phase 2 will consist of two additional 2,000-hour durability tests, plus numerous other tests on both bare engines and in vehicles including wind tunnel, component compatibility (fuel system and engine gaskets and sealants, plus plastic, rubber, elastomeric and metallic part compatibilities with E diesel fuel), E diesel fuel standards development, fuel pumpability, and hot/cold starting characteristics at ambient temperatures ranging from +120° F to -20°F. Testing will either be performed at Deere's Product Engineering Center (PEC) in Waterloo, Iowa, or farmed out to major testing laboratories (such as SwRI), depending on laboratory availability and testing schedules. This will be coordinated through John Deere & Company.

National Biodiesel Infrastructure Development Initiative

Tom Verry, National Biodiesel Board

Project Summary: Deliverable A.1.DL.1, Northville Industries Services' (NIS') final report "B5 Soy Test Data and Report," was completed and approved this quarter. Under task A.3.ML.1 Jefferson Biofuels LLC has completed its site plans and permitting requirements for its Kansas City biodiesel blending terminal. EF1 - NEPA paperwork is being reviewed by the Golden Field Office. Jefferson Biofuels LLC is in the process of completing the permitting requirements needed for its Jefferson City terminal; this task is taking longer than anticipated but is expected to be completed within the next quarter. Under task C.1 this quarter there were three BQ-9000 training sessions held with nearly 80 in attendance. NBB submitted justification to Golden Field Office to eliminate the Fuel Test Survey under task C.2. NBB is proposing funds from this task go to a newly proposed task D, USPS Biodiesel Demonstration, to be executed by NREL. NBB is waiting for Golden's official approval of this modification. Spending is slightly behind schedule but expected to get back on track once NEPA and sub-contractor restrictions are lifted. The DOE amount and cost share amount from last quarter has also been updated for last quarter based on corrections submitted by the recipient. Cost share was decreased due to a calculation error the first quarter. NBB overestimated its cost-share by including food and a non-allowable event (Canadian event).

The NBB will partner with petroleum products merchant wholesalers to perform pipeline run(s) with an expected result of understanding how biodiesel behaves in the pipeline, particularly if it is fungible, and why or why not. Limited testing has been done to date on biodiesel movements through pipelines. None of it is publicly available information. This project will be the first demonstration of soydiesel in a pipeline. This demonstration will raise awareness and dispel speculation about the concerns of moving low-level blends of biodiesel on the pipe. This project will have an outreach and education component directed at petroleum marketers on the proper procedure to blend, ship, and store ASTM D6751 quality biodiesel. This project will also establish an emergency implementation plan should fuel quality situations occur in the future, as did in Minnesota last winter. Further, this grant will result in the installation of a biodiesel meter-blending terminals at each of two existing petroleum terminals.

National Biofuel Energy Laboratory

Kelly Jezierski, NextEnergy

Project Summary: Overall the project is slightly behind schedule and will likely need a no cost time extension. Spending is also slightly behind. Cost share is substantially lower than it should be, it is currently at about 6% of funds spent to date. Task A is almost complete and has culminated with the dynamometer group testing various custom fuels, results are currently being reviewed. The major accomplishment for Task B was the initiation of the fuel additives for cold flow impact evaluation. This task is slightly behind schedule, the team has reached out to a couple of companies for additional help to effectively evaluate more additives. The review of biodiesel blends has continued in Task D. Lastly, initial parameters for the biofuels and biofuel blends database have been identified.

Little is known about the impact of the unavoidable compositional variability of biodiesel (and even conventional diesel) on diesel emissions. The alkyl ester makeup of biodiesel varies very widely world-wide, as does the hydrocarbon makeup of petroleum diesel. Not enough is known about the impact of these variations on fuel characteristics (e.g., cetane number, stability and cold weather performance) and engine performance (e.g., emissions, power output, cold-weather driveability, wear of fuel system and engine parts). In particular, very little is known of the impact of biodiesel on the production of certain emissions, such as formaldehyde, that are currently not regulated but are expected to be regulated in the future. It is the purpose of this program to resolve these issues.

Associated Products, Combined Heat and Power, and Other Technologies

Canola-based Automotive Oil R&D

Ira Pierce, The Green Oil Company

Project Summary: This research and development project will construct sufficient metrics on the sciences of Canola Oil, (Task 1); and on decision making towards adoption (Task 2) specifically directed at industries that are potential large-scale users of bio-based automotive products. This study is an early stage effort designed to develop practical knowledge required to achieve these stated objectives.

At a later date, we may consider using the decision making model on farmers, as well. They will have to elect to plant Canola on their lands, with their decision making based on criteria that are similar in many ways to those for users.

The overall objective of the government and the bioproducts industry is to replace petroleum lubricants and fuels with rapidly biodegradable, petroleum-free, environmentally safe products. To do so, industry must produce bioproducts of the highest quality, in large volumes and at competitive prices. Accomplishing that objective requires confident investors and integration of the entire "farm to refinery" operation.

Phillips Biomass Combined Heat and Power Facility

Carl Nelson, Green Institute

Project Summary: As noted in the previous quarter, Green Institute is seeking a workplan change from DOE to focus more on research activities with the remaining funding. A six-month no cost extension has been granted while the DNFA relative to this scope change circulates for signature. While awaiting approval of the scope change, Green Institute has focused their efforts on reporting on the development of urban biomass utilization for the Twin Cities region. The report has been completed.

The project objectives are to develop a biomass combined heat and power plant in the Phillips neighborhood of South Minneapolis and support the work of the Phillips Community Energy Cooperative in delivering energy efficiency services to low-income residents.

EERC Center for Biomass Utilization 2005

Dr. Bruce Folkedahl, University of North Dakota Energy & Environmental Resource Center (EERC)

Project Summary: Management and Strategic Studies and Biodiesel Education and Outreach tasks included organizing sessions, workshops and speakers at various biomass and biofuel related conferences.

Biomass Gasification and Distributed Power Production construction activities were delayed pending NEPA approval, construction and procurement activities are scheduled to continue in the next quarter.

Novel High-Cetane Oxygenates from Waste Glycerol from Biodiesel Plants efforts produced four candidates for cetane and cold-flow filter-plugging tests and one candidate to be used as a gasoline octane enhancer.

Process Integration for Economical Hydrogen Production from Ethanol efforts continued with varying parameters in pilot-scale testing to optimize product streams.

Biojet Fuel Cold-Flow Improvement submitted two samples of biojet fuel for evaluation at the UND lab, initial results show acid concentrations to be higher than specification and actions are being taken to resolve the problem.

Urea Fertilizer Production from ethanol Coproduct Carbon Dioxide process optimization continued with catalyst stability tests and reaction condition optimization as well as evaluating and compensating for a new possible reaction mechanism.

Chemical Feedstocks from Lignocellulosic Pyrolysis efforts continued on performing economic analysis of using bio-oil-extracted polymers in Enhanced Oil Recovery treatments, domestic data is difficult to find to perform this analysis and this activity has been delayed.

Utilization of Cuphea Oils for Biodiesel Production, Landfill Methane for Microturbine Power, Ethanol Processing for Hydrogen Production - System Integration, Biomass III Energy and Products Workshop, Biomass Gasification and Distributed Power Production, and Economically Optimized Biodiesel Production from Low-Value Feedstocks all entered the final write-up phase, the overall project is scheduled for closeout June 2007.

The goal of the EERC CBU Program is to develop economically and environmentally sound technologies to promote efficient biopower or bioenergy, transportation biofuels, and bioproducts such as marketable chemicals and hydrogen. An overarching goal of the EERC CBU is to develop technologies that will expand the use of biomass in practical and economic ways within the framework of sustainable development and environmental protection. The EERC CBU is in its fifth year of operation.

Anaerobic Digestion

Research on Anaerobic Digestion: Optimization and Scalability of Anaerobic Digestion of Mixed High Strength Food Processing Wastes for Renewable Biogas Energy

Floyd Schanbacher, The Ohio State University Research Foundation

Project Summary: This project consists of three main tasks: 1) Implementation of Research-scale Anaerobic Digester System, 2) Research and Operating Costs for Anaerobic Digestion of Biomass to Energy, and 3) Project Management and Reporting.

Task 1 - Design and Construction of Research-scale Anaerobic Digesters proceeded mostly on schedule. The digesters were fabricated and the installation area was prepared for their arrival. Due to performance limitations of the on-board biogas analyzer, subsequent related tasks are delayed and adjustments were made to the affected neighboring equipment. A suitable replacement analyzer has been identified and the task should be able to proceed as expected.

Task 2 - Research and Facility Operation activities included continued work on optimizing design and operation of the anaerobic digestion systems including bringing new lab-scale anaerobic digestors online, enhancing the microbiology and metabolism of anaerobic digestion through microbial genomic and metabolomic analysis of a variety of anaerobic bacterial species contained in a comprehensive molecular library, and appointing two graduate students to survey the food processing industry based biomass available in the state of Ohio with potential for use in biogas production including location, energy potential, and suitability for anaerobic digestion.

Outreach efforts included sponsoring a workshop titled "Waste to Energy Workshop for the Ohio Livestock & Food Processing Industries" in conjunction with the Ohio Department of Development and the Combined Heat and Power Association. To date, 20% of the project funds have been spent with 75% coming from cost share.

This project has two main objectives: 1) design, acquisition, and installation of research-scale anaerobic digestion systems (two) optimized for operation with high-strength non-lignin biomass wastes common to Ohio's agricultural and food processing industries, and 2) operating costs for support of research and development essential to our program for conversion of high-strength biomass wastes to renewable energy via anaerobic digestion.

This program includes facilities and interdisciplinary capacity for anaerobic digestion research at laboratory bench-scale (0.5-8 liter), drum-scale (45 gal), large (sub-pilot) research-scale (1,600 gal), and semi-commercial pilot-scale (8,000) scales using high-strength or mixed biomass types as feedstocks. This funding will be used to acquire the research-scale (2 x 1600 gal ea) anaerobic digestion systems for testing and optimizing the energy yield from high-strength food processing biomass wastes in concert with our lab- and drum-scale digesters.

New York Biomass / Methane Gas Fuel Cell Power Project

Dr. Caine Finnerty, NanoDynamics, Inc

Project Summary: This project is on schedule, however spending is slightly behind the spend plan. The following information should be treated as proprietary. During the past quarter several notable achievements occurred. 1) A single cell power of 17.25 W was achieved. It is project that next quarter 20 W will be achieved, a project milestone. 2) A cell stack was tested using simulated reformat fuel and a max power of 64.73 W was achieved. 3) Workable prototypes of B and C were fabricated. 4) Optimization of prototype A is complete over a hundred cells have been fabricated for testing. Optimization for prototypes B and C is still underway.

NanoDynamics has recently made a series of significant advances in the development of tubular anode supported ceramic solid oxide fuel cells that have resulted in cell power densities of as high as 2 Watt per square centimeter with measured electrochemical efficiencies greater than 55% and fuel utilization over 90% while the cell is operating at rated load. NanoDynamics has also demonstrated the ability to perform direct reforming of propane and methane fuel in tubular fuel cells with a 1000 hour endurance test revealing little or no deterioration of the cell structure. Such high power density in combination with high fuel utilization and high electrochemical efficiency provides the possibility of developing efficient compact (and therefore lower cost) fuel cell systems. NanoDynamics has filed a patent on an innovative cell manufacturing process that will allow the extension of the cell technology employed in their microtubular fuel cells larger stationary applications. This cell casting technology offers the potential to scale-up the benefits all ready demonstrated for portable applications to systems sizes of 10 kilowatts or greater. Employing these larger format cells and experience gained from the development of hydrocarbon reforming technologies, it will be possible to develop fuel cell systems that operate from biomass produced gases to generate both electricity and heat (C.H.P).

This project will develop a novel solid oxide fuel cell casting technology and innovative catalyst design. Fuel cells and "short" fuel cell stacks (up to five cells) including gas distribution manifolding will be designed, built and tested to evaluate the feasibility of scaling-up this novel cell manufacturing technique to multi kilowatt applications. The fuel cell's anode material composition and structure will be optimized to improve the performance of the fuel cell in biomass gas applications. The results of this project will provide the basis for construction of solid oxide fuel cell systems in the future capable of producing significant power efficiently from biomass gas.

Solid Waste Authority Pyramid Resource Center

Tim Berlekamp, SWACO

Project Summary: Through proprietary technology, SWACO's landfill gas will be cleaned to produce fuels for the production of electricity through either micro-turbines or fuel cells, compressed natural gas for fueling SWACO's dual fuel transfer fleet, which will run on bio-diesel and CNG, make methanol for the production of bio-diesel, hydrogen and direct methanol fuel cells as well as creating food grade CO₂. By utilizing the created energies and by-products for commercial purposes, this project will demonstrate the viability of using landfill gas as an alternative energy resource. SWACO will monitor the efficiency, economics, and performance of the commercial uses for a period of twenty-four months.

Communications, Outreach, and Partnerships Part I

Biobased Products

Mark Williams, Growth Dimensions for Belvidere and Boone County Inc.

Project Summary: Under task A, a bio-lubricant/grease company continues to explore the development of a new biobased product division; the Rockford Airport (Freedom Field) Biomass to Hydrogen demonstration project continued with information gathering and concept stage development; and BioVantage, a biodiesel product commercialization and production company has entered the investment and marketing strategy stage. Under Task B, the Third RFP solicitation was advertised March 1, 2007 with an end date of March 31, 2007. The proposal for a biodiesel product commercialization and production company was reviewed and determined to move to DOE review. Proposal was submitted to DOE for review March 29, 2007. Subsequent review by DOE determined that the project will require a NEPA review. Growth Dimensions has determined that it is necessary to eliminate the Task 3 - Design Services Task, because the Growth Dimensions is in the process of negotiating on the acquisition of an existing facility for the use and has decided it would be more prudent to The decision has been made to eliminate Task C, design of an Ag-Tech commercialization center, and instead focus the funding on support of Task A. In the next quarter the revised scope and budget will be submitted reflecting these changes. Due to complications with Task C and the subsequent revision of the scope, project spending continues to be behind schedule. A no-cost extension will be requested in the 3rd quarter, 2007.

The objectives of this project are three-fold: (1) biomass product development and commercialization support services; (2) development and management of a competitive capital award program; and (3) preliminary design and engineering studies of the proposed Ag-Tech Commercialization Center.

Alternative Energy Enterprise Program (Strategic Biomass Initiative)

Sumesh Arora, Mississippi Technology Alliance

Project Summary: Under task A, modifications to the ban floor in the east and west feeding alleys were completed. Due to poor health and personal issues on the part of one of the sub-contractors, the project is slightly behind schedule, but is expected to be on track during the third quarter. Three additional sub-grants were awarded during the last quarter. A no-cost extension was requested through December, 2008, in order to complete oversight and support of projects supported under this award.

The overall objective of this project referred to by MTA as the Strategic Biomass Initiative (SBI) is to foster viable commercial enterprises in Mississippi based on the state's natural biomass resources and to further develop near-term biomass technologies through university based applied and research and development (AR&D). This project will examine barriers to commercialization of biomass technologies and identify AR&D as well as commercial demonstration opportunities which can overcome these barriers. The project will also consider the need for post-commercialization AR&D as needed by the existing biomass technology based companies in Mississippi and help develop industry-university partnerships to overcome the challenges faced by the industry.

Communications, Outreach, and Partnerships Part II

Kentucky Rural Energy Supply Program

Cam Metcalf, Kentucky Pollution Prevention Center

Project Summary: The project is on schedule. Cost share is currently low, 10% instead of the required 25% or about \$150,000 low.

- The project's quarterly meeting was held and was attended by House Representative Tanya Pullin and a representative for Senator Jim Bunning's office.
- Sub-award 1, "Development of an Ethanol Pilot Scale Facility to Evaluate the Effect of Collection, Storage, and Pretreatment of Corn Stover": Lower moisture content corn stover was baled and a compositional analysis was performed. It was found that there was a slight decrease in glucan content which was explained by the ensiling process.
- Sub-award 2, "Development of an Integrated Solar Heat Pipe System for Improving Building Energy Efficiency": A preliminary set of simulations has been performed to compare the performance of a baseline solar heat pipe system to water wall, concrete wall and direct gain systems in Louisville, KY, Madison, WI, Rock Springs, WY and Albuquerque, NM. Results are not in yet.
- Sub-award 3, "Differentiating Microbial Pathway and Membrane Adaptations for Enhanced Performance in Extreme Environments": The saponification and methylation procedures to form fatty acid methyl esters from *C. thermocellum* whole cells was revised from the standard protocol to a new method that increases yield by up to three times.
- Sub-award 4, "Novel Catalytic Approaches for Bio-Oil Upgrading": The catalyst type was changed from a basic cracking catalyst to a reforming catalyst. The project is moving forward with promising results, increasing % carbon and decreasing % oxygen in the oil by ~40% for both.
- Sub-award 5, "Photo-catalysts for Solar Energy and Hydrogen Production": The electrochemical system is fully operational as of the end of the quarter. The first series of topography images of the nanowires have been obtained. Initial experiments with the EC system have shown that a surface of gold coated mica onto which the nanowires can be deposited may not withstand the experimental conditions.
- Sub-award 6, "Production of Biomass Briquettes as an Alternative Fuel Source": The briquetter has been installed and is operational; however they have not been able to find a binder that works.
- Sub-award 7, "Weather Responsive Ventilation for Residential Energy Efficiency and Indoor Air Quality": Early results from the superposition study indicate that flow continuity cannot be measured in real time. To overcome the problem, a post-processing program was written which iterates the internal pressure coefficient to achieve continuity. The technique appears reliable and acts as an error checking procedure as convergence will not occur if sensors readings are inaccurate (e.g. rain water in the pressure taps).

The Kentucky Rural Energy Supply Program was established in 2005 by a federal direct appropriation to benefit the citizens of the Commonwealth by creating a unified statewide consortium to promote renewable energy and energy efficiency (REEE) in Kentucky. The Kentucky Rural Energy Consortium (KREC) was formed and seeks to advance comprehensive research on biomass and bioenergy of importance to Kentucky agriculture, rural communities, and related industries. The research goals for the consortium include dramatically reducing the U.S. dependency on foreign oil and creating an economically viable bioenergy industry in the Commonwealth.

Regional Biomass Program- Council of Northeastern Governors (CONEG)

Frederic Kuzel, Council of Great Lakes Governors

Project Summary: In the last quarter the review committees for the two Bioheat projects recommended changes to each of the projects in order to enhance the deliverables and make the projects more efficient. This necessitated additional discussion and negotiation with the selected contractors and has delayed the actual signing of the agreements. The Bioheat Laws and Regulations contract will be signed next quarter and the Bioheat Consumer Education project will be signed next quarter. CONEG representatives attended several congressional briefings on energy and biofuels and provided written summaries. A presentation was given on cellulose ethanol to the Eastern Lands Council and Western Land Managers Conference in DC. The Bioheat notebook is still waiting for additional research data from states. It may be necessary to distribute a partial notebook and follow-up with supplements later as reports become available. The CONEG staff hosted several conference calls and meetings with the Partnership Principal Committee and attended numerous conferences and workshops related to biofuel and cellulosic ethanol outreach and education. Spending continues to be slightly behind schedule.

The Northeast Regional Biomass Program (NRBP), a public-private, cooperative initiative funded by the DOE, is one of five federally supported programs that seeks to increase the production and use of biomass energy resources. It brings together eleven Northeastern states, the federal government, regional and national organizations, and key industrial concerns in the Northeast. The eleven states are Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont. Through a combination of research and demonstration projects, outreach and education, and assessment and partnership-building, the NRBP seeks to enhance the development and use of biomass resources and technologies appropriate to the Northeast.

Regional Biomass Program-Council of Great Lakes Governors (CGLG)

Frederic Kuzel, Council of Great Lakes Governors

Project Summary: CGLG continues to monitor the state sub-grant projects through quarterly technical reports, conference calls, and email communication. Representatives from all Great Lakes states participated on conference calls of the Great Lakes Biomass Emissions Resource Group in January and February. The purpose of this group is to address common issues related to emissions from biomass energy processes. The group developed a letter to be sent to biomass combustion equipment manufacturers alerting them to the various permitting and emissions requirements in the states. The GLBSRP continues to manage the Antares project to measure success of the National Biomass Partnership. During this quarter, Antares completed the revised final reports for the Southeast and Great Lakes regions. During this quarter, Antares completed the revised final reports for the Western region, completing the reports for all five of the regions. The GLBSRP initiated the first planning conference call for the Conference on Renewable Energy from Organics Recycling, which is presented annually by BioCycle magazine. Under task E a year long drivability test continues and a winter cold start drivability test was conducted at sub-freezing temperatures using E0, E20, and E40 fuel. Spending is slightly behind schedule but CGLG continues to make progress.

The purpose of this earmark is to facilitate the increased use of bioenergy and biobased products in accordance with state and regional goals and DOE's plans and strategies. This project is intended to increase the use of biomass technologies, biomass fuels and biobased products through extensive outreach and education. The project is designed to expand and strengthen the existing networks that have been put in place over the past twenty years, benefit from the years of technical experience of its regional managers and state representatives, and to take advantage of the access provided by four regional governors' organizations to bring biomass development issues to the highest levels of state government.

Regional Biomass Program (Southeastern Biomass State & Regional Partnerships Project)

Frederic Kuzel, Council of Great Lakes Governors

Project Summary: The purpose of this project is to facilitate the increased use of bioenergy and biobased products in accordance with state and regional goals that support DOE's plans and strategies. Funding for activities during FY06 will be supported with FY05 funding.

Regional Biomass Program- Western Governors Association (WGA)

Frederic Kuzel, Council of Great Lakes Governors

Project Summary: In the last quarter, WGA continued to conduct conference calls, briefings, and agency meetings and attended several bioenergy conferences. One new state subgrant was awarded. WGA staff continued to conduct quarterly calls to track biomass related recommendations such as proposed tax incentives, possible actions the utility industry could take, and implementation plans. Timeframes and funding plans were discussed with each awardee. Additional feasibility studies have been completed and a conference was held to discuss utilization of beetle damaged trees in Colorado. WGA is slightly behind schedule with their spending but continues to make progress.

The purpose of this earmark is to facilitate the increased use of bioenergy and biobased products in accordance with state and regional goals and DOE's plans and strategies. This project is intended to increase the use of biomass technologies, biomass fuels and biobased products through extensive outreach and education. The project is designed to: expand and strengthen the existing networks that have been put in place over the past twenty years, benefit from the years of technical experience of its regional managers and state representatives, and take advantage of the access provided by four regional governors' organizations to bring biomass development issues to the highest levels of state government.

Not Reviewed

Development of Biofuels Using Ionic Transfer Membranes

UNLV

Project Summary: UNLV and subcontractor Ceramatec began work on installing equipment and evaluating various properties of NaSICON-type membranes working towards a new method of producing sodium methoxide. Training of staff is proceeding as planned and care is being taken to minimize the quantities of waste produced in the lab. Progress was made on all tasks as schedule with a few minor variances that they should be able to recover from in the next quarter. Financially they are slightly behind (18% instead of 20%) on cost share but have used approximately 25% of their budget so costs should equalize in the following quarters.

Sodium methoxide is an effective catalyst for the transesterification of vegetable oils, animal fats and recycled greases one application of which is biodiesel production. These basic catalysts are useful in processing biomass or plant based oils in general. For example, approximately 0.7 kg sodium methoxide per barrel of biodiesel is required, typically used as a 5-6 wt% sodium methoxide in methanol solution. One method produces high-purity sodium methoxide from sodium metal, an expensive raw material that also requires complex infrastructure for safe handling of sodium. Another makes sodium methoxide from Na/Hg amalgam, but the product contains trace mercury. Improved methods for producing these basic catalysts more inexpensively could benefit the oils processing industry and possibly other chemical processes requiring a basic catalyst.

The University of Nevada, Las Vegas and an industrial partner propose to investigate an electrochemical process to produce high-purity sodium methoxide from low-cost aqueous sodium hydroxide using a sodium-selective NaSICON-type membrane, providing a lower-cost yet high-purity product with no hazardous contaminants and reduced waste stream. Since the membrane is thought to be permeable to sodium only, lower-cost impure sodium hydroxide streams can be utilized. This scalable process will reduce the cost of biodiesel manufacture, and allow on-site production of the catalyst, thereby further reducing transportation costs, avoiding inventory and shelf-life costs, and reducing safety hazards. Ultimately a "one-step process" or "zero inventory option" is envisaged by integrating the on-site sodium methoxide generation with the downstream biodiesel process.

Asphalt Roofing Shingles into Energy Project, Xenia (OH)

Owens Corning

Project Summary: The project met with GO to discuss a re-scope because the cement demonstration is not proceeding as planned. Progress was made on other tasks such as: pilot scale testing of shingles fed into a pre-calciner was performed, emission analysis is pending; working with Rosby Resource Recycling to inform contractors of the opportunity to recycle shingle tear-offs; a relationship is now in place with a CFB to perform a shingle demonstration once details are worked out; work continues on developing a method to remove inorganic material (granules) from the shingles for re-use in shingle manufacturing; Phase II of the asbestos thermo-degradation study lab work was completed, field work was completed at the University of Cardiff. FL Smidth pyroprocess and emissions tests were once again postponed due to pilot testing lab availability.

The demonstration project will allow Owens Corning and a cement kiln or possible extension into a Circulating Fluidized Bed (CFB) boiler, to study the feasibility of utilizing post consumer residential asphalt shingles as an alternative raw material and an alternative fuel. The project's goals include demonstrating the feasibility of: (1) Implementing a system that moves Ohio towards long-term pollution prevention, waste reduction and recycling sustainability; (2) Creating a program and the supporting infrastructure for recapturing the natural resources of a large, consistent waste stream; and (3) Developing a demand for value-added recyclable material sufficient to create competitive market prices. The ultimate objective of the project is to demonstrate the potential value of diverting post-consumer residential asphalt shingles from landfills into a system that will sort, process and deliver materials into alternative raw material and alternative fuel applications. Additionally, slip streams (that can be created during the recycling of shingles to enhance their fuel related properties), will be evaluated for their feasibility as a raw material input into the asphalt shingle manufacturing process.

City of Stamford Waste to Energy Project

City of Stamford Water Pollution Control Authority

Project Summary: Under Task A the SWPCA and Pullman and Comely have signed their agreement to draft the subcontractor contracts. Those contracts are in draft form and are being review by SWPCA staff for accuracy and insurance and other requirements. Under Task B, some work has been started on this review although the official contracts have not been signed. A literature search is in progress. Under Task C, the SWPCA laboratory has gotten price quotations for instruments and analysis for this portion of the project. In addition, the laboratory has continued to do total and volatile solids determinations and pH on samples of dewatered biomass that will be used in the project. The SWPCA is ready to recommend and instrument and sampling system. Additionally the SWPCA has collected all ASTM and EPA approved analytical methods for the solids characterization. Spending has not yet begun but is expected to start in the next quarter with the signing of the sub-contracts.

The goal of Stamford's Waste-to-Energy project is to determine the technology needed to convert pellets of dried wastewater residual into a renewable fuel which can in turn be used to generate power. Department of Energy Funds matched with funds from the Stamford WPCA will be used to meet the objectives of the project set forth below and throughout this document.

The objectives for this project are:

- Evaluate and assess technology for thermal conversion of biomass and electrical generation.
- Perform sampling, bench-scale testing, vendor testing, and laboratory analysis to determine the most acceptable gasification alternatives.
- Prepare a detailed-alternatives analysis of selected technologies.
- Develop a preliminary design for interfaces, structures, generators (turbines), and equipment necessary to the generation process.
- Conduct economic analysis based on preliminary design.
- Prepare constructability reviews, cost estimate, and implementation schedules for construction of the full-scale demonstration facility.
- Develop final design of a generation facility including interfaces, structures, generators (turbines), and equipment necessary to the generation process.
- Produce plans and specifications for the construction of the facility. It is estimated that there will be approximately 250 design drawings and 900 pages of detailed project specification.

Madison County Landfill Gas Utilization Project

County of Madison, New York

Project Summary: A no cost time extension was granted to the project through 3/31/2008. Activities included development and internal review of an RFP. A RFP scoring document, Madison County energy cost analysis, and finalizing and release of RFP have all been delayed until next quarter. Other personnel commitments attributed to the delay. The project hopes to make up time compressing the time for review and screening of proposals.

Madison County proposes to develop a Landfill Gas (LFG) Utilization Project to recover the energy value of landfill gas produced on the site of the existing County-owned and operated landfill. This project will build on previous efforts to utilize an existing supply of landfill gas. This Madison County proposes to develop a Landfill Gas (LFG) Utilization Project to recover the energy value of landfill gas produced on the site of the existing County-owned and operated landfill. This project will identify available technologies for landfill gas utilization and select and implement the best long-term use of the fuel for implementation based on maximum recoverable fuel. Emerging technologies with a high probability of commercial success will be considered.

The landfill presently collects and flares approximately 236.5 million cubic feet of medium energy value LFG (550 Btu per standard cubic foot) per year with an existing LFG collection system. The existing system consists of piping, valves, and an 8-foot by 20-foot blower skid. The blower skid houses valves, piping, condensate collectors, safety and control devices and two 600 standard foot per minute (scfm) blowers. In June 1998, as part of a landfill closure project, the County installed these components of a methane gas collection system for environmental control and with the intention of making the LFG available for generating electricity.

Most operational LFG generation projects are larger than that which could be supported by the amount of gas easily available from the Madison County landfill. However, industry professionals and other successful projects around the state support the conviction that the amount of gas that could be recovered from the landfill exceeds the initial, default estimates.

From the outset of efforts to capture the LFG energy, an electricity generation project was favored due to high electricity prices in New York State. However, pre-deregulation conditions in New York made transmission of the electricity uneconomical. Recently, another electricity generation project was investigated in cooperation with the New York Power Authority. Cost proposals received in 2005 for that project determined that it was too expensive as designed by the Authority. It is believed that many elements of the project were over-designed.

Recently energy prices have risen. Long-term forecasts predict ever increasing costs for energy. This evolutionary change in the market dictates reassessment of uses for the landfill gas. Several entities have expressed interest in developing this landfill as a source of energy.

The County will undertake a preliminary, separately funded effort to identify physical and operational improvements in landfill-site gas management and to increase gas availability. Department of Energy funds will be used to undertake a follow-on project. Types of projects that will be considered for implementation may include combined heat and power, power generation, pipeline or direct burn projects. Competitive processes will be used to identify candidate projects.

Ohio State University 4-H "Green" Building Project (OH)

The Ohio State University Research Foundation

Project Summary: This project will be completed by the time of the Peer Review. The only field work remaining on this project is under Task B. Work to be completed in the next quarter includes: exterior site work; continuing work on the building enclosure; installing heat pumps and associated piping; and beginning finishes in all phases of the building. Spending for this project is on schedule.

Ohio 4-H, a component of OSU Extension will build a 4-H Center located on The Ohio State University campus in Columbus, OH. DOE's funding is for: geothermal well drilling; installation of the geothermal loop for the building's heating and cooling system. The project covers only these aspects of the construction. Once these activities are completed, DOE's involvement ends. That is, DOE will not be responsible for or involved with the other activities related to completing construction.