DR. ROBERT J. WOOLEY

Education and Training

PhD Chemical Engineering, 12/1987
The University of Florida, Gainesville, Florida
MS Chemical Engineering, 8/1979
The University of Michigan, Ann Arbor, Michigan
BS Chemical Engineering, 5/1976
The University of Michigan, Ann Arbor, Michigan

Professional Experience

Abengoa Bioenergy New Technology, Lakewood, CO, 2007 to present
Director, Process Engineering

Responsible for the development of engineering for all technologies in the New Technology group. Leading a group of 10-15 engineers in the analysis of experimental data; development of models, PFDs, P&IDs and equipment and instrumentation specifications. Projects include cellulose conversion to ethanol and enhancements to the starch ethanol process.

National Renewable Energy Laboratory, Golden, CO, 2006 to 2007
Strategic Principal Engineer

Responsible for assuring appropriate and complete analyses, including risk and scenario analysis, are performed to support the objectives of the U.S. DOE's Biomass Program. Led the efforts to maintain a rigorous stage gate review process of all Biomass projects.

NatureWorks-Cargill, LLC, Minnetonka, MN, 2002 to 2006
Biomass Technology Manager

Led efforts (~ $5 million annually) to develop alternative feedstocks (biomass sugars) for the production of inexpensive lactic acid and polylactide polymers. This includesd managing Natureworks' efforts to develop intellectual property in biomass conversion, coordinate with strain and fermentation development at NatureWorks, and external partnerships with suppliers of supplemental technology (e.g., enzyme and feedstock collection). Responsible for process modeling and economic analysis of alternative biomass processes through the production of polylactide.

National Renewable Energy Laboratory, Golden, CO, 1991 to 2002
Technology Manager – Biofuels Program (2000 – 2002)

Accountable to DOE for the planning and execution of NREL and outside subcontracted research of approximately $20 million annually for advancing the National Biofuels Program. Considerable amount of stakeholder interaction and reviews were required to maintain support for the program at DOE and NREL.

Team Leader - Process Engineering (1996 – 1999)

Led a group of engineers responsible for developing and validating the process design and evaluating the economics through advanced modeling (ASPEN+) for the cellulosic biomass to ethanol process.

Manager/Team Leader - Alternative Fuels Data Center (1991 – 1995)
Advanced Separation Technologies, Inc., Lakeland, FL
Chief Engineer/Scientist
1989 to 1991

Development of laboratory and pilot plant procedures and design data for the ISEP continuous ion exchange and chromatographic process.

JSD Simulation Service Company, Houston, TX
Engineering Sales Manager
1988 to 1989
Responsible for program improvements and support of the process simulator ASPEN/SP.

Dow Corning Corporation, Midland, MI & Carrollton, KY
Engineering Specialist
1979 to 1984
Responsible for all chemical design aspects of several major capital projects.

Dow Chemical Company, Midland, MI
Chemical Engineer
1976 to 1978
Responsible for defining equipment and experiments to obtain scale-up information and customer samples of new products.

Selected Publications & Patents

"The eco-profiles for current and near-future NatureWorks® polylactide (PLA) production", with E. T. H. Vink, D. A. Glassner, J. J. Kolstad and R. P. O'Connor, Industrial Biotechnology, (3) 1, 58:81, 2007.

"Process for Fractionating Lignocellulosic Biomass into Liquid and Solid Products", with R. O'Connor, J. Kolstad, R. Kean, D. Glassner, B. Mastel, J. Ritzenthaler, J. Birk, J. Hettenhaus, R. Brooks, Patent Application WO 2007/120210 A2, October 25, 2007 "The Lignocellulosic Biorefinery: A Strategy to Return to a Sustainable Source of Fuels and Organic Chemicals" invited presentation with Davis Clements at Biorefinica 2004, Osnabrück, Germany, October 27-28, 2004.

"Standing Wave Design of Single and Tandem SMB Processes for Multicomponent Fractionation: Linear Isotherm Systems", with B. Hritzko, Y. Xie, N.-H. Wang, *AIChE J.*, (48) 2769, 2002.

"The effect of overliming on the toxicity of dilute acid pretreated lignocellulosics: the role of inorganics, uronic acids and ether-soluble organics", with T. Ranatunga, J. Jervis, R. Helm, J. McMillan, *Enzyme and Microbial Technology,* (27), 240, 2000.

"Process Design and Costing of Bioethanol Technology: A Tool for Determining the Status and Direction of Research and Development", *Biotechnology Progress,* with M. Ruth, D. Glassner, J. Sheehan, (15) 5:794, 1999.

"A Nine-Zone Simulated Moving Bed for the Recovery of Glucose and Xylose from Biomass Hydrolyzate" with Z. Ma and N.-H. L. Wang, *Industial and Engineering Chemistry*, (37) 9:3699, September 1998.

"Novel Three Component Separation Using a Single Continuous Counter-current Chromatographic Unit", presented at the AIChE National Meeting, Chicago, IL, November 1996.

ANDREA BOZZANO
UOP LLC
Development Manager - Renewables

EDUCATION AND TRAINING

Iowa State University	Chemical Engineering	MS	1989
University of Illinois	Chemical Engineering	BS	1987

PROFESSIONAL EXPERIENCE

UOP LLC	Manager, Renewables Development	Manager of Process Development group which is developing the UOP Ecofining and Renewable Jet technologies, as well as other technologies based on renewable feedstocks.
UOP LLC	Senior Specialist, Olefins and Detergents Development	Worked on a number of projects in development of technologies related to light olefins.
UOP LLC	Specialist, Olefins and Detergents Development	Worked on a number of projects in development of technologies related to detergents.
UOP LLC	Field Advisor	Worked on a number of startups in refineries and petrochemical plants.

Selected Publications

	PAT. NO.		Title
1	7,396,966	T	Olefinic feedstock treatment processes
2	7,189,885	T	Staged process for producing linear 2-phenyl-alkanes
3	6,979,394	T	Alkylaromatic process with catalyst regeneration
4	6,756,515	T	Dehydrogenation process using layered catalyst composition
5	6,740,789	T	Alkylaromatic process with catalyst regeneration
6	6,486,370	T	Dehydrogenation process using layered catalyst composition

SYNERGISTIC ACTIVITIES

AIChE membership

REG

Renewable Energy Group

Glen Meier

Director, Technology & Feedstock Development

Renewable Energy Group®, Inc.,

For more than 15 years, Glen Meier has managed diverse and entrepreneurial businesses. Currently, Meier serves as Director of Technology & Feedstock Development at Renewable Energy Group®, Inc.

Renewable Energy Group, Inc., (REG) is a biodiesel industry sales leader offering a complete biodiesel solution. Renewable Energy Group markets REG-9000™ biodiesel through large petroleum companies and fuel distributors. REG-9000 is used by on-highway fleets, municipalities, and power generator, mining, military, home heating and agriculture applications. REG's network production facilities consist of state-of-the-art proprietary multiple-feedstock technology. Renewable Energy Group offers procurement and risk management, production operations and technology services in addition to alternative feedstock research and commercialization.

As Director of the Technology & Feedstock Development department, Mr. Meier investigates new technologies that are complementary to REG's business and assigns priorities, staff and resources to multiple projects. The Technology & Feedstock Development department is a core strength of REG and the department supports many other functions of the business including Quality, Production, Procurement and Construction.

Todd A. Potas, PE, QEP
e-mail: tapotas@NRG-LLC.com

Todd A. Potas, P.E., Q.E.P., is a Principal at Natural Resource Group, LLC (NRG) with over 22 years of professional experience. He is a registered Qualified Environmental Professional and a registered professional engineer in Minnesota, Nebraska, North Dakota, Louisiana and Florida. Todd leads our Renewables environmental services for the biofuels industries; his primary responsibilities include business development, quality assurance/quality control, project management, air permitting and environmental compliance management, regulatory negotiations, alternative fuel source and process engineering and control evaluations. Todd previously was a principal investigator for several coal beneficiation projects for coal companies, public utilities, and the U.S. Department of Energy, using technologies that included high temperature and pressure drying, oil agglomeration, and conventional physical cleaning of various coals. Todd's combination of experience with biofuels and coal technologies allows him to evaluate environmental and permitting challenges for advanced biofuels projects.

Selected Project Experience

- Ethanex Energy: Project Manager, environmental permitting for four 100 MMgal/yr ethanol plants to be built in Illinois, Missouri and Kansas; work included fractionation and biomass boiler processing.
- DOE Biofuels funding applications. Have assisted with NEPA process and other application requirements for serveral applicant proposers.
- Biofuels Energy: Principal, environmental permitting for two 100 MMgal/yr ethanol plants built in Fairmont, Minnesota and Wood River Nebraska; work includes storm water and water discharge permitting and stack testing on-going compliance.
- Red Trail Energy: Principal, environmental permitting for a 50 MMgal/yr ethanol plant operating in Richardton, North Dakota; project includes a coal-fired bubbling bed boiler and was permitted as a PSD major source with BACT analysis and NAAQS and Class I air dispersion modeling. Work includes support for on-going compliance.
- Vector Pipeline Project: managed air permitting for the Springfield, Indiana and Highland, Michigan compressor stations from start to finish.
- Guardian Pipeline Project: completed the RR9 for the Joliet, Illinois compressor station.
- Buccaneer Pipeline Project: completed the air quality section of the third-party EIS, including a compressor station, off-shore construction operations through a National Wildlife Refuge, and a liquid separation facility. The RR9 work included the required noise sections.
- International Paper, Mansfield, Louisiana: project task manager for installation and operation of a PSD pre-construction ambient air monitoring network for sulfur dioxide and MET parameters near a pulp and paper manufacturing facility.
- Waste Management, Inc. Air Quality Work: preparation of over 15 Title V air permit applications for landfill gas flare systems, reciprocating engines, and landfill gas-fired turbine generators; preparation of air quality training manuals and Title V emission inventory guidance for landfills; and presenter at four air quality seminars.

Education and Training

- M.E., Chemical Engineering, University of North Dakota, Grand Forks, North Dakota
- B.S., Chemical Engineering, University of North Dakota, Grand Forks, North Dakota

- Presenter, Annual Fuel Ethanol Workshop, Bryan and Bryan International, Air Emissions from Ethanol Plants, June 1999, 2001, 2002, 2003, 2005, Environmental Issues related to Biomass Gasification, June 2008, Moderator, June 2009.
- Presenter, DOE biomass programs, biofuels facility environmental siting and permitting issues, Argonne National Labs, February 2006.
- Instructor, Executive Enterprises, Inc., Air Quality Compliance Case Histories, Chicago, Illinois, 1997; Cincinnati, Ohio, 1997; and Farmington Hills, Michigan, 1997
- Prevention of Significant Deterioration/New Source Review Workshop, presented by EPA and the Air and Waste Management Association, Denver, Colorado, 1992

CHEROKEE
PHARMACEUTICALS
A PRWT LIFE SCIENCES COMPANY

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dennis.bauer@cherokee-pharma.com

June 29, 2009

Mr. Tyler Painter
Chief Financial Officer
Solazyme, Inc.
561 Eccles Avenue
South San Francisco, CA 94080

RE: Cost Share - Integrated Biorefinery Operations

Dear Tyler:

Cherokee Pharmaceuticals LLC looks forward to the opportunity to participate in the U.S. Department of Energy project for the Demonstration of Integrated Biorefinery Operations in response to Funding Opportunity Announcement Number DE-FOA-0000096.

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We are pleased that you have selected us as the site for your integrated biorefinery and we will endeavor to help make the project a success. We believe that Solazyme's heterotrophic algal technology represents an important advance both for renewable biofuels and for industrial bioproduction, and we are excited to play a pivotal role in this project.

Best regards,

Dennis P. Bauer, Ph.D.
Vice President – Sales & Marketing

cc: Mkt Files, Elliot, Haney, Noll

UOP LLC
25 E. Algonquin Rd.
Des Plaines, IL 60017-5017

Tel: 847.391.2000
Fax: 847.391.2253
www.uop.com

June 16, 2009

Dr. Matthew Frome
Director of Business Development
Solazyme
561 Eccles Avenue
South San Francisco, CA 94080

RE: Letter of support for the cost share for the DOE-FOA-0000096 application:
Solazyme Integrated Biorefinery (SzIBR): Diesel Fuels from Heterotrophic Algae

Dear Dr. Frome:

UOP, LLC looks forward to the opportunity to participate in the U.S. Department of Energy project for the Demonstration of Integrated Biorefinery Operations in response to Funding Opportunity Announcement Number DE-FOA-0000096.

UOP LLC is a leading international supplier and licensor of process technology, catalysts, adsorbents, process plants, and consulting services to the petroleum refining, petrochemical, and gas processing industries. Launched in late 2006, our Ecofining™ process technology is the first commercial product from UOP's Renewable Energy & Chemicals business unit. UOP is developing and commercializing technology to produce transportation fuels and chemicals from biofeedstocks ranging from vegetable and algal oils to second generation cellulosic waste feedstocks like corn stover or wood chips.

As a member of this project team, we agree to contribute cost share of Ex 4 of the project costs if the program is selected. Based on the current budget, the UOP costs are expected to be Ex 4 with UOP contributing Ex 4

We are pleased to be included in this program to produce renewable diesel from Solazyme's algae oil. We believe that Solazyme's heterotrophic algal technology represents an important advance for renewable biofuels, and are excited to play an important role in this project.

If you have any questions, please feel free to contact me.

Best Regards,

Jennifer Holmgren
General Manager
Renewable Energy and Chemicals

ABENGOA BIOENERGY
ABENGOA BIOENERGY NEW TECHNOLOGIES

11500 W 13th Avenue
Lakewood, CO 80215
Telephone (+) 303-928-8500
Fax (+) 303-928-8510

June 26, 2009

Dr. Tony Day
Solazyme, Inc.
561 Eccles Avenue
South San Francisco, CA 94080

Dear Dr. Day,

I write in support of your application "Sustainable Feedstock Production Supply Systems to Support Cellulosic Biorefinery Industries" to be submitted to the U. S. Department of Energy's Funding Opportunity.

Your efforts in the utilization of algae to ferment sugars, specifically derived from cellulosic, to lipid based fuels aligns with our research, demonstration and production of low cost fermentation sugars from biomass. We are willing to produce fermentable sugars from biomass in our pilot plant in York, NE for your use in the production of lipid oils from algae. If your proposal is awarded by the DOE,

We look forward to your success in this project.

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Sincerely,

Robert J. Wooley, PhD, PE
Director, Process Engineering

Science. Solutions. Service

The data contained in every page (pages 1 to 15) of this application have been submitted in confidence and contain trade secrets or proprietary information, and such data shall be used or disclosed only for evaluation purposes, provided that if this applicant receives an award as a result of or in connection with the submission of this application, DOE shall have the right to use or disclose the data herein to the extent provided in the award. This restriction does not limit the government's right to use or disclose data obtained without restriction from any source, including the applicant.

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Environmental Questionnaire for FOA Applicants
(To Be Completed by Applicant)

PART I: General Information

Applicant Name: Solazyme, Inc.
Proposed Project Title: Solazyme Integrated Biorefinery
Solicitation Number: DOE FOA-0000096
Applicant Preparer:
Applicant Phone: REDACTED EXEMPTION 4 REDACTED EXEMPTION 6
Applicant Email:

1. Please describe the intended use of DOE funding in your proposed project. For example, would the funding be applied to the entire project or only support a phase of the project? Describe the activity as specifically as possible, i.e. planning, feasibility study, design, data analysis, education or outreach activities, construction, capital purchase and/or equipment installation or modification.

   Solazyme, Inc. (Solazyme) intends to use DOE funding for all aspects of the Solazyme Integrated Biorefinery (SzIBR) project proposed for funding under DOE FOA-0000096. *Solazyme proposes to build, operate, and optimize a pilot-scale integrated biorefinery in order to demonstrate an integrated scale-up of its heterotrophic algal oil biomanufacturing process and to validate the projected commercial-scale economics.*

   One of Solazyme's main intents is to show that the SzIBR process can be used to produce inexpensive, high-quality renewable oil with current industrial biomanufacturing technology usable by the existing petroleum refining, distribution, and retail infrastructure grid. In order to demonstrate this concept, Solazyme will be utilizing multiple facilities for the feedstock, bench-scale fermentation optimization, processing of algae biomass into algal oil, and refining of algal oil into diesel fuels. A detailed description of the design, facilities, installation and use of existing equipment, data analysis, schedule, capital purchases, and processes associated with the SzIBR can be found in Project Execution Plan. For purposes of the environmental questionnaire, the main components of the SzIBR are summarized below:

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Feedstock

The SzIBR project will use domestically-sourced sucrose as a transitional feedstock. During the later phases of the pilot-scale project, Solazyme intends to run several small batches of cellulosic sugars derived from switchgrass, wheat straw, corn stover and municipal green waste. An existing and fully permitted facility in York, Nebraska operated by Abengoa BioEnergy Corporation will convert switchgrass, wheat straw, and / or corn stover biomass to cellulosic sugars via enzymatic hydrolysis and deliver them to one of several locations associated with the project (discussed below). Additionally, an existing and fully permitted facility in Irvine, California operated by Blue Fire Ethanol will convert municipal green waste to cellulosic sugars via acid hydrolysis and deliver them to Solazyme.

R & D Laboratory Work

Solazyme will utilize feedstock supplies delivered to their preexisting and fully permitted laboratory facilities in South San Francisco, California to optimize fermentation processes during set up of the pilot-scale equipment. Work at this facility will only include ordinary, on-going laboratory activities and no algal oil refining will occur at this location.

Pilot Scale SzIBR

Solazyme will construct the pilot-scale SzIBR at the site of Cherokee Pharmaceuticals' (Cherokee) existing commercial chemical manufacturing and fermentation plant in Riverside, Pennsylvania. Cherokee has extensive spare fermentation capacity and the necessary supporting infrastructure, which will avoid the need for Solazyme to construct a new facility. No structural modifications will be required at Cherokee to accommodate the SzIBR and will only require the installation of skid mounted process equipment needed for EX 4 *Only relatively minor remodeling of the interior space will be required to install the equipment necessary for the SzIBR. The fermentation, drying, extraction, and algal oil purification process is described in detail in Section 2.2 of the Project Management Plan.*

Refining Algal Oil to Biodiesel and Renewable Diesel

The SzIBR project will utilize an existing biorefinery in order to transesterify the refined algal oil into ASTM D6751 standard biodiesel. Solazyme will transport a majority of the refined algal oil produced at Cherokee (200,000 gallons) to a transesterification refining facility operated by Renewable Energy Group (REG) in Iowa. The remaining 25,000 gallons of algal oil produced at Cherokee will be transported to a biodiesel refining facility operated by UOP near Houston, Texas, for conversion to renewable diesel.

2. Does any part of your project require review and/or permitting by any other federal, state, regional, local, environmental, or regulatory agency? If yes, please describe.

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Yes. Permit modifications required for the Project area are described by resource below:

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3. Has any review (e.g., NEPA documentation, permits, agency consultations) been completed? If yes, is a finding or report available and how can a copy be obtained?

   No NEPA documentation, permit applications, or agency consultations have been completed for the project.

4. Is the proposed project part of a larger scope of work? If yes, please describe.

   Yes. Solazyme anticipates upgrading and increasing throughput of the pilot-scale SzIBR in place, into a demonstration-scale SzIBR as part of an accelerated pathway to commercialization. The ultimate goal of the pilot-scale project is to demonstrate economic feasibility of the process for eventual commercialization.

   a. Do you anticipate requesting additional federal funding for subsequent phases of this project? If yes, please describe.

      At this time it is unclear if Solazyme will request additional federal funding for the demonstration-scale SzIBR. Funding sources for the demonstration-scale and commercial scale SzIBR are not currently defined.

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5. Does the scope of your project **only** involve one or more of the following:
   - Information gathering such as literature surveys, inventories, audits,
   - Data analysis including computer modeling,
   - Document preparation such as design, feasibility studies, analytical energy supply and demand studies, or
   - Information dissemination, including document mailings, publication, distribution, training, conferences, and informational programs.

   No, the project will involve activities beyond the scope of the activities listed above.

PART II: Environmental Considerations

Section A. Please indicate if any of the following conditions or special areas is present, required, or could be affected by your project. For each item listed below please indicate:

- Yes or No,
- The specific nature or type of activity or condition,
- Whether a consultation, approval, or permit applies and a description and status of the permitting/approval/documentation process.
- Where appropriate, please indicate if additional documentation is available.

1. Clearing or Excavation (indicate if greater than 1 acre)
   No. The project will not involve any ground disturbing activities (i.e. clearing or excavation). All construction and operation activities associated with the project will occur in existing structures.

2. Dredge and/or Fill. Specify the number of acres.
   No dredge or fill activities, which would potentially require U.S. Corps of Engineers Section 10, 401, and 404 permits, will be conducted for the project.

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4. Pre-Existing Contamination
   Solazyme is not aware of any pre-existing contamination at any of the facility locations associated with the project. No ground disturbing

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activities that could expose existing contamination will occur associated with the project.

5. Asbestos
   No asbestos will be produced, present, or disturbed by construction and operation of the project.

6. Criteria Pollutants

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   Potential criteria emissions are negligible compared to a commercial scale facility. Cherokee Pharmaceuticals staff will ensure that proper permit coverage either through exemption or permit is obtained. The SzIBR project will

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7. Non-Attainment Areas
   The Cherokee facility, in Riverside, Pennsylvania, is not located within in any area designated by the EPA for non-attainment of CO, NO2, Ozone (1-hour and 8-hour), SO2, PM 2.5, PM10, or Pb pollutants. The laboratory facility in South San Francisco is located in a non-attainment area for 8-hour Ozone. The project will generate a small amount of Ozone emissions in the non-attainment area associated with transportation of feedstock materials and algae to/from the Solazyme lab facility. These emission levels would be minor and would not significantly contribute to Ozone levels present in the San Francisco area.

8. Class I Air Quality Control Region
   The project facility locations are not located within or near any Class I Air Quality Control Regions.

9. Navigable Air Space
   The project will not be located in or interfere with any navigable air space.

10. Areas with Special Designation (e.g., National Forests, Parks, Trails)
    The project will not be located within or near any special designation areas including National Forests, National Parks, or trail systems.

11. Prime, Unique or Important Farmland
    The project will not disturb any prime, unique, or important farmland. The project will not involve any ground disturbing activities and will be located within existing facilities.

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12. Archeological/Cultural Resources
    No known archeological or cultural resources will be impacted by the project. No ground disturbing activities will occur. Additionally, the facility modifications and equipment installation will not occur in any structures listed as eligible or potentially eligible for listing on the National Register of Historic Places.

13. Threatened/Endangered Species and/or Critical Habitat
    No threatened or endangered species will be impacted by construction and operation of the project. No critical habitat will be impacted or modified as a result of the project. Development of the project will not involve any ground disturbing activities that would impact species or habitat.

14. Other Protected Species (Wild Burros, Migratory Birds)
    No other species will be impacted by construction and operation of the project. Development of the project will not involve any ground disturbing activities that would impact species or habitat. No structures or overhead transmission lines, which could lead to impacts on migratory birds, will be constructed in association with the project.

15. Floodplains
    Floodplains will not be impacted by the project. No buildings or other structures that could change surrounding floodplain elevations will be constructed in association with the SzIBR project.

16. Special Sources of Groundwater (e.g., Sole Source Aquifer)
    No groundwater will be used in association with the project. All water supplies for the project will come from municipal sources and/or permitted surface water intakes.

17. Underground Extraction/Injection (non-hazardous substances)
    No underground extraction or injection will occur during the course of the project.

18. Wetlands
    The project will not be located within or near any wetland areas. Additionally, no ground disturbing activities will occur as a result of the project.

19. Coastal Zones
    No coastal zone consistency determinations or associated permits will be required for the construction and operation of the project.

20. Public Issues or Concerns

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Solazyme has not identified any public issues or concerns associated with construction and operation of the proposed project. None are expected because the project will use existing facilities. The SzIBR project will be a very small operation amongst a large existing industrial operation. All newly installed equipment will be enclosed in an existing building. No outward impact can be observed.

21. Noise
    Noise above ambient conditions could be generated from the installation of process equipment at the Cherokee facility, but would be short term in nature and only occur during daylight hours. Operation of the fermenters at Cherokee would generate noise levels that necessitate the use of ear protection, but would not increase ambient noise levels due to current noise mitigation measures at the facility. Because noise will be short term and minimal, no permits, consultations, additional mitigation measures or approvals associated with noise will be required for construction and operation of the project.

22. Depletion of a Non-Renewable Resource
    Non-renewable resources that will be used in association with the project include diesel fuel used to transport the feedstocks and algal oil. Other non-renewable resources for the project include natural gas used to operate the burner associated with the dryer at Cherokee.

23. Aesthetics
    Construction and operation of the project will occur in existing structures, therefore no changes or negative impacts to aesthetics will occur.

24. Odor
    Odor generated from the project will be minimal and at levels below that which could be considered a nuisance outside of the facility boundaries.

Section B. Would your project use, disturb, or produce any chemicals or biological substances? (i.e., pesticides, industrial process, fuels, lubricants, bacteria) For each materials or processes listed below please indicate:

- Yes or No,
- Quantity,
- Whether a permit is required and if so what type of permit,
- Specific type, use, or condition,
- Where appropriate, please indicate if additional documentation is available.

1. Polychlorinated Biphenyls (PCBs)
   The proposed project would not use, disturb, or produce any Polychlorinated Biphenyls.

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2. Import, Manufacture, or Processing of Toxic Substances
   The SzIBR project will not import, manufacture, or process any toxic substances listed on the Toxic Substances Control Act of 1976. The transesterification of algal oil into biodiesel at the REG facilities will involve the use of methanol. The methanol is contained within a closed loop system for the refining process and only trace amounts are present in the glycerin byproduct. REG currently has small quantity hazardous waste permits to properly dispose of methanol. UOP will not import, manufacture, or process any toxic substances during the refining process.

3. Chemical Storage, Use, and Disposal

   Solazyme
   During laboratory activities very small amounts of chemicals for work supporting the SzIBR effort, including media nutrients, ammonia, and potassium hydroxide that will be stored, used, and disposed of at the Solazyme laboratory facility. Solazyme utilizes protocols outlined in their Laboratory Chemical Hygiene Plan and Hazardous Materials Business Plan to properly handle, store, and dispose of these chemicals.

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4. Pesticide Use
   The proposed project would not use, disturb, or produce any pesticides.

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5. Hazardous, Toxic, or Criteria Pollutant Air Emissions
   Emissions of Hazardous Air Pollutants (HAPs) or toxics not listed as HAPs will be negligible. SzIBR will not trigger new applicability of any NESHAP regulation or emit toxic air emissions of any concern.

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   Potential criteria emissions are negligible compared to a commercial scale facility. Cherokee Pharmaceuticals staff will ensure that proper permit coverage either through exemption or permit is obtained. The SzIBR project REDACTED EXEMPTION 4 *will involve new emission units but will emit at levels below the PSD Significant Emission Rates (SER).*

6. Liquid Effluent

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7. Underground Extraction/Injection (hazardous substances)
   The project will not involve underground extraction or injection of hazardous substances.

8. Hazardous Waste
   Based on the current regulations regarding hazardous waste (Title 10 CFR § 261.31-33) no materials used or produced by the SzIBR are classified as hazardous waste. The transesterification of algal oil into biodiesel at the facility will involve the use of methanol. The methanol is contained within a closed loop system for the refining process and only trace amounts are present in the glycerin byproduct. REG currently has a small quantity hazardous waste permits to properly dispose of methanol.

9. Underground Storage Tanks

Every line on this page contains proprietary information that Solazyme, Inc. requests not be released to persons outside the Government, except for purposes of review and evaluation.

The project will not involve the use of any underground storage tanks.

10. Biological Materials. Indicate if genetically altered materials are involved.

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Section C. Would your project require or produce any radiological materials? For each item below, please indicate:

- Yes or No,
- Quantity,
- Whether a permit is required and if so what type,
- Specific nature of use,
- Where appropriate, please indicate if additional documentation is available.

1. Radioactive Mixed Waste
   The project will not require or produce any radioactive mixed waste.

2. Radioactive Waste
   The project will not require or produce any radioactive waste.

3. Radiation Exposures
   The project will not generate any radiation exposure.

Section D. The following questions are designed specifically to guide applicants who are doing laboratory/bench-scale projects or who will have laboratory work associated with their projects.

NEPA R&D Laboratory Questions

In order for a recipient to receive financial assistance, their project must be reviewed under the National Environmental Policy Act (NEPA) for potential environmental impacts. For research and development laboratory activities, the following questions must be sufficiently answered before the review can be completed. Please add as much detail as possible.

1. Please provide and describe the location of the facility or facilities where lab work will take place.

Laboratory activities, mainly consisting of algae fermentation optimization, will occur at the Solazyme facility located at 561 Eccles Avenue, South San Francisco, California, 94080.

Fermentation and algal oil refining activities will occur at the Cherokee facility, which is located at Avenue C, Riverside, Pennsylvania, 17868.

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2. What type of safety protocols are in place in the areas where work will take place? Who monitors these? Internally and externally? OSHA standards?

Solazyme

Solazyme is committed to protecting employee health and complying with all applicable laws and regulations. This is accomplished through the implementation of OSHA compliant safety policies and procedures. These policies and procedures include: A Hazardous Materials Business Plan compliant with the California Health and Safety Code, an Injury and Illness Prevention Program, a Laboratory Chemical Hygiene Plan as well as a Radiation Safety Program and License. These programs are monitored internally by Solazyme and externally by the California Department of Health. These plans include provisions to identify and prevent safety and health hazards, inspection protocols, safety training, communication and record keeping protocols, emergency action planning, fire prevention and planning, personal protective equipment use, and hazardous substance handling procedures.

Cherokee

Cherokee is committed to protecting employee health and complying with all applicable laws and regulations. This is accomplished through the implementation of OSHA compliant safety policies and procedures. These policies and procedures include: Hazardous Work Permits, Hazard Communication, Safety Incident Reporting & Investigation, Safety Shower/Eyewash Stations, Biosafety, Portable & Fixed Ladders, Aerial Lifts, Scaffolds, Job Safety Assessments, Internal Safety Assessments (Audits), Fixed Cranes, Hoists, & Rigging, Mobile Cranes, Contractor Safety Management, Personal Protective Equipment, Laboratory Spill Response, Fork Lift Trucks, Hearing Protection, Ventilation, Control of Hazardous Energy, Respiratory Protection, Process Safety Management, Electrical Safe Work Practices, Fall Protection, Ergonomics, and Emergency Evacuation. All affected employees are trained on the requirements of these procedures prior to starting work at the facility and again when changes are made and/or per the site's training schedule.

3. How are the gases, chemicals, heavy metals, etc...? handled, stored and disposed?

Solazyme

Solazyme utilizes protocols outlined in their Laboratory Chemical Hygiene Plan and Hazardous Materials Business Plan to properly handle, store, and dispose of gases, chemicals, and heavy metals. Specific protocols include monitoring use and disposal of chemicals used in the lab, conducting audits, correcting deficiencies, and maintain appropriate documentation of chemical use and disposal, identifying adequate protective measures, and conducting training for lab employees. Chemical fume hoods are used when working with volatile substances and fire extinguishers are available throughout the laboratory. Emergency eye wash stations and safety showers are available within a 10 second walk of any area of expected exposure. Solazyme has a stringent set of administrative and safety controls for the procurement, distribution, and storage of chemicals which are outlined in the Laboratory Chemical Hygiene Plan.

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Cherokee

The site has procedures to review every raw material, product, and/or byproduct used prior to it entering the site including gases, chemicals, and raw materials. Cherokee also conducts a detailed environmental review of new processes prior to implementation. Part of this review is to characterize (for disposal) any wastes and/or byproducts that will be generated by the process. Prior to disposal, a contracted laboratory is used to perform any testing requested by the disposal facility.

4. What type of safety equipment is in place for the facilities (i.e. fume hoods, alarms, scrubbers, etc...)?

Solazyme

Chemical flume hoods are used when working with volatile substances and fire extinguishers are available throughout the laboratory. Emergency eye wash stations and safety showers are available within a 10 second walk of any area of expected exposure. Personal protective equipment available at the laboratory includes safety glasses, protective gloves, safety shoes, and respiratory equipment. Other safety equipment on-site includes fire alarms, telephones for emergency use, respiratory protection and ventilation, and first-aid kits.

Cherokee

Cherokee Pharmaceuticals provides personal protective equipment to all employees, including but not limited to, safety glasses, steel-toed shoes, face shields, respiratory protection, hearing protection, and chemical resistant gloves and aprons. Protective equipment requirements are determined by the site safety department when new chemicals are brought on-site. Portable fire extinguishers and safety eyewash / showers are provided throughout the facility and all employees are trained on their use. Additionally, the site is equipped with automatic sprinkler protection and utilizes a Simplex fire alarm system. All fire protection systems are inspected and maintained per National Fire Protection Association (NFPA) and state Fire Marshall (FM) recommendations.

5. What permits are in place for the facility for this type of work? Please list.

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Cherokee

No operation permits, aside from the existing environmental permits listed in Part 1, Question 2 are required for the SzIBR project.

Abengoa, BlueFire, UOP, and REG

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All actors other than Cherokee and Solazyme are independently responsible for proper permit coverage of their activities. These are existing operations with existing permit coverage which the SzIBR will transact business with not extensions of the SzIBR pilot facility.

6. What permits <u>are needed or will be acquired</u> for this type of work? Please list.

<u>Solazyme</u>
No additional permits will be required to conduct work for the SzIBR project.

<u>Cherokee</u>
No additional permits will be required to conduct work for the SzIBR project.

<u>Abengoa, BlueFire, UOP, and REG</u>
All actors other than Cherokee and Solazyme are independently responsible for proper permit coverage of their activities. These are existing operations with existing permit coverage which the SzIBR will transact business with not extensions of the SzIBR pilot facility.

7. How is liquid effluent handled and discharged?

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8. How is toxic waste handled, stored, disposed?

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9. Will the work being done create any air pollutants? If so please explain how these are handled/disposed/mitigated.

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11. Will prototypes be tested in a separate location, if so, please describe the location and answer questions #1-9?
No prototypes will be tested in separate locations.

12. Are subcontractors being used for some of the work? If so please answer Questions #1-10 for work being completed by subcontractors.
No subcontractors will be used for any additional R & D lab work.

The data contained in every page (pages 1 to 30) of this application have been submitted in confidence and contain trade secrets or proprietary information, and such data shall be used or disclosed only for evaluation purposes, provided that if this applicant receives an award as a result of or in connection with the submission of this application, DOE shall have the right to use or disclose the data herein to the extent provided in the award. This restriction does not limit the government's right to use or disclose data obtained without restriction from any source, including the applicant.

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Project Management Plan

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1. Project Management Overview for SzIBR

1.1. Project Management Approach

Solazyme will utilize a traditional project management approach to manage the Solazyme Integrated Biorefinery project (SzIBR). At a high level, this approach consists of five components:

- Initiation stage – This stage has been completed
- Planning and design stage – This stage is 75% complete and will be completed in Period 1
- Execution and production stage
- Monitoring and controlling systems
- Completion stage

1.1.1. Initiation

The initiation stage determines the best approach and scope for the project. Solazyme has completed all of the following essential tasks:

- Analyzed business needs in terms of measurable goals.
- Reviewed current operations.
- Completed conceptual design of the pilot production facility.
- Assessed equipment and contracting requirements including long-lead items.
- Completed financial analysis of the costs and benefits including a budget.
- Established users and support personnel for the project.
- Assembled project data including costs, tasks, deliverables, and schedule.

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1.1.2. Planning and Design

The status of the key elements of this stage is described below:

- Scope Planning. The scope has been defined and fixed.
- Work Breakdown Structure. The WBS has been completed at a level sufficient to ensure that it captures the full project scope and aligns properly to the project scope. In Period 1, some elements of the WBS will be expanded to an additional level of detail to correspond to effective work package units.
- Organizational Breakdown Structure. The OBS has been completed implicitly but not yet formalized. It will be formalized in Period 1.
- Design Development. The preliminary project, process and equipment designs have been completed and all major equipment items quoted. These designs will be revised as necessary in Period 1 to account for additional data obtained from vendor testing between now and the beginning of the project. Additional design that will be completed in Period 1 includes detailed engineering and preparation of Process & Instrumentation Drawings (P&ID).
- Resource Planning. Resource planning has been completed for the critical path activities to ensure no conflicts. The balance of detailed resource planning will be completed in Period 1.
- Project Schedule Development. The Gantt chart for the project has been completed to a level of detail sufficient to support and validate other planning activities. It will be completed to the full level of detail corresponding to the WBS in Period 1 to enable project control and tracking.
- Budget Planning. The budget has been completed and will be verified in Period 1. Once verified the budget will be transferred into Solazyme's accounting system.
- Procurement Planning. Vendors have been qualified and quotes obtained for all major equipment items. The remainder of the procurement process will be completed in Period 1 to enable purchase orders to be submitted in the first week of Period 2.
- Communication Planning. The communication strategy has been defined. The specific communication timetable for major meetings will be scheduled in the Period 1 calendar.
- Quality Planning. Planning for quality assurance to be applied to the project is mostly complete and will be finalized during Period 1.
- Risk Management Planning. Key project risks that impact the schedule and budget have been identified and mitigation strategies outlined. In Period 2, additional detail will be added to these contingency plans and additional risks (including process risks and operational hazards) will be analyzed.

1.1.3. Execution

The Execution phase of this project will consist of the processes used to complete the work defined in the SzIBR project management plan to accomplish the project's goals. The execution process involves coordinating people and resources, as well as integrating and performing project activities in accordance with the project management plan. The deliverables are produced as defined in the project management plan.

1.1.4. Monitoring and Controlling

The Monitoring and Controlling Phase follows the Execution Phase and will run concurrently with Period 2. Monitoring and Controlling involves the comparison of the actual performance with the planned performance and taking appropriate corrective action to get the desired results. The key benefit is that project performance is observed and measured regularly to identify variances from the project management plan.

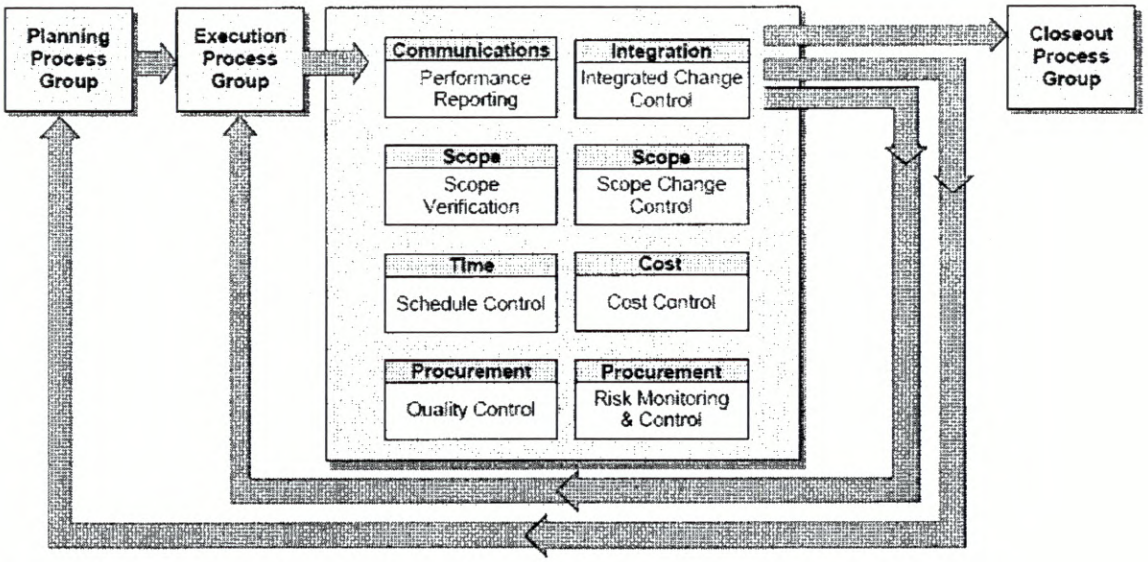

Figure PMP 1.1 – Monitoring and Controlling Phase Processes

During this phase, the Project Team is responsible for the following activities:

- Team Members execute the tasks as planned by the Project Manager.
- Project Manager is responsible for performance measurement which includes finding variances between planned and actual work, cost and schedule.
- Project Manager is responsible for providing Project Status Report to all key stakeholders to provide visibility.
- All Project Key stakeholders are responsible for the review of the metrics and variances.
- All Project Key stakeholders are responsible for taking necessary action on the variances thus determined so as to complete the project within time and budget.

The basic processes of the project Monitoring and Controlling phases will be:

- Project Plan Execution.
- Review of Metrics and Status Reports.
- Project MOC (Management of Change) Control Process. This defines the procedures to handle the changes that are introduced during the project Monitoring and Controlling phases. The procedure is covered in greater detail in section 8, Quality Assurance / Quality Control Plan (QA/QC).

The facilitating processes during project Monitoring and Controlling phases will be:

- Quality Assurance and Quality Control.
- Performance Monitoring.
- Information Distribution
- Status Reporting.
- Risk Monitoring and Control.
- Scope Control.
- Schedule and Cost Control.
- Contract Administration.

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1.1.5. Closing

A number of activities will be carried out and reports compiled and submitted at close of Period 2. Note that the SzIBR will continue uninterrupted operation following Period 2 in Period 3 outside the scope of this proposal; however, reports will continue to be provided to DOE.

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Some closing activities are outlined below.

- Independent Engineer Performance Test will be carried out at the end of Period 2.
- Administrative closure includes preparation of closure documents and process deliverables. This includes the release and redistribution of unneeded project resources.
    - All reports required according the American Recovery and Reinvestment Act of 2009 will be finalized and submitted.
    - All other required reports required for closeout, such as Patent and Property Certification will be compiled and submitted.
    - IEPT Report submitted.
- Development of the project post implementation evaluation report include:
    - Project sign-off
    - Staffing and skills
    - Project organizational structure
    - Schedule management
    - Cost management
    - Quality Management
    - Customer expectations management
    - Lessons learned

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