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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1.3. Staffing Plan

Following is the detailed staffing plan, including names and affiliations for the Solazyme Integrated Biorefinery (SzIBR) project.

Name	Affiliation	Responsible for
Period 1: Preliminary Activities		
David Brinkmann	Solazyme, Inc.	
Nick Lurty	Solazyme, Inc.	
Peter Licari	Solazyme, Inc.	
Tyler Painter	Solazyme, Inc.	
Matthew Frome	Solazyme, Inc.	
Orlando Romero	Solazyme, Inc.	
Todd Potas	National Resource Group, LLC	
Jeff Haney	Cherokee	
Greg Spancake	Cherokee	REDACTED EXEMPTION 4
Bob Wooley	Abengoa	
John Cuzens	Blue Fire	
Period 2: Construction and Operation		
David Brinkmann	Solazyme, Inc.	
Nick Lurty	Solazyme, Inc.	
Felipe Arana	Solazyme, Inc.	
Steve Decker	Solazyme, Inc.	
Matthew Frome	Solazyme, Inc.	
Peter Licari	Solazyme, Inc.	
Tony Day	Solazyme, Inc.	
Tyler Painter	Solazyme, Inc.	
Jeff Haney	Cherokee	
Greg Spancake	Cherokee	
Bob Wooley	Abengoa	
John Cuzens	Blue Fire	
Glen Meier	REG	
Andrea Bozzano	UOP	

Table PMP 1.3 — Staffing Plan

Period 3 Staffing Plan – Extended Operation

As per Period 2 operation only

1.4. Communication Plan

The communication plan will implement a hub and spoke model with the Solazyme manager privy to all material communication regarding the project as shown in Figure PMP-1.4. Special attention will be accorded to facilitating the critical communication channel between Solazyme and Cherokee.

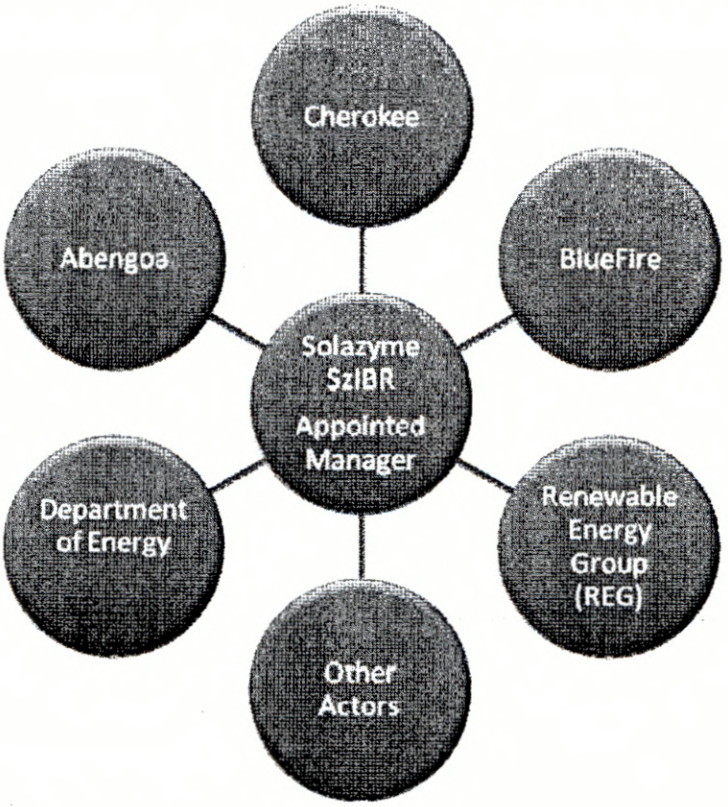

Figure PMP 1.4 – Hub and spoke communication model

Tables PMP 1.4a and PMP 1.4b represent the communication plan matrix for the Solazyme Integrated Biorefinery (SzIBR) project.

The matrix defines the project team, communication types, communication frequency and the information to be communicated. The construction team comprises a subset of the project team, as noted in the table below, as well as the Construction Management Agent. Meetings will be face-to-face, web-cast, and voice conference calls. Documents will be placed on central repository server and distributed by email.

Management / Project Team	Name	Email Address
Project Manager	David Brinkmann	
Project Team	Nick Lurty (construction team)	
	Matthew Frome	
	Steve Decker	
	Orlando Romero	
	Felipe Arana (construction team)	REDACTED EXEMPTION 4
	Peter Licari	
	Tony Day	
	Jeff Haney (construction team)	
	Greg Spancake (construction team)	
	Bob Wooley	
	John Cuzens	
	Glen Meier (Period 2 only)	REDACTED EXEMPTION 6
	Andrea Bozzano (Period 2 only)	
	Todd Potas (Period 1 only)	
Management	Jonathan Wolfson	
	Harrison Dillon	
	Tyler Painter	
	Genet Garamendi	
	Jurgen Dominik	

Table PMP 1.4a – Project Team

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1.5. Procurement Plan

1.5.1. Task Overview

Solazyme will follow the "owners approval purchasing cycle" for all procurements related to the project. The Procurement Manager will work directly with the Project Manager to validate the estimates, and to adapt the procurement schedule to the master schedule, establishing procurement budgets for each phase of the project, and allocating the necessary resources to meet the procurement targets.

1.5.2. Owner Approval Purchasing Cycle

This purchasing process is applied when the owner delegates the procurement efforts to the contractor, but the owner retains control over every aspect, to be able to respond to external auditors for every expenditure. Following this procedure demands more time than the Typical Purchasing Cycle, so provisions must be made in the master schedule to minimize the impact on the project completion date.

1.5.3. The phases of the procurement effort will be identified as follows:

- Conceptual Phase. (Completed)
- Planning Phase. (Completed)
    - Prepare pre-qualification vendor list
    - Prepare pre-qualification documents
- Equipment Procurement Phase. (In Progress)
    - Prepare equipment and material requisitions
    - Pre-qualify vendors
    - Prepare request for bid
    - Obtain bids
    - Technical evaluation of bids
    - Commercial evaluation of bids
- Construction Procurement Phase.

1.5.4. Equipment Procurement Phase – (In Progress)

This is the most demanding phase of the procurement effort, because it is expected to start immediately after the project is funded and almost in parallel to the detailed design effort of specifying and sizing equipment.

Using some of the procurement information generated during the planning phase and incorporating the approved by the "owner" equipment specifications, the procurement department has issued requests for bids to obtain "firm prices", and "firm deliveries".

To carry on this procurement task it was necessary to assemble requests for bid that included as a minimum the following information:

a) Documents (cover letter, non-disclosure agreement)
b) Scope of the work (scope of supply)
c) Equipment, material or systems specifications
d) Quantities (material take off)
e) Delivery requirement (best route, time and location)
f) Commercial terms and conditions
g) Tax or no Tax (depending on exemptions)

Immediately after the receipt of the bids, the procurement department initiated the tabulation effort to compare the bids and to facilitate the technical and commercial evaluations.

The format included a list of the specifications that were submitted with the request for bid, to allow a fast and accurate technical evaluation.

To perform the commercial evaluation, the format included at a minimum involves the following items:

a) Price
b) Time of delivery (ideally what was requested)
c) Freight to the site (pre-paid and add)
d) Terms and conditions (ideally what was requested)
e) Tax or no tax (depending on exemptions)
f) Required down payment
g) Time to deliver shop drawings.

At the conclusion of the evaluation cycle, the procurement department submitted recommendations based on the rating of each bidder with sufficient background information to support the rating process.

NOTE: *Orders have not been placed yet. Current status is Bids Received.*

Upon receiving the proper authorization to proceed (at the beginning of Period 2) the equipment orders will be placed and the procurement department will assign an expediter to follow up with the vendors to make sure that the shop drawings are released to the design group ASAP (per vendor's commitment), then expedite the marked up or approved drawings from the design group back to the vendor. This cycle may have to be repeated as many times as necessary to assure that the equipment is fabricated correctly.

Once the design group releases the vendor drawings for fabrication, arrangements will be made to schedule visits to the fabrication shop by qualified inspectors.

The expediter or the procurement manager depending on the seriousness of the deficiency will handle negative inspection reports on quality or potential delays.

There are some systems being procured as "pre-assembled" skids that will require testing at the factory prior to shipment. The Project Manager will assign a team of engineers and purchasing personnel to witness the test at the factory.

The expediter will continue to work with the vendors to assure that they are proceeding with fabrication, and that nothing that the vendor expects to get from the "owner's" team could be used as an excuse to delay the delivery of the equipment.

During the negotiating of the purchase order, it is customary to define how the equipment or goods will be delivered. However, there are situations when the expediter must act to avoid shipping delays due to labor strikes, weather, cost, or government refusal to allow "oversized" items in the highways that were originally consider the best route to the site.

At the construction site the expediter or the vendor, at the time of arrival of equipment, will notify the site receiving coordinator. Arrangements will be made to coordinate the necessary labor and equipment (crane, fork truck) to unload the equipment, and immediately install it or place it in the warehouse or storage yard.

All the procurement activities are monitored (at least weekly) to keep the project team informed and to identify potential problems or delays by the procurement group, the vendor, or the design group.

As a minimum reporting for the procurement activities the following reports will be compiled:

- The purchase order report (POR)
- The material status report (MSR)
- The master equipment and vendor drawing report (ME &VDR)

1.5.5. Construction Procurement Phase

This is the second most demanding phase of the procurement effort, because as the last phase in the procurement, it tends to catch items that were accidentally omitted from the previous phases.

Following the path established during the prior procurement phases, the procurement department will work with attorneys, accountants, the owners' representative, the Project Manager, and construction manager on establishing the "contracting strategy".

This phase will start after the environmental permits are approved, the design group issues construction bid packages, and the "owner" has hired a contractor or subcontractors.

While subcontractors are given the responsibility to include materials as part of their scope of supply, there are situations when materials and services must be contracted as they were not included in the scope of supply. The construction site procurement team will perform these activities.

The site accountant will be responsible for preparing the contracts for services, and construction work, and to coordinate with attorneys to insure that the documents will provide the proper legal protection to the "owner".

As the progress of the contracts is monitored, there is a need for the site procurement team to be knowledgeable on the interpretation of the contracts, to prevent overcharges due to high earned value estimates.

Progress payments approvals will be generated by the site procurement team, based on the equipment deliveries, and services performed.

It is imperative to require "lien releases" for services rendered, prior to each progress payment, and particularly important prior to the release of retainages.

Once the project is built and commissioned, it will be necessary to obtaining "certificates of operation" from the local authorities and "certificates of acceptance" from the plant user.

1.6. Construction Management Plan

Solazyme proposes to "construct" the SzIBR on the site of team member Cherokee Pharmaceuticals' existing commercial facility in Riverside, PA. The Cherokee plant manufactures numerous active pharmaceutical ingredients, biopesticides, and nutraceuticals

An experienced project engineering design and construction firm will be contracted to act as the Construction Management agent for the design, engineering, construction and commissioning of the SzIBR. Firms which will be considered for this role include the following:

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1.6.1. Approach

A design – bid – build project delivery system will be employed to bring this project to completion, whereas pre-qualified contractors / vendors will be solicited to provide the various elements necessary to construct the facility on a "fast track" basis as design documents become available from the engineering service provider. This process will be overseen by the Construction Management agent in consultation with both Jeff Haney at Cherokee and David Brinkmann, the Project Manager. No major decisions will be made, or expenditures incurred, without sign-off by David Brinkmann.

Pre-construction phase activities EX 4

- Review preliminary design documents to develop a baseline understanding of the project status.
- Review project design criteria and establish Quality Assurance protocol.
- Review Process Flow Diagrams (PFD's) and Process and Instrumentation Diagrams (P&ID's), if available, to gain an understanding the process.

- Review mechanical equipment layout concept to determine the required building size and configuration.
- Review the process equipment list and specifications for content and pricing status.
- Review Work Breakdown Structure (WBS) for completeness.
- Review preliminary overall project schedule and spend plan.
- Provide preliminary risk analysis to identify risk associated with preliminary design documents and recommend plan for mitigation.
- Conduct "value engineering" session to identify areas of potential cost savings.
- Expand overall project schedule and identify the critical path.
- Expand WBS to be inclusive of all aspects needed to support construction and establish a Schedule of Values (SOV) as a base line for tracking Earned Value.
- Define project team responsibilities.
- Implement project controls.
- Develop project communication protocol and establish team meeting schedule.
- Issue Non-Disclosure agreements to selected vendors and contractors.
- Issue pre-qualification packets to selected contractors.
- Reach agreement of construction contract format for contract administration (AIA, EJCDC)

Procurement phase activities

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- Procure specified equipment. Procurement will be on the owner's paper to assure that all guarantees and warrantees are passed through to the owner.
- Compare equipment quotations to WBS schedule of values.
- Monitor and report on equipment procurement status on a bi-weekly basis.
- Develop construction bid packages.
- Qualify construction bids and secure contracts.
- Monitor and report on construction procurement status on a bi-weekly basis.

Construction phase activities

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- Provide construction safety management in compliance with OSHA 29 CFR 1910 and any site-specific safety requirements.
- Provide on-site document control and distribution.
- Provide on-site receiving and receiving reports.
- Manage construction contracts.
- Monitor critical path construction schedule and provide bi-weekly updates.
- Monitor WBS schedule of values and report on earned value on a bi-weekly basis.

- Check out and start up phase activities:
  - Motor rotational checks.
  - Instrumentation checks.
  - System installation qualification checks.
  - System operational qualification checks.
  - Water runs.
  - Validate entire integrated process.

Construction Management Plan staffing requirements:

- Construction Manager
- Construction Superintendent
- Safety Manager
- Document control/ receiving clerk
- Purchasing Agent
- Project Accountant

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2. Detailed Schedule

See Figure PMP 2.1 – 2.3 for the detailed project schedule for the Solazyme Integrated Biorefinery (SzIBR) project. The detailed project schedule is shown in two sections for clarity.

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Figure PMP 2.1 – Detailed project schedule – part 1

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3. Key Project Decision Points and Stage Gates

Table PMP – 3.0 depicts the key project decision points incorporating the stage gate review approach that will be utilized for the Solazyme Integrated Biorefinery (SzIBR) project. The stage gate review will be coordinated via the communication plan outlined in PMP section 1.4 and in conjunction with the detailed list of key project decision points.

Stage gate review will involve the project and management teams. It will take into consideration all gating factors to determine if progress to the next stage is technically and economically justified. The CEO in consultation with the CTO and the Project Manager will make the final decision.

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4. Project Milestones

Table PMP – 4.0 depicts the detailed project milestones through Periods 1, 2 and 3 for the Solazyme Integrated Biorefinery (SzIBR) project. The milestone review will be coordinated via the communication plan outlined in PMP section 1.4.

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5. Detailed Resource Loaded Schedule

See Table PMP 5.0 for the detailed resource loaded schedule for the Solazyme Integrated Biorefinery (SzIBR) project.

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6. Detailed Spend Plan

See Tables PMP 6.0a- 6.0b for the detailed spend for the Solazyme Integrated Biorefinery (SzIBR) project.

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Figure PMP 6.4 – Cumulative Cost Graph

7. Risk Management Plan

7.1. Risk Management Strategy

Following is the risk management methodology that will be followed for the Solazyme Integrated Biorefinery (SzIBR) project.

This risk management process has been adapted to be scalable to ensure that the level, type, and visibility of risk management are commensurate with both the risk and the importance of this project.

A. Preliminary Risk Identification – Risks are identified in Table PMP-7.0, listing significant risk factors. Risks will continue to be identified as additional parts of the project management plan are implemented (i.e. project monitoring, project controlling, procurement plan and construction management plan). Additional risks will be identified up to and during Period 1.

B. Risk Impact Assessment – For each risk identified, the risk will be assessed in terms of likelihood of occurrence and its effect on project objectives if the event occurs. This information will be used to prioritize the risk and develop a mitigation strategy.

C. Risk Response Planning – Each risk will be reviewed as part of the project review meeting for risk management as outlined in PMP section 1.4 – Communication Plan. The review meetings will determine the options and actions to reduce the likelihood or consequences of impact to the project's objectives. The results of the review meeting will provide an appropriate response for planning the actions to be taken to mitigate the risks.

D. Monitor Risk:

- Systematic reviews are scheduled and outlined in section 1.4 – Communication Plan.
- These reviews will ensure:
  - All of the requirements of the Risk Management Plan are being implemented
  - Assess currently defined risks
  - Evaluate effectiveness of actions taken
  - Status of actions to be taken
  - Validate previous risk assessment (likelihood and impact)
  - Validate previous assumptions
  - State new assumptions
  - Identify new risks

E. Control Risk:

- Validate mitigation strategies and alternatives
- Take corrective action when actual events occur
- Assess impact on the project of actions taken ($$, time, resources)
- Identify new risks resulting from risk mitigation actions
- Ensure the Project Execution Plan (including the Risk Management Plan) is maintained
- Ensure change control addresses risks associated with the proposed change. Change control is addressed in great detail in section PMP section 8.3- Management of Change Plan (MOC)–Production.
- Revise Risk Response Plan

7.2. Project Risks and Mitigation

It is anticipated that project milestones and schedules may change as new information is generated and unforeseen operational problems such as equipment delivery delays or breakdowns occur. When these occur, project risks and mitigation will be re-evaluated during regular meetings as outlined in the Communication Plan. Elements of effective risk management include the following:

- Experienced project team.
- Complete and effective design criteria.
- Clear project objectives.
- Clear and effective communications.
- Identify the nature of any uncertainties.
- Effective decision making.
- Effective risk control measures.
- Earned value management.
- Critical path scheduling.
- Management of change.

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Table PMP 7.0 – Project risk factors and mitigation strategies

NOTE: The proposed project schedule includes four months to gather NEPA documentation and obtain a CX. If an EA or EIS is required, the transition to Period 2 could be delayed without incurring any expense. The separation between Period 1 and Period 2 is a logical break point.

7.3. Preliminary Process Hazard Analysis (PHA)

Overview

The Construction Management Agent witl perform HAZOP analysis using a formally structured method of systematically investigating each piece of equipment in the SzIBR process. This information will be assembled in the most detailed of the four OSHA recommended formats, 29 CFR. 1910.119. The hazard and operability problems will be determined by a study of the Piping and Instrument Diagrams (P&ID's) and the equipment Standard Operating Procedures (SOPs). NFPA guidelines are also utilized where applicable. The analysis is assembled into the following categories:

- Deviation
- Causes
- Consequences
- Safeguards
- Hazard Category
- Recommended Changes

Project personnel with extensive operational and start-up experience will critically analyze the system design for potential problems arising in each component of the plant operation. Possible causes of failure will be identified. Important parameters that can deviate from the intended design conditions and their associated Consequences will then be identified. A Hazard Category will be assigned based on Frequency and Severity. The P&ID, SOP, and NFPA documents will be used to ensure that the proper instrumentation, alarms and interlocks are incorporated as Safeguards into the design to prevent injury, loss of life, significant equipment damage, and production downtime.

Multiple concurrent failures will also be included in the analysis and recommendations appropriate to risk management will be provided.

Cause

The causes are developed first through critical thinking analysis of what can go wrong. This is accomplished by asking the question "what if" there is a:

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Depending on the equipment, some of these may be Deviations or Consequences; however, most are Causes. Since instruments and DCS systems have been developed to include a certain level of self-diagnostic capability, the HazOp is limited to equipment. The intent is to "poke holes" in the design and look for weaknesses.

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Deviation

Pertinent parameters are selected, such as . . . . . Then the effect of deviations from design conditions of each parameter is examined. A list of key words, such as . . . . . is selected for use in describing each potential deviation.

Consequences

The Consequences list an event or chain of events associated with the deviation. Consequences are listed as if there were no safeguards in place. The consequence could be as simple as plugging a spout or as complex as . . . . . The consequences are listed to assist in determining the Severity of the problem.

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Hazard Category

The Hazard Category is a number and a letter that corresponds to the Severity and Frequency of a deviation.

Severity

1 – Catastrophic	Over $10,000 in equipment damage and 24 hrs in downtime
2 – Critical	$1000 – 10,000 in equipment damage and less than 24 hrs downtime
3 – Marginal	Minimal expense or less than 4 hrs downtime
4 – Negligible	Minimal expense or interruption

Frequency

A – Frequent	More than once a month
B – Probable	Once in 1-3 months
C – Occasional	Once in 3 – 12 months
D – Remote	Less than once a year
E – Improbable	Rarely ever occurs

For example, in most parts or the country, it is common to lose power 3 or 4 times a year. Therefore, Loss of Power automatically gets a "C" designation for frequency. If this is the . . . . . the Severity gets a . . . . . because if no course of action is taken, there will most likely be a . . . . . REDACTED
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Safeguards

Safeguards are reactive measures that are taken to prevent the possible Consequences. It is important to note that the Safeguards do not address the Deviation or Cause. For example, motorized equipment will stop when there is a power failure. There is nothing that can be done to prevent the power failure; however, reactive measures can be put in place to prevent the Consequences from spiraling into a catastrophic failure.

As a general guideline, if the Hazard Category is a 1,2 and A, B, C, then instrumentation and alarms/interlocks should be put in place to prevent the loss.

Standard Operating Procedures (SOPs)

In order to complete a HAZOP, SOPs are required of all complex process equipment including all the controls included with each package and a written description of the control logic of each control system. Complex equipment includes

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The process equipment SOPs are required in order to perform a HAZOP analysis because the HAZOP team has to know if the risk of each possible process deviation is managed properly or if additional controls or procedures are required to insure the safety and operability of operation.

8. Quality Assurance / Quality Control Plan (QA/QC)

8.1. Design Quality Assurance/Quality Control (QA/QC).

The Project Management Plan establishes the general requirements for Quality Assurance/Quality Control (QA/QC) to be used during the design phase. Standard design QA/QC documents will be utilized. The design QA/QC procedures include the following:

- An overall design QA/QC Plan.
- Design standards to be adhered to.
- Procedures for preparing and checking individual plans, specifications, estimates, calculations, and other submittal items.
- Procedures for coordinating work performed by different persons for related tasks, to ensure that conflicts, omissions, or errors do not occur between drawings or between drawings and other design documents.
- Procedures for coordinating and obtaining permits from permitting agencies, utility companies, and railroad companies.
- Peer reviews are staged at the 30%, 60% and 90% design completion and include constructability, operability and maintainability reviews.
- Procedures for reviewing and checking design drawings and documents required during construction. Pre-construction review phase.
- Documentation and submission procedures to ensure that the established design QA/QC procedures have been followed.

8.2. Construction Quality Assurance/Quality Control (QA/QC).

The Project Management Plan establishes the general requirements for Quality Assurance/Quality Control (QA/QC) to be used during the construction phase. Standard construction QA/QC documents will be appropriate. The construction QA/QC procedures include the following:

- An overall Construction QA/QC Plan.
- Construction standards to be adhered to for performing construction inspection. Frequency and agency involvement for construction coordination (progress) and/or partnering meetings.
- Procedures for coordinating with permitting agencies, utility companies, and railroad companies during construction to ensure that all requirements are incorporated into the project such that the overall project schedule is not delayed.
- Level and frequency of inspections to identify and correct any deficiencies in the project construction that do not meet the requirements of the plans, specifications, and other binding documents.

- Qualifications for all key construction personnel.
- Documentation and submission procedures to ensure that the established construction QA/QC procedures have been followed.

8.3. Management of Change Plan (MOC)-Production

8.3.1. Approach

Manage changes for operations and quality processes so that:

- The rationale for change, anticipated results, acceptance criteria and testing (if required) are evaluated and approved prior to initiation.
- The proposed change conforms to all regulatory and quality requirements applicable to the process.
- Documents affected by the change are revised and proper training has been conducted.
- Changes are communicated to the proper personnel.

8.3.2. Scope

The Management of Change Plan describes the procedure to be used when making changes to processes within the following areas: Operations, Chemical Labs, Customer and Quality Support Systems and/or other controlled systems. Examples of these changes include, but are not limited to:

- Standard Operating Procedures (SOPs), Work Instructions, Forms and Lists
- Changes in equipment and/or instrumentation
- Computer/control systems
- Methods
- Documentation and/or protocols
- Product specifications
- Materials
- Utilities

The Management of Change Plan does not apply to replacement with identical equipment, instrumentation, parts, etc.

8.3.3. Responsibilities

Requestor

- Initiates Process Change Order (PCO).
- Communicates the change to approvers (i.e. by attending change control meetings or communicating directly with each approver).
- Works with change owners and quality representatives to identify all approvers of the change.
- Works with various managers (Quality, Operations, Laboratory, etc.), as necessary, to determine documentation needed to complete the change.
- Ensures that the required approvals are obtained during each step of the PCO in order to proceed with the change.
- Ensure that the required resources are available to implement the change.
- Prepares, executes and completes documentation protocols or test plans as required.
- Ensures the training documentation is completed as the process change is being implemented.
- Ensures that the PCO is brought to closure in a timely manner.

PCO Facilitators (Document Specialists)

- Receives PCO requests.
- Schedules and conducts change control meetings or verifies that proper PCO approvals are obtained.
- Ensures the change is documented correctly in the PCO files.
- Ensures that documents are issued as per the change owner's direction.
- Coordinates the overall PCO process.

Approvers – Change Owners

- Reviews and approves PCO requests.
- Provides review and approval of documentation protocols, test plans and other documentation as required by the change.
- Works with requestor to determine and complete documentation (i.e. SOPs, forms, HMI graphics, etc.) that requires updating to proceed with the change.
- Provides training support and resources to ensure that the required training is completed in a timely manner.

Approvers – Quality Representatives

- Reviews and approves PCOs to assure that the changes comply with quality system requirements.
- Reviews and approves change order request to assure that method changes are consistent with established scientific principles and changes in methods and/or procedures are in accordance with industry accepted standards.
- Works with requestor to determine and complete attachments for Installation Qualifications (IQ), Operational Qualifications (OQ), Performance Qualifications (PQ) and test plans.
- Provides review and approval of documentation protocols, test plans and other documentation as required by the change.

Supporting Departments / Partners

- Reviews and approves PCOs as necessary.
- Works with the requestor to determine and complete documentation that requires updating in the supporting departments and/or partners to proceed with the change.
- Works with the requestor to ensure that the appropriate resources are available to implement process changes to established quality systems within the supporting departments and/or partners.

9. Earned Value Management System (EVMS)

The EVMS that will be utilized for the SzIBR project is comprised of several well structured and time proven formats that will adhere to ANSI/EIA 748-A-1998, DOE Order 413.1A, and DOE M 413.3-1 guidelines. A software package, such as Timberline™ will be used to integrate financial and project management data.

9.1. GENERAL OVERVIEW

A. Organization – Most of the Contractual Responsibilities have been defined, and the subcontractors have been briefed on their anticipated effort. The scope of work and completion times of the major subcontractor's responsibilities has also been identified.

B. Planning, Scheduling and Budgeting – A database format has been created to assign value to each of the project's milestones. This allows for the establishment of budgets for work through various cost types (labor, material, equipment, etc.), and facilitates the measurement of progress of task performed internally and by subcontractors.

C. Accounting – During the planning phase the accounting department manager participated on the project budget allocation task, and each project milestone was assigned area and subarea numbers to facilitate detailed tracking of the cost. At the end of the month the accounting department will work with the Project Manager to confirm that the charges to each account are accurate, and that the invoicing task can continue as planned.

D. Analysis and Management Reports – The schedule variance analysis will be performed weekly, and summarized by the end of each month to identify the amount of budget earned for the period. The cost variance analysis will also be performed weekly, and summarized by the end of each month to compare the budget earned against the actual cost for each task. It is customary and critical to report the reasons for unexpected changes of schedule variance and cost variance (higher or lower), as this is indicator of how the project is performing in budget and schedule. The report must include forecasts of budget and schedule to complete the project.

E. Revisions and Data Maintenance – Authorized (signed) change orders will be used to increase or reduce the overall budget. The Change Order's will be tracked individually, but the overall budget will be adjusted to reflect an accurate earned value (or percent completion).

9.2. Performance Measurement Baseline

A. Total Project Cost and Project Schedule – Define the WBS into work packages to allow for tracking of subcontractors' responsibilities, cost and timeline for each work package

B. Risk Management – Will define risk ownership, identify potential risks to both the budgeted cost and schedule along with a course of action of any risks and the possible mitigation of such.

C. Value Management/Engineering – Indicated through the baseline and milestones that are determined prior to the project beginning.

D. Project Controls – Assigns the responsibility of monitoring the schedule and budget and will ensure the project is going according to plan with the WBS and PMB.

9.3. Project Controlling

A. Cost – Use a cost variance (reference above to 9.1.D)

B. Schedule Position – Use a schedule variance (reference above to 9.1.D)

9.4. Financial Controlling

A. Estimate to Complete – Tracking of all direct costs and indirect costs that will be incurred between a specific point in time and the expected project end date. Also, include all future costs for items that were in addition to scopes that will be labeled in change orders.

B. Estimate at Completion – All previously recorded costs along with the estimate to complete and additional indirect costs that will potentially be allocated to the project.

C. Elaborate past for controlling the future – Tracking of previous schedule and cost variances to determine if the schedule is behind, on track or ahead of schedule to determine if any unexpected costs or savings will be incurred to get on schedule or remain on schedule.

10. Invoicing System Plan

Invoicing throughout the project will be based on criteria being met through milestones that are set in place. Milestones are indicated throughout the Work Breakdown Structure (WBS) and the Performance Measurement Baseline, outlined in section 9.2. Invoicing will occur on a monthly basis and dated the 1st business day of every month.

There will be several general areas set up in the EVMS (e.g. R&D, site & civil, equipment, operations, etc.) and more defined sub-areas. Each sub-area will have a dollar amount allocated based on estimates for completion through bids, quotes, and other pre-determined cost structures that will be listed in a schedule of values (SOV). The number of milestones could vary depending on the length of time estimated for each sub-area to be completed along with the depth of scope for each sub-area. The time and intensity of each sub-area will impact the number of milestones needed on each sub-area. The EVMS will show in detail the position of invoicing through the previous billings, the current billings and the remaining amount on the contract of each milestone.

With the possibility that any change orders could delay the milestones from being met, a plan of action will be created as described in the Risk Management section to avoid financial overruns.

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Clarifications:

For each facility, similar information is gathered throughout the application package. Take care to provide the same information in each location as to aid the Merit Review Committee in evaluating the application.

Each sheet should contain information specific to the facility being described. For example, if the proposed facility will sell any product, the "Break Even Sales Price" should relate to the "Proposed Facility" and not the "Future Commercial" facility.

Short Technology Description

This should only be a short, one sentence description to clarify the "Conversion Technology Type" stated above.

Project Partners

Include any other Federal or State contributions under "Other." If the contribution will be in-kind, describe what will be donated and how the value was obtained.

Yield

State the condition of the product, ie.: anhydrous, undenatured, raw.

Consumables

Examples of expenses to include in this section are (but not limited to): Chemicals such as wastewater treatment consumables or catalyst and catalyst regeneration expenses, Electricity, Natural Gas, Fermenting Organisms, Steam, Water

Budget Information - Subtotal

This subtotal should match the value stated on the SF-424a. Total Project Costs should include the allowable preparatory work, construction or modification of the proposed facility and startup costs through completion of the independent engineer performance test.

Feedstock Storage Costs

Include both onsite and offsite storage costs. Offsite storage could include storage and handling costs, such as those paid to a farmer or tree plantation.

The data contained in every page (pages 1 to 20) 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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Business and Commercialization Plan

Sub-criteria for Review Criterion 2:

1. Commercialization Pathway from SzIBR to Forecasted Commercial Facility

1.1. Overview of the First and Subsequent Forecasted Commercial Facilities

Commercial facilities arising out of the technology pathway embodied in this proposal will comprise a front-end module that converts lignocellulosic biomass to fermentable sugars coupled to a back-end module that converts the fermentable sugars to algal oil suitable for refining to liquid transportation fuels. The back-end module will implement Solazyme's cellulosic-sugar-to-algal-oil technology that the pilot-scale

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1.3. Value Proposition

Solazyme's value proposition for customers includes:

- *Supply the renewable, scalable, environmentally sustainable,* ***oil-based fuels*** *— including renewable diesel, biodiesel, and jet fuel — that customers want.* Solazyme is not aware of any competing technology that simultaneously satisfies all four of these critical criteria. (See PEP Sections 2.2 and 3.10.) The Energy Information Administration predicts that domestic diesel fuel prices will rise considerably over the next decade, tracking the anticipated trajectory of crude oil, yet wholesale ethanol prices will remain steady or fall in real terms. This stark contrast, which appears to be robust in EIA's model against differing assumptions about the shape of economic recovery, clearly and concisely captures the added value to the customer of converting lignocellulosic biomass to petroleum-equivalent biofuels rather than ethanol.

- *Remain fully compatible with existing petroleum-based infrastructure — including pipelines and other forms of distribution, storage, retailing, and end-use vehicles.* Biofuels refined from Solazyme's algal oil not only displace but also directly *replace* existing petroleum-based fuels. Other biofuels, such as ethanol, imperfectly substitute for petroleum-based fuels. As mandates under the Renewable Fuel Standard (RFS) steadily increase, the amount of ethanol consumed will surpass the amount that can be blended into the domestic gasoline pool as E10 ("the blend wall"). When this occurs in the middle of the next decade, the ability of existing infrastructure to absorb more ethanol will reach an intrinsic limit that will require the nation to make a substantial capital investment to overcome and will require at least some consumers to explicitly choose unfamiliar fuels. At this point, recognition of the value of Solazyme's oil-based technology will increase substantially, enabling direct refining customers to comply with the RFS without the enormous cost of marketing new fuels and enabling indirect downstream customers to continue to utilize existing assets.
- *Deliver high quality and high performance biofuels.* REDACTED EXEMPTION 4 (-5° C)

  Renewable Energy Group, the leading US biodiesel refiner and project team member has stated, "REG has extensive experience in producing biodiesel from a wide variety of feedstock including moringa oleifera, jatropha, camelina and many others. Over the last two years, REG has received algal oil produced by Solazyme, converted the oil to biodiesel in our pilot scale production system and analyzed the quality of the finished product. We have found the final biodiesel quality to be excellent and the performance characteristics to be superior to that of other oils we have converted."

- *Deliver biofuels with extremely low sulfur content* — REDACTED EXEMPTION 4 less than 1.5 ppm for biodiesel produced to date and less than 2.5 ppm for renewable diesel.
- *Compete on cost with petroleum-derived fuels* — Estimated break-even production cost ranges from ıer gallon of purified algal oil See Section 2.5.

1.4. Justification of Federal Investment

Federal investment in the proposed project is justified because it advances several top-tier national priorities, including energy independence and security, climate and environmental goals, and economic development. Solazyme's value proposition for the collective national interest includes all the points discussed in the previous section and also the following:

- ***Connect the domestic resource potential of renewable, sustainable, high-impact lignocellulosic biomass feedstocks to production of advanced biofuels fungible with petroleum.***

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- *Address a significant fraction of the RFS requirements* — the fast commercialization pathway could potentially result in installed capacity that reaches

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- *Counteract "food vs. fuel" pressures* — Solazyme's process applied to lignocellulosic biomass not only avoids the use of food crops as a feedstock, but will also generate premium quality animal feed as a coproduct, even from biomass sources such as switchgrass.
- *Enhance energy security more than other biofuels* — by not merely displacing petroleum imports, but replacing them with a portfolio of domestic, renewable transportation fuels identical to their petroleum equivalents and fully compatible with existing infrastructure and vehicles.

Solazyme's value propositions that further justify federal investment include:

- *Enhance the value of a wide range of complementary biomass technologies already funded by DOE* — many technically promising technologies that might not be commercially viable producing ethanol (if, as EIA projects, ethanol fails to track crude oil prices upward) may become competitive if linked to Solazyme's back-end process. Solazyme's technology therefore provides a valuable hedge for a significant portion of DOE's lignocellulosic technology portfolio.
- *Deliver against promises* — Solazyme has manufactured over 2,000 gallons of purified algal oil in commercial facilities, limited only by the high cost of tolling. No other microbial biofuel company has achieved this scale with an oil-based fuel. Solazyme has demonstrated multiple refined biofuels that fully comply with applicable ASTM standards. No other microbial biofuel company has demonstrated even one unblended oil-based biofuel that meet *any* standard. Solazyme's diesel fuels have powered an unmodified diesel truck and three cars driven thousands of miles on a mix of blends ranging from 20% to 100% (neat). No other microbial biofuel company has road tested an oil-based fuel in unmodified engines at *any* blend percentage.
- *Leverage existing facilities, substantial private investment, and substantial investments by Solazyme* in R&D activities in parallel with but outside the project scope to maximize return on DOE's investment.
- *Obtain essentially a pilot-scale facility and a demonstration-scale facility for the cost of a pilot project.*
- *Execute a project plan tailored specifically for speed to address the company's commercialization objectives, national RFS goals, and ARRA objectives.*
- *Catapult the technology* — DOE funds will enable Solazyme to consolidate technology validation and demonstrations steps at a critical inflection point, accelerating progress along the commercialization pathway far faster than Solazyme could accomplish without a partnership with DOE. DOE funds will complement and enhance private investment, not replace it, and therefore achieve a large impact.

2. Commercial Vision

2.1. Critical Success Factors for the Commercialization Pathway

Critical success factors (CSFs) for the proposed pilot project (to proceed to commercialization) are discussed in PEP Section 2.1. Further CSFs for the commercialization pathway include:

- Compete on price with fuels derived from petroleum.
- Deliver high quality fuels that identically replace their fossil-fuel equivalents and remain fully compatible with all refining, storage, distribution and retailing infrastructure and existing vehicle fleets.
- Compete on value extracted from lignocellulosic feedstocks compared with other biofuel technologies.
- Assure and encourage supply of biomass feedstocks at attractive prices.
- Forge partnerships with others in the biofuel value chain (including established and emerging fuel refiners and distributors, vehicle manufacturers, feedstock suppliers, and especially companies with technologies to saccharify lignocellulosic feedstocks).
- Raise equity and debt financing after pilot-scale demonstrations to build commercial plants.
- Enable significant reductions in greenhouse gas emissions.
- Monitor, evaluate and incorporate complementary and competing technologies.
- Maintain an agile strategic posture to adapt to evolving technologies and changing market conditions.
- Diligently protect the company's intellectual property and trade secrets.

Specific economic metrics underlying these CSFs are discussed in Sections 2.5-2.6.

2.2. Description of the First Commercial Facility (ComlBR)

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2.3. Partnership Strategy

Solazyme is actively engaging dozens of partners and potential partners that span the entire value chain from biomass to sugar to oil to fuel to consumer, including strategic feedstock growers; universities, national laboratories, and companies with nascent cellulosic conversion technologies; companies that are actively deploying advanced cellulosic conversion technologies such as BlueFire and Abengoa; engineering companies with expertise in building large bioproduction facilities; key equipment vendors; partners that can help accelerate development and demonstration, such as Cherokee; fuel refiners and distributors such as REG, UOP, and Chevron; consumers of coproducts such as EX 4 engine and vehicle manufacturers; airlines; and potential customers with large vehicle fleets. We recognize that we are only one link in this chain and we are already putting in place the agreements necessary to execute our business strategy from end to end.

The most crucial relationships are with front-end cellulosic partners, because each commercial facility will be a permanent marriage with a substantial capital investment into each of the two modules that form

the plant. It is too early for Solazyme to commit to a specific partner for the first ComIBR. That decision will depend on technical questions that will be resolved at SzIBR as well as business considerations. BlueFire and Abengoa represent two diverse and strong candidates. However, Solazyme intends to work with other companies as well, when they are able to demonstrate the ability to provide significant quantities of cellulosic-derived sugars. SzIBR is designed specifically to enable a wide range of diverse collaborations as more demonstration-scale cellulosic facilities come on line, and Period 3 will be devoted exclusively to this objective.

2.4. Commercialization Schedule for the First Commercial Facility

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Figure BCP-1. Summary of early commercialization schedule and the pathway from SzIBR to ComIBR.

2.5. Commercial Products and Sales

ComIBR's primary product, purified algal oil, will be sold to refiners, who will convert it to biodiesel or renewable diesel and then either resell the fuels to a wholesale distributor or distribute it directly. Solazyme expects to negotiate offtake agreements with a fixed price schedule over a term sufficient to pay back the debt portion of ComIBR's financing. Interest in algal biodiesel is extremely high and will almost certainly exceed Solazyme's ability to ramp production for the foreseeable future. Discussions with many of the top US energy and refining companies validate this expectation. While confidentiality agreements preclude disclosing the details of most of these discussions, the interest of Chevron and team member Renewable Energy Group can be mentioned. Chevron Technology Ventures is an investor in Solazyme, and REG, the largest marketer of biodiesel in the US, has expressed strong interest in refining and marketing Solazyme's algal biodiesel.

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2.8. Continuity and Continuous Improvement

Solazyme is investing heavily in R&D to continuously advance and improve its technology platform. Activities both within and outside the scope of the proposed project include:

- *Strain selection and improvement* — Solazyme is continuously improving strains through a combination of classical strain selection, directed evolution and genetic engineering to improve productivity, robustness, and feedstock utilization. These activities will run in parallel with the proposed project and continue thereafter.

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2.9. Outputs and Business Strategies

Solazyme's core business strategy is to leverage heterotrophically grown algae to produce renewable biofuels and chemicals. The proposed project therefore lies directly on the company's critical path. (A secondary business thrust, to produce specialty ingredients such as nutraceuticals, relies on different strains of algae and different handling methods and does not overlap the project.) Team members BlueFire Ethanol, Abengoa Bioenergy, and Renewable Energy Group share a similar focus on renewable biofuels. UOP, a refining technology company with expertise in both conventional petroleum refining and renewable fuels, is investing heavily in biofuels. Cherokee Pharmaceuticals has a strategic business interest in employing its underutilized facility and demonstrating its value as a process development, demonstration, and production center for new biomanufactured products (not necessarily biofuels, but symbiotic with the project).

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2.11. Legal and Regulatory Issues

2.11.1. Proposed Pilot-Scale Project (SzIBR)

Legal and regulatory issues pertaining to the pilot-scale project are discussed in PEP Section 8 and the Environmental Questionnaire.

2.11.2. Forecasted Commercial Facility (ComIBR)

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These issues will be addressed during the planning and construction phases of ComIBR. Engineering design will incorporate elements necessary to ensure compliance with all pertinent ESH and GMP regulations. Key learnings from operation of the pilot SzIBR will be included. All necessary permits will be identified and obtained from the relevant regulatory agencies before construction of the commercial facility commences. Similarly, all necessary operating permits will be identified and obtained before startup of the facility commences. (See Section 4 for further discussion on permits.) The engineering firm that manages the project will take lead responsibility on these permitting issues, with support from Solazyme's engineering and corporate staff.

Formal ESH and GMP policies will be developed by experts then issued by the Plant Manager. Subject matter experts will conduct and carefully document ESH and GMP training of all employees. Plant employees who have been trained to identify areas of non-compliance will conduct periodic inspections and implement corrective actions. Outside agencies such as EPA, OSHA, USDA, and coproduct customers may also conduct occasional inspections. Employees will receive detailed training on the operation of any new equipment or process prior to startup. All new equipment and processes will also be evaluated via HazOp during design phase and via Startup Safety Inspection (SUSI) prior to startup, in order to identify and correct any deficiencies which could potentially risk employee safety or environmental compliance. The Plant HR Manager will have responsibility for employee medical testing (drug screening, hearing tests, periodic physical exams, etc.), record retention, and arrangements with a local hospital for emergency medical treatment. An on-site Emergency Response Team will respond to ESH related incidents and prepare for the arrival of professional responders.

2.12. Liability Insurance

2.12.1. Proposed Pilot-Scale Project (SzIBR)

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The operation of the proposed pilot process will be covered under existing Property Policy and renewals thereof will have responsibility for managing liability with respect to outside parties. Potential liabilities between the project team members will be covered in the contracts between them.

2.12.2. Forecasted Commercial Facility (ComIBR)

The forecasted commercial facility will be covered under comparable policies. The processes involved are similar to those in widespread use in many industries and pose no special hazards or environmental concerns. As a result, we do not anticipate any difficulty obtaining suitable coverage.

2.13. Prospective Customers

2.13.1. Proposed Pilot-Scale Project (SzIBR)

The disposition of biofuels produced within the project scope is discussed in PEP Section 9.6.

2.13.2. Forecasted Commercial Facility (ComIBR)

Prospective direct customers for algal oil produced at ComIBR include most domestic biodiesel and petroleum refiners. Renewable Energy Group, the largest refiner and marketer of biodiesel in the US, has expressed strong interest in selling algal biofuels derived from Solazyme's process. Solazyme has also entered into a joint development and testing agreement with Chevron and has held discussions with several other leading domestic energy companies.

2.14. Configuration Control Management Plan Summary

In the proposed project, no products will be sold, and no formal configuration control management plan will be implemented. (See PEP Section 9.6 for a discussion of the disposition of fuels produced at SzIBR.) REG, however, plans to handle the purified algal oil it receives and the biodiesel it refines in accordance with Solazyme will also systematically collect extensive process data throughout the project (cf. PEP Sections 6.4-6.5), record them in a robust database, and correlate them with REG and UOP's fuels data. Formal change control procedures, status accounting, verification and auditing are not necessary for SzIBR. At commercial scale, a formal configuration control plan will be documented and implemented at ComIBR. We anticipate, however.

2.15. Technology and Market Conditions

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2.15.1. Biodiesel

Biodiesel (ASTM D6751) is a certified and accepted fuel. Inspectorate America Corporation and the Southwest Research Institute have both independently verified that biodiesel refined from Solazyme's algal oil complies with all of the specifications. REG has determined that it exceeds the requirements for the company's highest value biodiesel, REG-9000-1. (See fuel analyses in PFD file.) The only issue remaining for certification is whether algal oil is considered to be a different type of fuel feedstock, and therefore requires additional EPA testing prior to certification. We believe that additional testing will not be required. The current ASTM specification identifies feedstocks "from vegetable oils or animal fat" as appropriate for biodiesel, though other feedstocks including brown grease and used cooking oil are currently in commercial use. According to Steve Howell, Chairman of the ASTM Biodiesel working group, when ASTM D6751 was approved, EPA accepted the argument that the final Fatty Acid Methyl Ester (FAME) produced in the biodiesel refining process is substantially similar whether derived from vegetable oils or from animal fats, so only one certification process was required. Don Scott of the National Biodiesel Board asserts that the list of vegetable oils and animal fat in the IRS code and EPA regulations is illustrative but not restrictive. As stated in the EPA biodiesel factsheet: *Guidance for Biodiesel Producers and Biodiesel Blenders/Users* (Document EPA420-B-07-019): "In the United States, most bio-

diesel is made from soybean oil. However, canola oil, sunflower oil, recycled cooking oils, palm oil, animal fats, and other oils are also used as feedstocks." Algal oil is an "other oil", and it is substantially similar to canola oil. To further clarify this issue, the ASTM biodiesel subcommittee intends to address this ambiguity and officially include oils derived from algae and other microorganisms as feedstocks for biodiesel.

Domestic sales of biodiesel had surged over the past few years to reach ~700 Mgal in 2008, but have since declined sharply with the fall of crude oil prices, which have made refining biodiesel unprofitable for most refiners at current feedstock prices. The ongoing trade dispute with the European Union has reduced exports. Many biodiesel production facilities are either idle or operating at very low production levels. On the positive side, consumer acceptance and awareness of biodiesel continue to increase, and the environmental benefits of biodiesel have been firmly established; the net energy balance of biodiesel has been investigated and found to be extremely positive.

We expect that as oil prices return over the next few years to the EIA's trend predictions, biodiesel sales will resume their climb, further aided by the RFS. By the time ComlBR is operational, the market dynamic will have reversed itself completely. Rather than being demand limited, biodiesel production will be constrained by limited supply of oil feedstocks to at most a few billion gallons per year. Capacity to expand agricultural production of oilseed crops is extremely limited and on the margin encroaches on corn production. REG and all the other biodiesel companies cannot foresee any other practical source of oil feedstocks to expand production, except for algae. Solazyme's process will utilize agricultural by-products or wastes, energy crops that grow on marginal land unsuitable for cultivation of traditional oil crops, or other types of lignocellulosic feedstocks that do not compete with food production.

2.15.2. Renewable Diesel

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Renewable diesel meets the same specification as petroleum diesel (ASTM D975) and therefore more closely resembles currently available petroleum diesel products than biodiesel. However, the EPA has not yet certified renewable diesel for sale in the United States. In Europe, Neste Oil has been producing and selling renewable diesel since 2007. Dynamic Fuels (a joint venture between Syntroleum, Inc. and Tyson Foods) is expected to complete construction of the first renewable diesel fuel refining facility in the US in early 2010. ConocoPhillips has already received certification for a renewable diesel fuel made from co-processing triglycerides. Other groups, including team member UOP, have been producing certification quantities of renewable diesel. Because the hydrotreating process takes all feedstocks to normal paraffins, which are then isomerized and fractionated, the chemical composition of the final product is independent of the feedstock. Thus, once a renewable diesel facility is certified for fuel production, no further testing will be required in order to use algae oil as a renewable diesel feedstock.

UOP has refined Solazyme's algal oil into renewable diesel that fully complies with ASTM D975 using the company's proprietary Ecofining process. Jennifer Holmgren, UOP's Director of Renewable Energy and Chemicals, has stated that "Solazyme's algal oil can be converted to 'true' diesel fuel at high yield with desirable properties."

The process for registering renewable diesel with the EPA includes filing Form 3520-12. This form will be accompanied with support information including:

- Detailed description of the renewable diesel production
- Description of pre-treatment/cleanup for each of the feeds and quality targets achieved
- Details on feedstock types pilot tested and converted to renewable diesel
- Data that demonstrate consistent product quality irrespective of feedstock used (if product properties vary, present data or analysis to demonstrate the impact of any difference on composition and effect on emission controls)
- Detailed analytical data on renewable diesel with comparison to ULSD – Chemical, Distillation, Viscosity, Gravity, Aromatics, etc.

- All analytical and other support data to demonstrate that renewable diesel meets ASTM D975.
- Analytical data to demonstrate that contaminants such as halogens, phosphorous, metals, etc. are not present in renewable diesel (if any contaminants are present, data or analysis to demonstrate the impact of purities on composition and effect on emission controls).

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Although Solazyme intends to take a leading role in ensuring the fuels derived from algal oil comply with all applicable standards and meet all applicable licensing and certification requirements, ultimately the refiners that purchase algal oil from Solazyme will bear responsibility for the regulatory compliance of the finished fuels that they refine and sell. PEP Section 9.6 describes how Solazyme intends to use the fuel produced as part of the project to help ensure market acceptance.

Renewable diesel will be completely fungible with petroleum diesel, but it will likely sell at a premium because it will help blenders to comply with RFS requirements; the high cetane number and low sulfur content of Solazyme's renewable diesel also increases its value as a blend stock. Alternatively, neat renewable algal diesel could potentially command a premium from environmentally-aware consumers and businesses. At this point, it is difficult to predict whether biodiesel or renewable diesel, and whether neat formulations or blends will return the greatest value on algal oil. Solazyme's commercialization pathway is flexible and remains agnostic on these questions. (The product pricing in the pro forma financials reflects blended biodiesel for definiteness and because reliable market data is available, but does not imply an early preference.)

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3. Feedstocks for a Commercial-Scale Facility

3.1. Projected First Commercial-Scale Facility

According to the EPA, more than 200 billion tons of municipal solid waste (MSW) are being generated annually in the United States. With current recovery technologies (including recycling and source separation), more than 160 billion tons of this material are landfilled and unutilized. The organic fraction of this material will undergo slow anaerobic digestion and, unless captured for energy generation, will release the resulting GHG to the atmosphere. A significant fraction of this material can be recovered and used as a source of feedstock for the production of transportation fuels.

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4. NEPA and Other Environmental Compliance for a Forecasted Commercial Facility

Although Solazyme anticipates that ComIBR will be designed, constructed, and operated entirely with private funds, the project may still be subject to review under the NEPA. If ComIBR will be located on federal lands or will require authorization by a federal agency (e.g., if the facility will impact wetlands or waterbodies, requiring a federal permit from the U.S. Corps of Engineers), it will be the individual permit authorizing agency's discretion to determine if issuing the permit will constitute a major federal undertaking necessitating a NEPA review. If ComIBR is privately funded and will not require issuance of a permit or authorization of an activity by a federal agency, then review of the project under NEPA will not be required. Examples of environmental permits that may be required for ComIBR are listed in Table BCP-2.

Agency	Permit/Approval/Consultation
Potential Federal	
Advisory Council on Historic Preservation	Consultation regarding impacts on cultural resources under Section 106 of the National Historic Preservation Act (NHPA)
U.S. Army Corps of Engineers	Permits under Section 404 of the Clean Water Act (CWA) and Section 10 of the Rivers and Harbors Act
U.S. Environmental Protection Agency	Review and comment on Section 404 permits issued by the COE (if applicable); National Pollutant Discharge Elimination System (NPDES) permit for stormwater discharges in certain states.
U.S. Department of Agriculture, Natural Resources Conservation Service	Consultation regarding erosion control and revegetation; Consultation for construction on lands enrolled in the Conservation Reserve Program (if applicable)
U.S. Department of the Interior, U.S. Fish & Wildlife Service	Consultation on threatened and endangered species under Section 7 of the Endangered Species Act (ESA); Consultation under the Migratory Bird Treaty Act and the Fish and Wildlife Coordination Act
Potential State Permits	
State Dept. of Environmental Quality	Environmental Review for consistency with state environmental regulations (Document required may be similar to EA or EIS - Not required in all states); Industrial Facility Siting Permit (if applicable); NPDES permit for construction stormwater discharges; Water quality certification under Section 401 of the CWA (required with the COE permit); NPDES industrial storm water discharge permit; NPDES individual industrial process water discharge permit; Ground water well permit (if applicable); Construction Air Emission Permit; Operating Air Emission Permit
State Division of Wildlife	Consultation for state-listed sensitive species
State Dept. of Natural Resources	Land use license for crossing navigable waterways (if applicable); Right-of-way grant for crossing state lands (if required)
State Dept. of Transportation	Encroachment permits for roads to the facility
State Floodplain Administrator	Permit for new construction within designated 100-year floodplains (if applicable)
State Historic Preservation Office	Consultation regarding impacts on cultural resources under Section 106 of the NHPA or state cultural resource laws if Section 106 is not applicable
Potential Local Permits	
County Authority	Land use zoning amendment; Dust Control Permit; Grading Permit; Building Permits

Table BCP-2. Potential Environmental Permits, Approvals, and Consultations

5. Energy and Environmental Life-Cycle Analysis

The separate LCA_GHG Attachment analyzes the

as well as for an alternate scenario (utilizing switchgrass as the feedstock with Abengoa as the front-end partner).

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Waste streams and emissions at commercial scale are discussed in Section 2.11.2 and PEP Section 3.8.2. Waste streams and emissions at pilot scale are discussed in PEP Section 8 and the Environmental Questionnaire.

6. Solazyme's Core Competencies and Experience for Commercialization

This section complements PEP Section 13 and focuses on the experience of Solazyme's business staff.

Troy J. Campione, **Senior Vice President of Business Development** will assume responsibility for all business milestones related to commercialization activities that will run separately from but in parallel with the proposed project. Dr. Campione was most recently Vice President and General Manager, Research Collaborations, Strategic Alliances and Materials Licensing for Symyx Technologies, Inc., a high throughput materials discovery company. During his seven years at Symyx, he was directly responsible for securing over $400 million dollars of research and development commitments, hardware and software purchases and advanced royalties. Prior to that Dr. Campione enjoyed a 15 year career with ExxonMobil where he held a variety of business, operations and technology leadership positions. His responsibilities at Exxon included management, strategy, and planning for Intermediates' $1B Vinyl business segment; laboratory, pilot plant, commercial and multi-site operations management; and leadership of a wide range of R&D activities, including major ventures, corporate, academic, institution and JV partner research across the full spectrum of Exxon Chemicals' business interests. He received a PhD in Chemical Engineering from the University of Texas at Austin, and ME and BS degrees in Chemical Engineering from Tulane University in New Orleans.

Tyler Painter, Chief Financial Officer, will assume responsibility for financing activities. Tyler has over 15 years experience in senior financial positions at companies such as PMC Sierra and Wind River Systems Inc. He has extensive capital structuring experience raising over $500 million in equity and debt in both private and public markets, was a corporate officer of a $1B public software company (Wind River Systems) with direct responsibility for managing corporate assets in excess of $200 million, and winner of the 2006 Pinnacle Award for Risk Management from the Association of Financial Professionals for creating industry leading approach to global treasury and finance operations that enhanced internal controls and resulted in over $500K of annual savings. He received his BS in Business Administration and Finance from Cal Poly in San Luis Obispo, California.

Dr. Harrison Dillon, President, Chief Technology Officer and Co-Founder, is an expert in microalgal genetics. He completed his Ph.D. research, including X-ray crystallography and quantitative trait loci characterization, under the direction of Dr. Jean-Marc Lalouel at the University of Utah. Dr. Dillon formerly managed the biotechnology patent portfolio in the University of Utah's Technology Transfer Office. Dr. Dillon received a J.D. cum laude from Duke University School of Law and is licensed to practice before the United States Patent and Trademark Office. He is a member of the State Bar of California and he also worked as an Associate in the Biotechnology Group at Townsend and Townsend and Crew. Dr.

Dillon has authored articles in scientific, business, and legal journals, and is an inventor on over 30 patents and patent applications owned by Solazyme.

Jonathan Wolfson, CEO and Co-Founder, has negotiated a range of commercial relationships with international energy, chemical, and other companies while at Solazyme. He was most recently the Vice President of Finance and Business Development for 7thOnline, a venture-backed supply chain software company where he was responsible for overseeing legal issues, finance and the development and implementation of corporate strategy, which resulted in annualized revenue growth of over 100% during his tenure. Mr. Wolfson was also a primary interface between the company's management and its board and investors. Prior to that Mr. Wolfson was a co-founder and President and Chief Operating Officer of InvestorTree, a financial software and ASP services firm. At InvestorTree, he was responsible for operations and for obtaining major clients including Fidelity Investments, AXA, Fiserv, Raymond James and others. Previously he worked as an investment banker for Morgan Stanley, in the M&A department of Fried, Frank, Harris, Shriver & Jacobson and as a business/legal analyst for Triarc Companies. Mr. Wolfson holds J.D. and M.B.A. degrees from the NYU School of Law and the NYU Stern School of Business. Additionally, he spent several years as an Adjunct Assistant Professor of Economics at Hunter College of the City University of New York.

7. Commitment to the Project

I am Jonathan Wolfson, Co-Founder, Chief Executive Officer, and member of the Board of Directors of Solazyme. I declare that

- Among many others, six of the company's seven most senior executives have been actively engaged in preparing this proposal. I personally have devoted approximately one-third of my time over the past six weeks to issues directly relating to this proposal and I have reviewed the Project Execution Plan, and supporting materials. Every element of the proposal has been prepared or reviewed by at least two senior executives and accurately represents the company's plans.
- The proposed effort lies directly on Solazyme's critical business path.
- Negotiations and discussions with all of the project team members have involved senior executives of the partner companies.
- If DOE selects this proposal for an award, negotiating and closing the contract will be a top priority for the company. Solazyme is ready to begin executing this project, and can and will begin in earnest as soon as funding is committed.
- I understand the risks associated with the proposal and the proposed project.

Affirmed by

Jonathan Wolfson
CEO Solazyme Inc.

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The data contained in every page (pages 1 to 3) 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 U.S. government's right to use or disclose data obtained without restriction from any source, including the applicant.

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IP Statements and Support Documentation

IP Statements

Solazyme owns all the intellectual property necessary to accomplish the tasks set out in this proposal. The intellectual property rights owned by Solazyme have not been licensed to any other parties. There are no intellectual property rights that have been licensed from another party.

Solazyme's Partners have confirmed the following:

"To the best of its knowledge, UOP LLC owns or will have a license to all the intellectual property rights necessary to convert Solazyme's purified algal oil into renewable diesel as set out in proposal in response to DE-FOA-0000096. Limited licenses will be granted to Solazyme only to the extent necessary to use the resulting fuel."

"To the best of its knowledge, Bluefire owns or will have a license to all the intellectual property rights necessary to provide concentrated cellulosic sugars to Solazyme to carry out algal fermentations to produce purified algal oil to be refined into transportation fuels as set out in proposal in response to DE-FOA-0000096. Limited licenses will be granted to Solazyme only to the extent necessary to accomplish the tasks set out in the proposal."

"To the best of its knowledge, The Renewable Energy Group owns or will have a license to all the intellectual property rights necessary to convert Solazyme purified algal oil into FAME biodiesel as set out in proposal in response to DE-FOA-0000096. Limited licenses will be granted to Solazyme only to the extent necessary to use the resulting Fuel."

"To its knowledge, Abengoa Bioenergy New Technologies has all the intellectual property rights necessary to provide concentrated cellulosic sugars to Solazyme. Limited licenses will be granted to Solazyme only to the extent necessary to carry out algal fermentations to produce purified algal oil to be refined into transportation fuels as set out in this proposal."

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Overview

Solazyme's proprietary platform utilizes non-photosynthetic cultivation of oil-bearing microalgae and other microbes for the production of non-alcohol based fuels and other hydrocarbon or lipid compositions on a large scale for use in transportation fuels. The platform includes: (1) microalgae strain selection; (2) feedstock selection and processing; (3) genetic engineering of microalgae strain(s) and other microbes; (4) scale up and optimization of fermentation processes; (5) oil extraction; and (6) oil to fuel conversion.

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Strain/Feedstock Selection, Cultivation and Genetic Engineering

Some microalgae strains can be cultured under heterotrophic conditions (non-photosynthetic process using fermentation tanks) in which a fixed carbon source or feedstock provides energy for growth and lipid accumulation. These microalgae strains can utilize a variety of fixed carbon sources including sucrose, glycerol and cellulosic materials.

Listed below are patent applications filed and owned by Solazyme regarding microalgae strain selection, feedstock selection and genetic engineering of microalgae strains and cultivation of these microalgae strains for the production of biomass and oils.

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Oil Extraction Process

Once the oil-bearing microalgal biomass has been produced, the oil contained within the microalgal cells, typically in the form of triacylglycerides (TAGs), need to be extracted or separated from the cells. Part of Solazyme's platform technology includes several processes to extract the oil from the microalgal cells. The oil extraction process also include filtration, separation or purification steps needed before the crude algal oil (TAGs) can be subjected to chemical modifications to produce fuels. Listed below are patent applications filed and owned by Solazyme regarding oil extraction from oil-bearing microalgal biomass.

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Oil to Fuel Conversion

Because the crude oil produced by microalgae strains is in the form of TAGs, chemical modification of the crude oil needs to be performed in order to generate fuels. These chemical modifications include transesterification to produce biodiesel (fatty acid methyl esters, FAMEs), hydrotreating to produce renewable diesel and a combination of hydrotreating and hydrocracking to produce aviation/jet fuel. Listed below are patent applications filed and owned by Solazyme regarding the conversion of crude microalgal oil/high oil-bearing microalgal biomass into transportation fuels such as biodiesel (FAMEs), renewable diesel, and aviation/jet fuel.

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Solazyme may own additional intellectual property in various forms that covers methods and compositions useful in the proposed project that are not listed above, including inventions conceived but not yet reduced to practice and inventions reduced to practice but not yet described in a filed patent application, as well as trade secrets.

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