

GRANTS/CONTINGENT AWARD REQUEST



To: Grants and Loans Office

Date: 11/9/2011

Project Manager: Paul Roggensack

Phone Number: 916-327-2224

Office: Energy Efficiency Research Office

Division: Energy Research and Development

MS- 43

Project Title: High Efficiency Server Fans

Type of Request: (check one)

New Agreement: (include items A-F from below) Agreement Number: _____

Program: PIER E / Industrial/ Ag/ Water

Solicitation Name and/or Number: _____

Legal Name of Recipient: PAX Scientific, Inc

Recipient's Full Mailing Address: 999 ANDERSEN DR STE 100
SAN RAFAEL, CA 94901-5363

Recipient's Project Officer: Francesca Bertone Phone Number: 415-256-9900

Agreement Start Date: 3/1/2011 Agreement End Date: 9/1/2013

Amendment: (Check all that apply) Agreement Number: PIR-10-020

Term Extension – New End Date: 9/1/2014

Work Statement Revision (include Item A from below)

Budget Revision (include Item B from below)

Change of Scope (include Items A – F as applicable from below)

Other: to change partners, key personnel

ITEMS TO ATTACH WITH REQUEST:

- A. Work Statement
- B. Budget
- C. Recipient Resolution, if applicable. (Resolution may be requested in Special Conditions if not currently available.)
- D. Special Conditions, if applicable.
- E. CEQA Compliance Form
- F. Other Documents as applicable
 - Copy of Score Sheets
 - Copy of Pre-Award Correspondence
 - Copy of All Other Relevant Documents

California Environmental Quality Act (CEQA)

CEC finds, based on recipient's documentation in compliance with CEQA:

Project exempt: 14 CCR 15306 NOE filed: _____

Environmental Document prepared: _____ NOD filed: _____

Other: _____

CEC has made CEQA finding described in CEC-280, attached

Funding Information:

*Source #1: _____ Amount: \$ _____ Statute: _____ FY: _____ Budget List #: _____

*Source #2: _____ Amount: \$ _____ Statute: _____ FY: _____ Budget List #: _____

*Source #3: _____ Amount: \$ _____ Statute: _____ FY: _____ Budget List #: _____

If federally funded, specify federal agreement number: _____

* Source Examples include ERPA, PIER-E, PIER-NG, FED, GRDA, ARFVT, OTHER.

Business Meeting Approval: (refer to Business Meeting Schedule)

Proposed Business Meeting Date: 1/11/2012 Consent Discussion

Business Meeting Participant: Paul Roggensack Time Needed: _____

Agenda Notice Statement: (state purpose in layperson terms)

Possible approval of a Grant / Contingent Award to...

Possible approval of Amendment 1 to Agreement PIR-10-020 with PAX Scientific, Inc. to change partners and key personnel, reallocate the task budget and extend the term from 9/1/2013 to 9/1/2014. The project will reduce the fan energy of data center servers by at least 15% by redesigning the fan blades. (PIER Electricity Funding) Contact: Paul Roggensack

PLEASE SEE SIGNATURES

Project Manager _____ Date _____ Office Manager _____ Date _____ Deputy Director _____ Date _____



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*Source #3: _____ Amount: \$ _____ Statute: _____ FY: _____ Budget List #: _____

If federally funded, specify federal agreement number: _____

* Source Examples include ERPA, PIER-E, PIER-NG, FED, GRDA, ARFVT, OTHER.

Business Meeting Approval: (refer to Business Meeting Schedule)

Proposed Business Meeting Date: 12/28/2011 Consent Discussion

Business Meeting Participant: Paul Roggensack Time Needed: 5 minutes

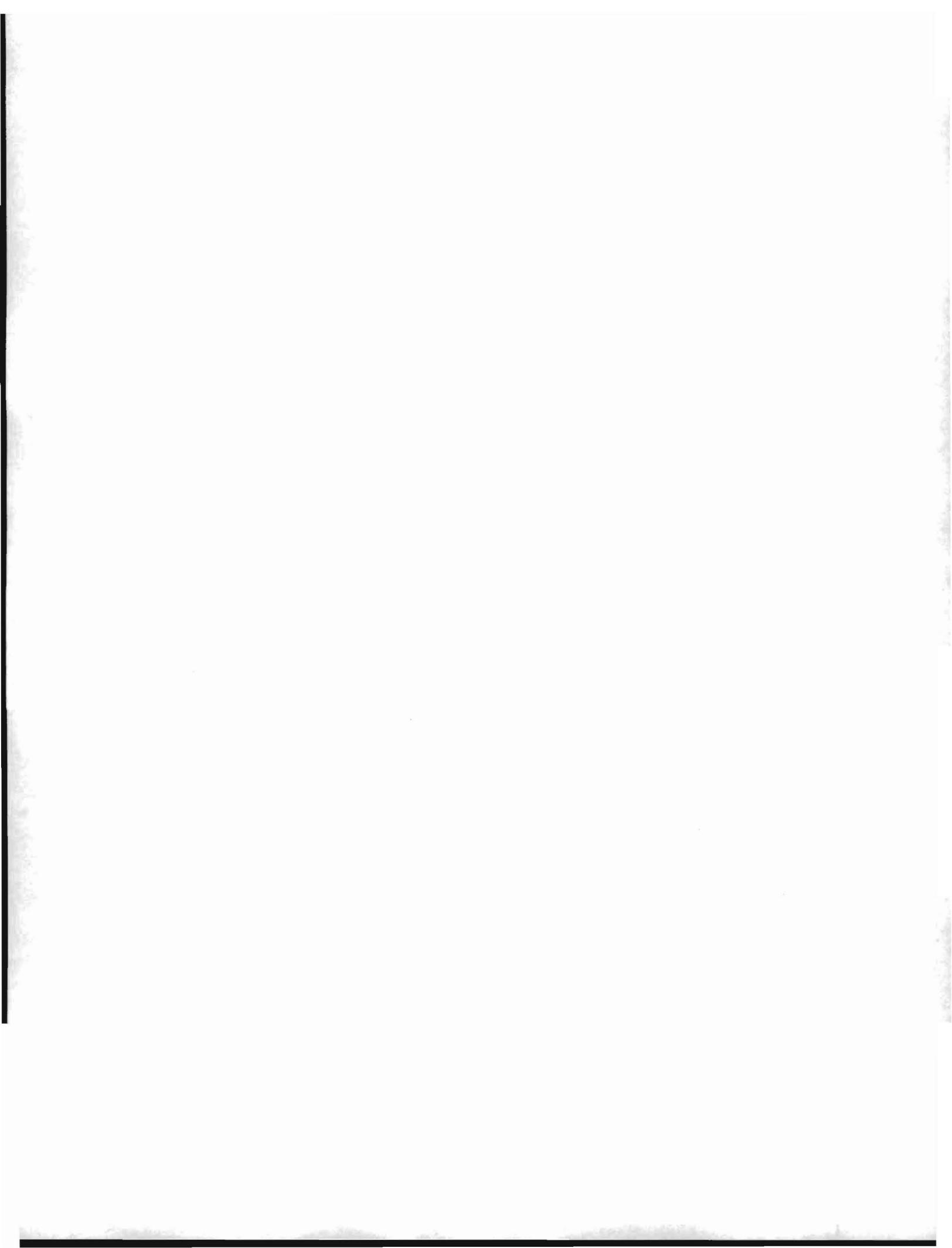
Agenda Notice Statement: (State purpose in layperson terms)

Possible approval of a Grant / Contingent Award to...

Possible approval of this Amendment 1 to Agreement PIR-10-020 with PAX Scientific, Inc to change partners, key personnel and reallocate the task budget. The project will reduce the fan energy of data center servers by at least 15% by redesigning the fan blades using the PAX Streamline Principle (PIER Funding) Contact: Paul Roggensack

Paul Roggensack 11/14/11 [Signature] 11/15/11 [Signature] 11/13/11

Project Manager Date Office Manager Date Deputy Director Date



**Exhibit A
WORK STATEMENT**

1 **TECHNICAL TASK LIST**

2

Task #	CPR	Task Name
1	N/A	Administration
2		Server Selection & Baseline
3		Iterate CFD & Meshing Parameters to Establish Simulation Set-Up
4	X	Fan Design Process
5		Prepare Samples & Airflow Correlation
6	X	Comparative Power Consumption Monitoring & Analysis
7		Additional Power Consumption Monitoring Tests (as Needed)
8		Technology Transfer Activities
9		Production Readiness Plan

3
4
5 **KEY NAME LIST**

6

Task #	Key Personnel	Key Subcontractor(s)	Key Partner(s)
1	Peter Fiske, Kimberly Penney Robin Giguere, Yahia Abdelhamid <u>Francesca Bertone,</u> <u>Kimberly Penney,</u> <u>Robin Giguere, Shadi Mahjoob</u>	<u>Bruce Webster</u>	-
2	Peter Fiske, Kimberly Penney Robin Giguere, Yahia Abdelhamid <u>Francesca Bertone,</u> <u>Kimberly Penney,</u> <u>Robin Giguere, Shadi Mahjoob</u>	Digi-Key, <u>Bruce Webster</u>	Jabil Circuit
3	Robin Giguere, Yahia Abdelhamid <u>Francesca Bertone,</u> <u>Kimberly Penney,</u> <u>Robin Giguere, Shadi Mahjoob</u>	Scansite, <u>Harvest, Bruce Webster</u>	-
4	Kimberly Penney Robin Giguere, Yahia Abdelhamid <u>Francesca Bertone,</u> <u>Kimberly Penney,</u> <u>Robin Giguere, Shadi Mahjoob</u>	Harvest/PAX Streamline, <u>Bruce Webster</u>	

**Exhibit A
WORK STATEMENT**

Task #	Key Personnel	Key Subcontractor(s)	Key Partner(s)
5	<u>Lead Fan Design Engineer & Team Lead</u>	OMW Corp., Intercise	Jabil Circuit
6-7	Peter Fiske, Kimberly Penney Robin Giguere, Yahia Abdelhamid <u>Francesca Bertone, Kimberly Penney, Robin Giguere, Shadi Mahjoob</u>	<u>Bruce Webster</u>	Jabil Circuit
8-9	Peter Fiske, Kimberly Penney Robin Giguere, Yahia Abdelhamid <u>Francesca Bertone, Kimberly Penney, Robin Giguere, Shadi Mahjoob</u>	<u>Bruce Webster</u>	-

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5

GLOSSARY

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

Term/ Acronym	Definition
AMCA	Air Movement & Controls Association
CAD	Computer Aided Design
CFD	Computation fluid dynamics
CPR	Critical Project Review
CPU	Central Processing Unit (inside server)
Energy Commission	California Energy Commission
HVAC	Heating Ventilation and Air Conditioning
IT	Information Technology
PAC	Project Advisory Committee
PIER	Public Interest Energy Research
RD&D	Research, Development and Demonstration
SLS	selective laser sintering

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Problem Statement:

Rack servers used in data centers produce a lot of heat, and require internal cooling fans to cool Central Processing Units (CPUs) and other components. These fans use significant energy to operate, power that is parasitic in that it does not go towards any actual computing task. The recipient has developed the PAX Streamlining Principle, a technology based on principles of fluid movement found in biological systems. The PAX Streamlining Principle, when applied to fan blade geometries, creates fans that are

Exhibit A WORK STATEMENT

1 more energy efficient and quieter (noise is wasted energy) than fans designed by
2 conventional means
3 The information technology (IT) industry builds systems using a procurement process
4 that tries to squeeze out cost on every component. Since conventional fan technology is
5 not significantly differentiated among suppliers, there is little room to garner value from
6 a more efficient fan product in a procurement process that does not recognize the
7 unique performance of the recipient's fans. This project seeks to generate independent
8 data to support the claim that the recipient's technology can design more energy
9 efficient fans, and to overcome the procurement hurdle by elevating the exposure of the
10 technology to the original equipment manufacturers
11

12 **Goals of the Agreement:**

13 The goal of this agreement is to promote greater energy efficiency in server cooling by
14 demonstrating the increased efficiency of fans designed using the PAX Streamlining
15 Principle.
16

17 **Objectives of the Agreement:**

18 The objectives of this Agreement are to demonstrate that a server retrofitted with the
19 recipient's designed cooling fans will use 15% less energy for those fans than the same
20 server using standard fans designed using conventional methods.
21

22 **Product Guidelines:**

23 For complete product guidelines, refer to Section 5 in the Terms and Conditions.
24

25 **TASK 1 ADMINISTRATION**

26 **Task 1.1 Attend Kick-off Meeting**

27 The goal of this task is to establish the lines of communication and procedures for
28 implementing this Agreement.
29

30 **The Recipient shall:**

- 31 • Attend a "Kick-Off" meeting with the Commission Project Manager, the
32 Grants Officer, and a representative of the Accounting Office. The
33 Recipient shall bring its Project Manager, Agreement Administrator,
34 Accounting Officer, and others designated by the Commission Project
35 Manager to this meeting. The administrative and technical aspects of this
36 Agreement will be discussed at the meeting. Prior to the kick-off meeting,
37 the Commission Project Manager will provide an agenda to all potential
38 meeting participants.
39
40

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

- 43 ○ Discussion of the terms and conditions of the Agreement
- 44 ○ Discussion of Critical Project Review (Task 1.2)
- 45 ○ Match fund documentation (Task 1.6)
- 46



**Exhibit A
WORK STATEMENT**

- 1 ○ Permit documentation (Task 1.7)

2
3 The technical portion of the meeting shall include, but not be limited to, the
4 following:

- 5 ○ The Commission Project Manager's expectations for accomplishing
- 6 tasks described in the Scope of Work
- 7 ○ An updated Schedule of Products
- 8 ○ Discussion of Progress Reports (Task 1.4)
- 9 ○ Discussion of Technical Products (Product Guidelines located in
- 10 Section 5 of the Terms and Conditions)
- 11 ○ Discussion of the Final Report (Task 1.5)

12
13 **The Commission Project Manager shall:**

- 14 • Designate the date and location of this meeting.

15
16 **Recipient Products:**

- 17 • Updated Schedule of Products (no draft)
- 18 • Updated List of Match Funds (no draft)
- 19 • Updated List of Permits (no draft)

20
21 **Commission Project Manager Product:**

- 22 • Kick-Off Meeting Agenda (no draft)

23
24 **Task 1.2 Critical Project Review (CPR) Meetings**

25
26 The goal of this task is to determine if the project should continue to receive Energy
27 Commission funding to complete this Agreement and to identify any needed
28 modifications to the tasks, products, schedule or budget.

29
30 CPRs provide the opportunity for frank discussions between the Energy Commission
31 and the Recipient. CPRs generally take place at key, predetermined points in the
32 Agreement, as determined by the Commission Project Manager and as shown in the
33 Technical Task List above. However, the Commission Project Manager may schedule
34 additional CPRs as necessary, and any additional costs will be borne by the Recipient.

35
36 Participants include the Commission Project Manager and the Recipient and may
37 include the Commission Grants Officer, the Public Interest Energy Research (PIER)
38 Program Team Lead, other Energy Commission staff and Management as well as other
39 individuals selected by the Commission Project Manager to provide support to the
40 Energy Commission.

41
42 **The Commission Project Manager shall:**

- 43 • Determine the location, date, and time of each CPR meeting with the
- 44 Recipient. These meetings generally take place at the Energy
- 45 Commission, but they may take place at another location.
- 46 • Send the Recipient the agenda and a list of expected participants in

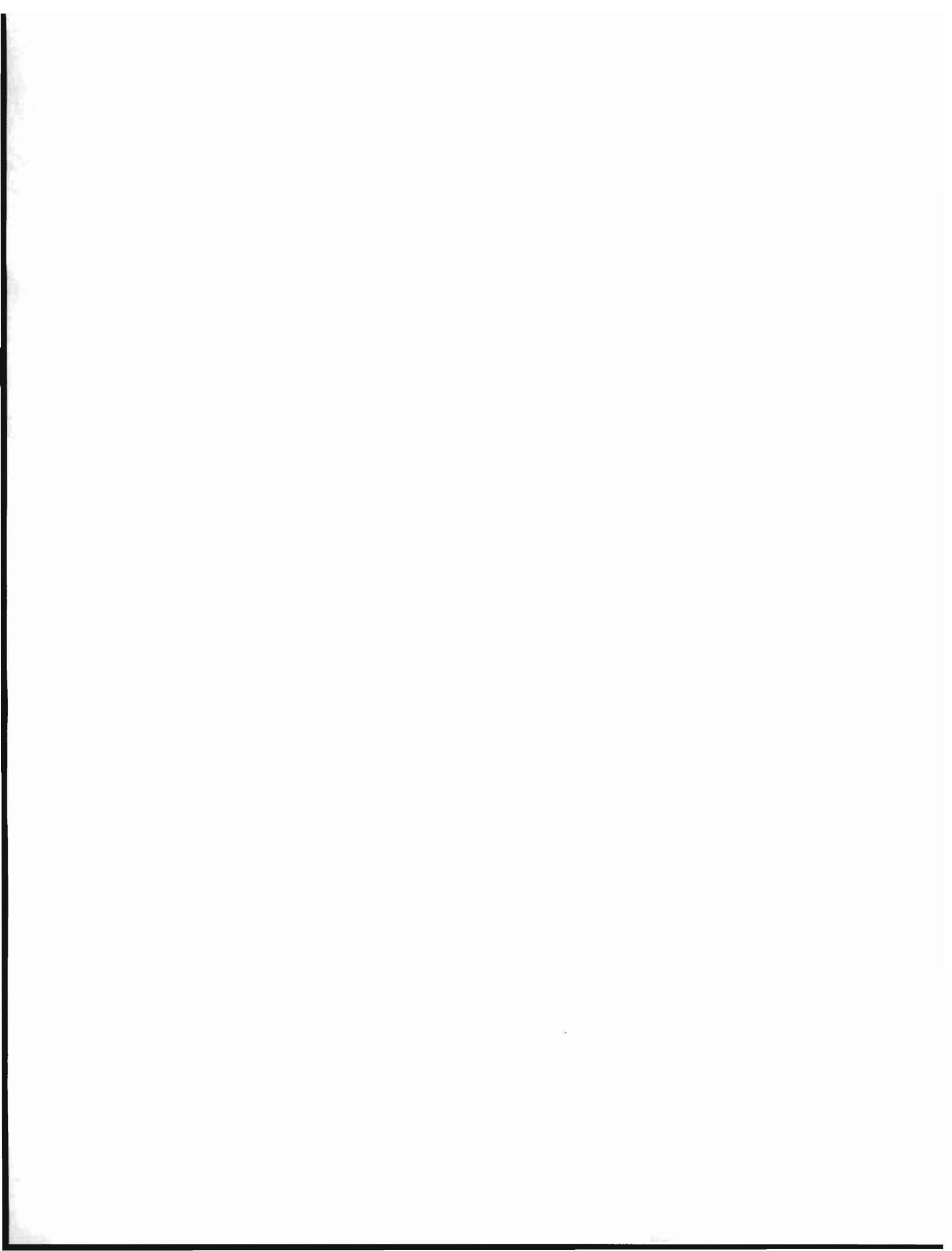


Exhibit A WORK STATEMENT

1 advance of each CPR. If applicable, the agenda shall include a
2 discussion on both match funding and permits.

- 3 • Conduct and make a record of each CPR meeting. One of the outcomes
4 of this meeting will be a schedule for providing the written determination
5 described below.
- 6 • Determine whether to continue the project, and if continuing, whether or
7 not modifications are needed to the tasks, schedule, products, and/or
8 budget for the remainder of the Agreement. Modifications to the
9 Agreement may require a formal amendment (please see the Terms and
10 Conditions). ~~If the Commission Project Manager concludes that~~
11 ~~satisfactory progress is not being made, this conclusion will be referred to~~
12 ~~the Energy Commission's Research, Development and Demonstration~~
13 ~~(RD&D) Policy Committee for its concurrence.~~
- 14 • Provide the Recipient with a written determination in accordance with the
15 schedule. The written response may include a requirement for the
16 Recipient to revise one or more product(s) that were included in the CPR.
17

18 **The Recipient shall:**

- 19 • Prepare a CPR Report for each CPR that discusses the progress of the
20 Agreement toward achieving its goals and objectives. This report shall
21 include recommendations and conclusions regarding continued work of
22 the projects. This report shall be submitted along with any other products
23 identified in this scope of work. The Recipient shall submit these
24 documents to the Commission Project Manager and any other designated
25 reviewers at least 15 working days in advance of each CPR meeting.
- 26 • Present the required information at each CPR meeting and participate in a
27 discussion about the Agreement.
28

29 **Commission Project Manager Products:**

- 30 • Agenda and a list of expected participants (no draft)
- 31 • Schedule for written determination (no draft)
- 32 • Written determination (no draft)
33

34 **Recipient Product:**

- 35 • CPR Report(s) (no draft)
36

37 **Task 1.3 Final Meeting**

38
39 The goal of this task is to closeout this Agreement.
40

41 **The Recipient shall:**

- 42 • Meet with Energy Commission staff to present the findings, conclusions,
43 and recommendations. The final meeting must be completed during the
44 closeout of this Agreement.
45



**Exhibit A
WORK STATEMENT**

1 This meeting will be attended by, at a minimum, the Recipient, the
2 Commission Grants Office Officer, and the Commission Project Manager.
3 The technical and administrative aspects of Agreement closeout will be
4 discussed at the meeting, which may be two separate meetings at the
5 discretion of the Commission Project Manager.
6

7 The technical portion of the meeting shall present an assessment of the
8 degree to which project and task goals and objectives were achieved,
9 findings, conclusions, recommended next steps (if any) for the Agreement,
10 and recommendations for improvements. The Commission Project
11 Manager will determine the appropriate meeting participants.
12

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

- 16 ○ What to do with any equipment purchased with Energy Commission
17 funds (Options)
- 18 ○ Energy Commission's request for specific "generated" data (not
19 already provided in Agreement products)
- 20 ○ Need to document Recipient's disclosure of "subject inventions"
21 developed under the Agreement
- 22 ○ "Surviving" Agreement provisions, such as repayment provisions
23 and confidential Products
- 24 ○ Final invoicing and release of retention
- 25 ○ Prepare a schedule for completing the closeout activities for this
26 Agreement

27
28 **Products:**

- 29 ● Written documentation of meeting agreements (no draft)
- 30 ● Schedule for completing closeout activities (no draft)

31
32 **Task 1.4 Monthly Progress Reports**

33
34 The goal of this task is to periodically verify that satisfactory and continued progress is
35 made towards achieving the research objectives of this Agreement on time and within
36 budget.
37

38 The objectives of this task are to summarize activities performed during the reporting
39 period, to identify activities planned for the next reporting period, to identify issues that
40 may affect performance and expenditures, and to form the basis for determining
41 whether invoices are consistent with work performed.
42

43 **The Recipient shall:**

- 44 ● Prepare a Monthly Progress Report which summarizes all Agreement
45 activities conducted by the Recipient for the reporting period, including an
46 assessment of the ability to complete the Agreement within the current

Exhibit A WORK STATEMENT

1 budget and any anticipated cost overruns. Each progress report is due to
2 the Commission Project Manager within 10 days of the end of the
3 reporting period. The recommended specifications for each progress
4 report are contained in Exhibit A, Attachment A-2.
5

6 **Product:**

- 7 • Monthly Progress Reports (no draft)

9 **Task 1.5 Final Report**

10
11 The goal of the Final Report is to assess the project's success in achieving its goals and
12 objectives, advancing science and technology, and providing energy-related and other
13 benefits to California.

14
15 The objectives of the Final Report are to clearly and completely describe the project's
16 purpose, approach, activities performed, results, and advancements in science and
17 technology; to present a public assessment of the success of the project as measured
18 by the degree to which goals and objectives were achieved; to make insightful
19 observations based on results obtained; to draw conclusions; and to make
20 recommendations for further RD&D projects and improvements to the PIER project
21 management processes.

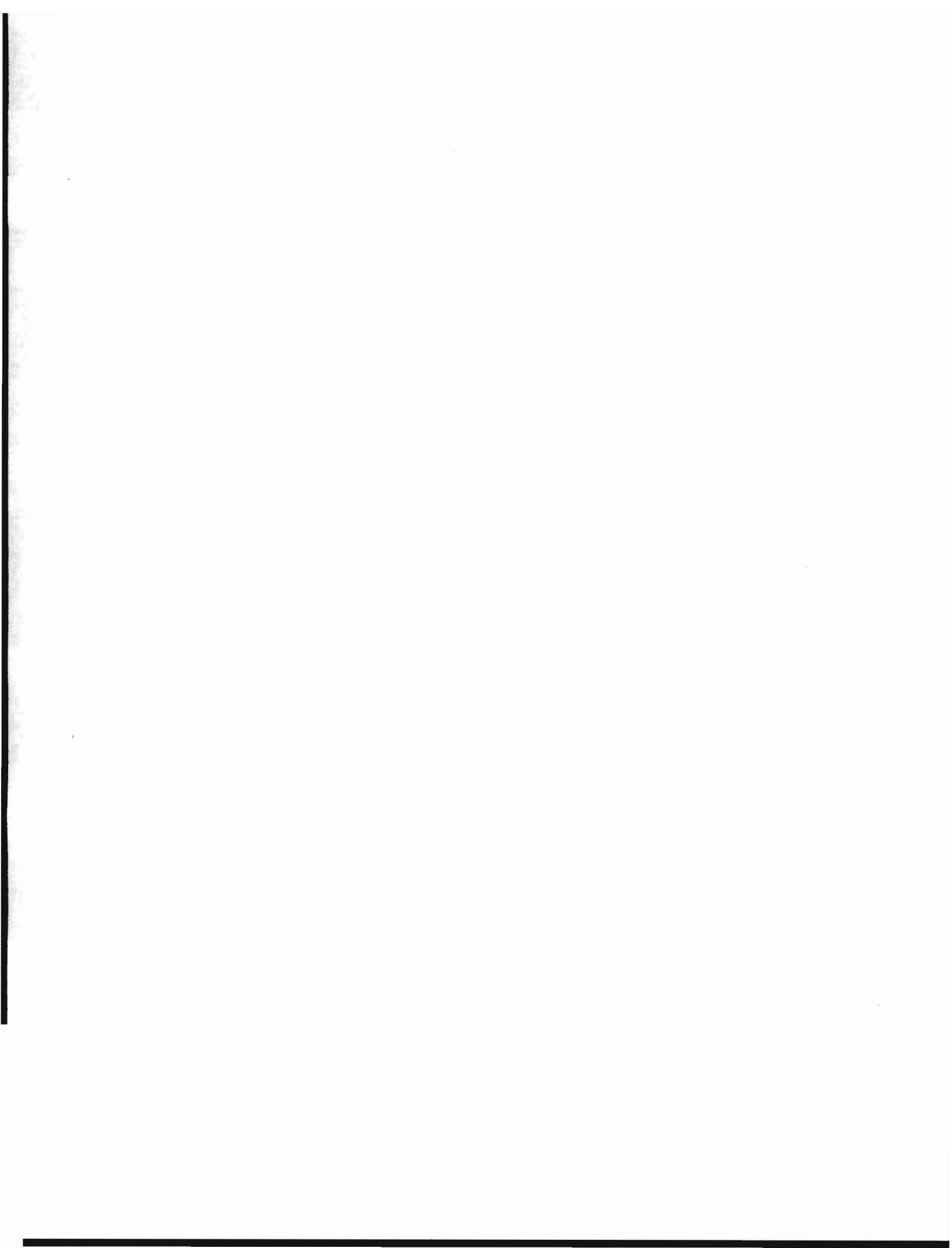
22
23 The Final Report shall be a public document. If the Recipient has obtained confidential
24 status from the Energy Commission and will be preparing a confidential version of the
25 Final Report as well, the Recipient shall perform the following activities for both the
26 public and confidential versions of the Final Report.
27

28 **The Recipient shall:**

- 29 • Prepare an Outline of the Final Report.
- 30 • Prepare a Final Report following the approved outline and the latest
31 version of the PIER Final Report guidelines published on the Energy
32 Commission's website at
33 <http://www.energy.ca.gov/contracts/pier/contractors/index.html> at the
34 time the Recipient begins performing this task, unless otherwise instructed
35 in writing by the Commission Project Manager. Instead of the timeframe
36 listed in the Product Guidelines located in Section 5 of the Terms and
37 Conditions, the Commission Project Manager shall provide written
38 comments on the Draft Final Report within fifteen (15) working days of
39 receipt. The Final Report must be completed on or before the end of the
40 Agreement Term.
- 41 • Submit one bound copy of the Final Report with the final invoice.

43 **Products:**

- 44 • Draft Outline of the Final Report
- 45 • Final Outline of the Final Report
- 46 • Draft Final Report



**Exhibit A
WORK STATEMENT**

- Final Report

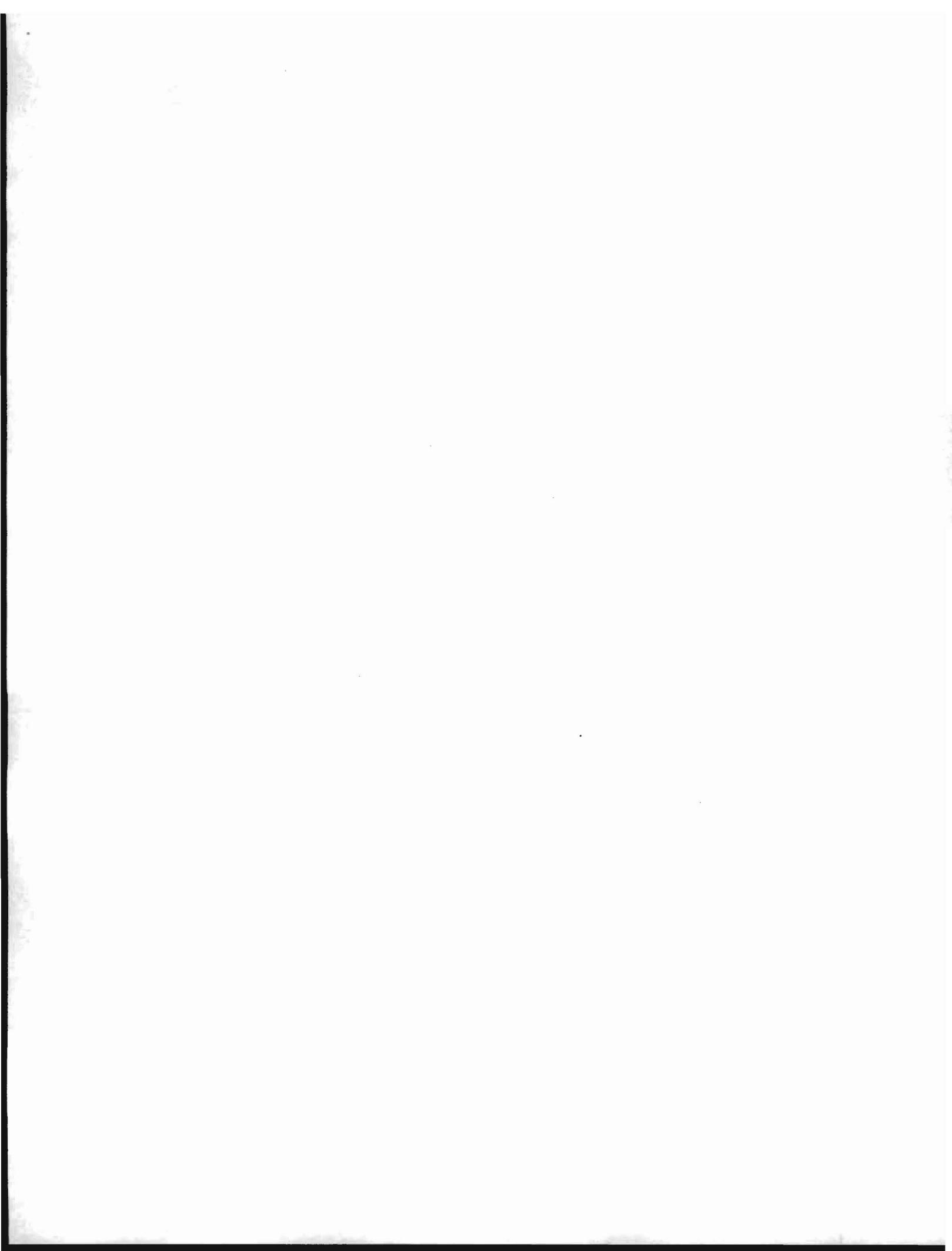
Task 1.6 Identify and Obtain Matching Funds

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

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

The Recipient shall:

- Prepare a letter documenting the match funding committed to this Agreement and submit it to the Commission Project Manager at least 2 working days prior to the kick-off meeting. If no match funds were part of the proposal that led to the Energy Commission awarding this Agreement and none have been identified at the time this Agreement starts, then state such in the letter. If match funds were a part of the proposal that led to the Energy Commission awarding this Agreement, then provide in the letter a list of the match funds that identifies the:
 - Amount of each cash match fund, its source, including a contact name, address and telephone number and the task(s) to which the match funds will be applied
 - Amount of each in-kind contribution, a description, documented market or book value, and its source, including a contact name, address and telephone number and the task(s) to which the match funds will be applied. If the in-kind contribution is equipment or other tangible or real property, the Recipient shall identify its owner and provide a contact name, address and telephone number, and the address where the property is located
- Provide a copy of the letter of commitment from an authorized representative of each source of cash match funding or in-kind contributions that these funds or contributions have been secured.
- Discuss match funds and the implications to the Agreement if they are reduced or not obtained as committed, at the kick-off meeting. If applicable, match funds will be included as a line item in the progress reports and will be a topic at CPR meetings.
- Provide the appropriate information to the Commission Project Manager if during the course of the Agreement additional match funds are received.
- Notify the Commission Project Manager within 10 days if during the course of the Agreement existing match funds are reduced. Reduction in match funds must be approved through a formal amendment to the



**Exhibit A
WORK STATEMENT**

1 Agreement and may trigger an additional CPR.
2

3 **Products:**

- 4 • A letter regarding match funds or stating that no match funds are provided
5 (no draft)
- 6 • Copy(ies) of each match fund commitment letter(s) (if applicable)
7 (no draft)
- 8 • Letter(s) for new match funds (if applicable) (no draft)
- 9 • Letter that match funds were reduced (if applicable) (no draft)

10
11
12 **Task 1.7 Identify and Obtain Required Permits**

13
14 The goal of this task is to obtain all permits required for work completed under this
15 Agreement in advance of the date they are needed to keep the Agreement schedule on
16 track.

17
18 Permit costs and the expenses associated with obtaining permits are not reimbursable
19 under this Agreement. Although the PIER budget for this task will be zero dollars, the
20 Recipient shall budget match funds for any expected expenditures associated with
21 obtaining permits. Permits must be identified in writing and obtained before the
22 Recipient can make any expenditures for which a permit is required.
23

24 **The Recipient shall:**

- 25 • Prepare a letter documenting the permits required to conduct this
26 Agreement and submit it to the Commission Project Manager at least 2
27 working days prior to the kick-off meeting. If there are no permits required
28 at the start of this Agreement, then state such in the letter. If it is known at
29 the beginning of the Agreement that permits will be required during the
30 course of the Agreement, provide in the letter:
 - 31 ○ A list of the permits that identifies the:
 - 32 ■ Type of permit
 - 33 ■ Name, address and telephone number of the permitting
34 jurisdictions or lead agencies
- 35 • The schedule the Recipient will follow in applying for and obtaining these
36 permits.
- 37 • Discuss the list of permits and the schedule for obtaining them at the kick-
38 off meeting and develop a timetable for submitting the updated list,
39 schedule and the copies of the permits. The implications to the
40 Agreement if the permits are not obtained in a timely fashion or are denied
41 will also be discussed. If applicable, permits will be included as a line item
42 in the Progress Reports and will be a topic at CPR meetings.
- 43 • If during the course of the Agreement additional permits become
44 necessary, provide the appropriate information on each permit and an
45 updated schedule to the Commission Project Manager.
- 46 • As permits are obtained, send a copy of each approved permit to the



Exhibit A WORK STATEMENT

1 Commission Project Manager.

- 2 • If during the course of the Agreement permits are not obtained on time or
3 are denied, notify the Commission Project Manager within 10 days. Either
4 of these events may trigger an additional CPR.
5

6 **Products:**

- 7 • Letter documenting the permits or stating that no permits are required (no
8 draft)
9 • A copy of each approved permit (if applicable) (no draft)
10
11 • Updated list of permits as they change during the term of the Agreement
12 (if applicable) (no draft)
13 • Updated schedule for acquiring permits as changes occur during the term
14 of the Agreement (if applicable) (no draft)
15
16

17 **TECHNICAL TASKS**

18 19 20 **TASK 2 SERVER SELECTION & BASELINE**

21 22 **Task 2.1 Fan Alone Baseline**

23 The goal of this task is to ~~airflow baseline test all the fans currently used by Jabil Circuit~~
24 ~~in their server platforms. This data will be used to select a server to target for the~~
25 ~~project.~~ **explore which fan size(s) and partner's server platform(s) to target for**
26 **this grant.**
27

28 29 **The Partner shall:**

- 30 • Provide a comprehensive list of ~~server platforms using combinations of~~
31 ~~120x38mm, 92x38mm, 80x38mm, and 60x38mm IT fans~~ **current cooling**
32 **fans used including the following**
33
34 • ~~Include specs for each server including:~~
35 ○ Number of each size fan **per unit**
36 ○ Number of units sold per year
37 ○ ~~Photo of unit architecture & fan locations~~ **Operating point/range**
38 ○ Any current cooling issues
39 ○ ~~Typical duty cycles~~
40 ○ Model numbers of fans
41 • Rate each server in terms of desirability of use for this project
42 • Provide three samples of each fan used (or a means to purchase them)
43
44

The Recipient shall:

Exhibit A WORK STATEMENT

- 1 • Purchase additional fan samples if available
- 2 • Complete fan-alone airflow tests in the recipient's flowmeter for the partner
- 3 identified fans as received. All tests in the flowmeter throughout this
- 4 project will be taken in accordance with Air Movement & Controls
- 5 Association (AMCA) 210 specifications on the recipient's Torrington
- 6 FM1000 flowmeter.
- 7 • Complete fan-alone airflow tests in flowmeter for same fans on
- 8 dynamometer to attain fan efficiency values
- 9 • Compare fan performance based on these tests to determine best
- 10 efficiency in each size
- 11 • Compare fans based on ease of use factors including motor size, sample
- 12 availability, output correlation to current the recipient's designs, complexity
- 13 of controls, etc.
- 14 • Use the findings to rate each server in terms of desirability of use for this
- 15 project
- 16
- 17

18 **Task 2.2 Server & Test Platform Finalization Test Plan Discussion & Validation**

19
20 The goal of this task is for the partner and the recipient to **explore test parameters.**
21 **The test plan will be discussed and iterated upon to ensure correlation of the**
22 **recipient's and the partner's test methods.** ~~use the information obtained in Task 2.1~~
23 ~~to decide on a server platform and fan size to target which is mutually beneficial to both~~
24 ~~parties. Once a server has been selected, both parties will work together to create a~~
25 ~~Detailed Server Test Plan for comparative power consumption monitoring.~~

26 27 28 **The Partner shall:**

- 29 • ~~Provide 2 samples of the selected server & 3 sets of selected fans (or a~~
- 30 ~~means for the recipient to purchase them)~~
- 31 • Inform the recipient as to methods the partner currently uses for
- 32 evaluating fan power consumption in servers
- 33 • **Give the recipient access to the partner's test facilities**
- 34
- 35

36 **The Recipient shall:**

- 37 • ~~Obtain the selected server as necessary~~
- 38 • ~~Complete baseline airflow testing of the fans in the server~~
- 39 • ~~Produce a Report Summarizing Baseline Data on Conventional Fans~~
- 40 ~~(Fan alone & In unit)~~
- 41 • ~~Produce Detailed Server Test Plan specifying~~
 - 42 ○ ~~Chosen server & fan selection~~
 - 43 ○ ~~Test settings (conditions of test room)~~
 - 44 ○ ~~Apparatus~~

**Exhibit A
WORK STATEMENT**

- Parameters monitored
- CPU loading
- Duration of test
- Manner of power monitoring of fans independently of the entire server

- **Participate in validation tests run at the partner**
- **Document test parameters**
- **Compare the partner-generated data to data generated at the the recipient test facility**

Task 2.3 Server & Test Plan Finalization

The goal of this task is for the partner and recipient to use the information obtained in Tasks 2.1 and 2.2 to decide on one or multiple server platform(s) and fan size(s) to target which is mutually beneficial to both parties. The test validation method will be finalized, and a Detailed Server Test Plan for comparative power consumption monitoring will be written.

The Partner shall:

- **Provide multiple samples of targeted fan size (or a means for the recipient to purchase them)**

The Recipient shall:

- **Obtain fan samples as necessary**
- **Produce Baseline Cooling Data Report**
- **Produce Detailed Server Test Plan specifying**
 - **Test settings (conditions of test room)**
 - **Apparatus**
 - **Parameters monitored**
 - **Manner of power monitoring of fans independently of the entire server**

Products:

- Conventional Fans Report (no draft)
- Detailed Server Test Plan Report (no draft)

TASK 3 ITERATE CFD & MESHING PARAMETERS TO ESTABLISH SIMULATION SET-UP

The goal of this task is for the recipient to work with the parameters and meshing densities in ACUSIM software to establish a simulation set-up which produces a good performance approximation **for a computer cooling fan** for the conventional fan

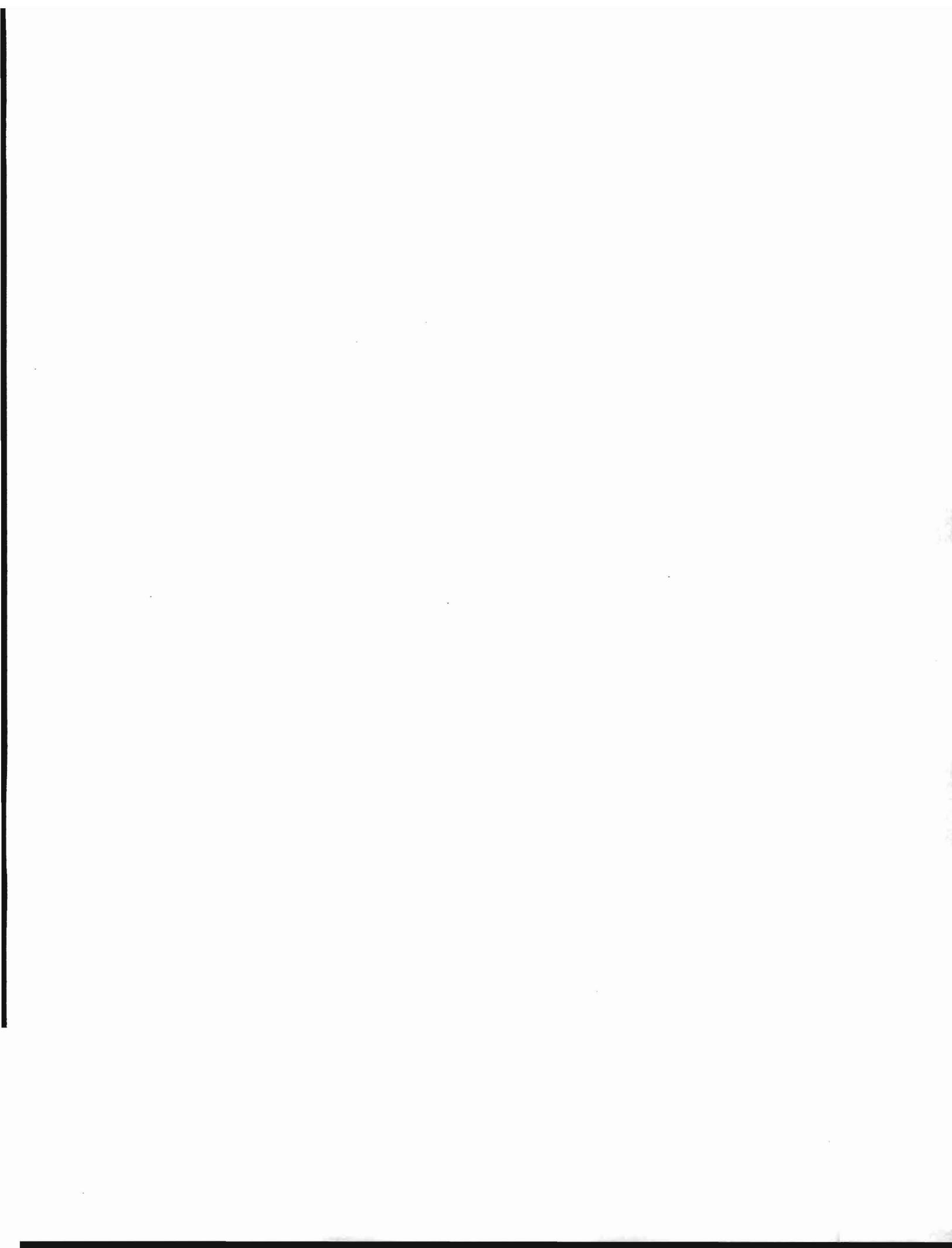


Exhibit A WORK STATEMENT

1 ~~currently in the server.~~ The ideal results will show good correlation between
2 experimental and simulation throughout several designs so that the simulations can be
3 used in Task 4 to design and improve upon the recipient's designs.
4

5 **The Recipient shall:**

- 6 • Obtain a Computer Aided Design (CAD) file for the conventional fan from
7 Partner if available
- 8 • If not available, the recipient will use Subcontractor Scansite to reverse
9 engineer the conventional fan geometry
- 10 • Work up an initial mesh and decide upon initial parameter values to run a
11 first simulation
- 12 • **Run airflow tests as necessary for correlation**
- 13 • Iterate upon initial simulation parameters
 - 14 ○ Mesh size & shape
 - 15 ○ Mesh density in different regions
 - 16 ○ Sliding mesh v. fixed reference frame
 - 17 ○ Time step
 - 18 ○ Boundary layer resolution
- 19 • Prepare report detailing computation fluid dynamics (CFD) Simulation of
20 Conventional IT Fan Set-Up
21

22 **Products:**

- 23 • Computation Fluid Dynamics Report (no draft)
24

25 **TASK 4 FAN DESIGN PROCESS**

26
27 The goal of this task is for the recipient to design a fan that uses PAX Geometries to
28 produce a more efficient air moving device in the specified server. The process will be
29 iterative beginning with an initial design, which is then optimized using CFD simulations,
30 **the recipient parameters optimizer**, prototyping, airflow testing, and analysis. This
31 task is complete when the recipient is satisfied that their design is optimized for the
32 server and motor provided and the design surpasses the conventional blade design by
33 at least 15% in airflow tests.

34 **The Recipient shall:**

- 35 • **Analyze current data available**
- 36 • **Optimize computer simulations to assist in fan design**
- 37 • **Run airflow tests as necessary for correlation**
- 38 • **Prepare Report Detailing the recipient's Optimized Fan Parameters**
39 **for Cooling Fans**
- 40 • Create initial design for fan blade & stator frame
- 41 • Use simulation set-up determined in Task 3 to simulate the initial design's
42 performance



**Exhibit A
WORK STATEMENT**

- 1 • Analyze results from simulation **and optimizer** to improve initial design in
- 2 CAD
- 3 • Periodically **produce** prototypes using selective laser sintering (SLS) rapid
- 4 prototyping in duraformGF material (either in-house or outsourced to
- 5 Harvest Technologies)
- 6 • Airflow test SLS prototypes for simulation confirmation
- 7 • Iterate upon initial design using CFD and experimental results to improve
- 8 efficiency
- 9 • Once high efficiency geometry is created, optimize design to match the
- 10 selected server and motor torque range
- 11 • Participate in a CPR as per Task 1.2
- 12 • Prepare report Summarizing Airflow Data on Finalized PAX Design
- 13

Products:

- 15 • **Optimized Fan Parameters Report (no draft)**
- 16 • Finalized PAX Design Report (no draft)
- 17

TASK 5 PREPARE SAMPLES & AIRFLOW CORRELATION

Task 5.1 Machine PAX Fans

21 The goal of this task is for the recipient to create **multiple** robust samples of the

22 recipient's fan units in plastic that will be tested inside the server at high temperatures

23 according to the Detailed Server Test Plan. These samples will ~~probably~~ be **created at**

24 **a subcontractor machine shop and/or prototype facility**, ~~machined by Subcontractor~~

25 ~~OMW Corp. on a 3-axis Computer Numerically Controlled (CNC) machine.~~

26

27

The Recipient shall:

- 29 • Work with Subcontractor to get the appropriate samples made
- 30 • Measure samples to ensure adherence to original design & PAX
- 31 geometries
- 32 • ~~Dyno test samples intermixed with SLS prototypes to make certain~~
- 33 ~~performance goals are reached~~
- 34

Task 5.2 Integrate Motors into Samples

36 The goal of this task is for the recipient to create freestanding (not needing a dyno to

37 test) samples of their fan design by integrating the machined samples with 3rd party

38 motors, taken from the conventional fans currently in the unit. This work will be

39 completed by Subcontractor **OMW Corp** ~~Interwise LLC.~~

40

41

The Partner shall:



**Exhibit A
WORK STATEMENT**

- **Provide motor samples to be used with the fans (or a means to purchase them)**

The Recipient shall:

- Pretest 3rd party motors to ensure +/-35% on performance parameters
- Work with Subcontractor to isolate motors from conventional fans
- Commission Subcontractor to assemble motors into samples
- Power-up samples created by subcontractor to ensure motor was not damaged during isolation & assembly process

Task 5.3 Final Airflow Testing of Samples & Verification

The goal of this task is for the recipient to take the functional samples created in Task 5.2 and generate airflow test data for them, giving an approximation of the results that will come from the Comparative Power Consumption Monitoring (Task 6). ~~These tests will be run in both the recipient's and the partner's laboratories for cross-site verification.~~

~~The Partner shall:~~

- ~~• Test functional samples in fan-alone test for airflow performance~~
- ~~• Test functional samples in fan-alone test for thermal performance~~
- ~~• Test functional samples in server for power comparison for matched flow (if possible)~~

The Recipient shall:

- Test functional samples in fan-alone test for performance
- Test functional samples in server for power comparison for matched flow
- Oversee airflow tests at Partner facility to ensure similar test set-up
- Compare results from two facilities to make sure samples are performing properly
- Prepare report summarizing airflow data comparison for functional samples

Products:

- Functional Samples Report (no draft)

TASK 6 COMPARATIVE POWER CONSUMPTION MONITORING & ANALYSIS

The goal of this task is for Partner to install the recipient functional samples in one server and the conventional fans in another server and complete the Detailed Server



**Exhibit A
WORK STATEMENT**

1 Test Plan agreed upon in Task 2. The recipient will work with Partner to manipulate the
2 raw data collected into usable tables and graphs which show a comparison on energy
3 usage between the recipient's fan designs and conventional fan designs. This data will
4 also be compared with the airflow-based power approximations created in Task 5. After
5 the data has been analyzed, the recipient suggests the results be presented at a CPR.

6
7 **The Partner shall:**

- 8 • Test functional samples installed in server according to test plan
- 9 • Provide the recipient with frequent (~~daily~~) updates on all raw data **(if recipient not present for test)**.
- 10 • Participate in a CPR as per Task 1.2

11
12
13 **The Recipient shall:**

- 14 • Observe & assist Partner set-up & test runs at Partner facility
- 15 • Analyze data provided by Partner
- 16 • Prepare comprehensive comparison for initial power consumption
17 monitoring report

18
19 **Products:**

- 20 • Power Consumption Monitoring Report (no draft)

21
22
23 **TASK 7 ADDITIONAL POWER CONSUMPTION MONITORING TESTS (AS NEEDED)**

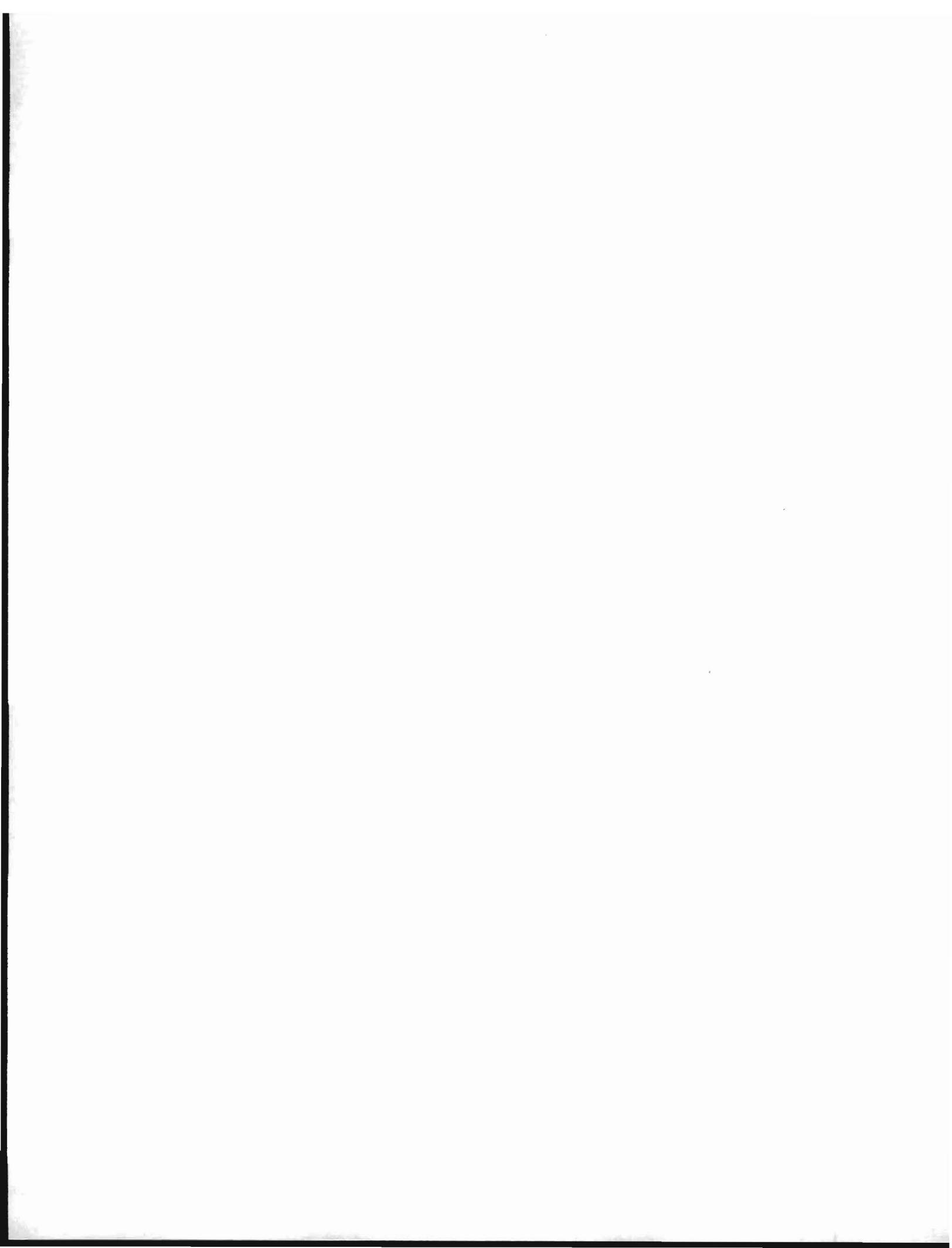
24
25 The goal of this task is for Partner to run any additional variations to the initial tests or
26 rerun any tests where the original test plan was not sufficient, as determined by the
27 recipient or at the CPR. Depending on results from Task 6, and if the desired 15%
28 power drop has not been demonstrated, the recipient may repeat Tasks 4-6 in order to
29 further optimize the blade with the new information the recipient gained from the initial
30 test run. **Additionally, if 15% drop is achieved, the recipient may work, either in
31 series or parallel, Tasks 4-6 again with a different target fan/server platform.**

32
33 **The Partner shall:**

- 34 • Run additional Comparative Power Consumption Monitoring Tests as
35 needed
- 36 • Provide the recipient with any data and comparison which results from
37 additional testing

38
39 **The Recipient shall:**

- 40 • Suggest further testing where appropriate
- 41 • Complete redesigns and samples as necessary



**Exhibit A
WORK STATEMENT**

- Prepare a comprehensive comparison for further power consumption monitoring report (if Needed)

Products:

- Further Power Consumption Monitoring Report (if Needed) (no draft)

TASK 8 TECHNOLOGY TRANSFER ACTIVITIES

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

The Recipient shall:

- Prepare a Technology Transfer Plan. The plan shall explain how the knowledge gained in this project will be made available to the public. The level of detail expected is least for research-related projects and highest for demonstration projects. Key elements from this report shall be included in the Final Report for this project.
- Conduct technology transfer activities in accordance with the Technology Transfer Plan. These activities shall be reported in the Monthly Progress Reports.

Products:

- Draft Technology Transfer Plan
- Final Technology Transfer Plan

TASK 9 PRODUCTION READINESS PLAN

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

The Recipient shall:

- Prepare a Production Readiness Plan. The degree of detail in the Production Readiness Plan discussion should be proportional to the complexity of producing or commercializing the proposed product and its state of development. The plan shall include, as appropriate, but not be limited to:
 - Identification of critical production processes, equipment, facilities, personnel resources, and support systems that will be needed to produce a commercially viable product.
 - Internal manufacturing facilities, as well as supplier technologies, capacity constraints imposed by the design under consideration, identification of design critical elements and the use of hazardous

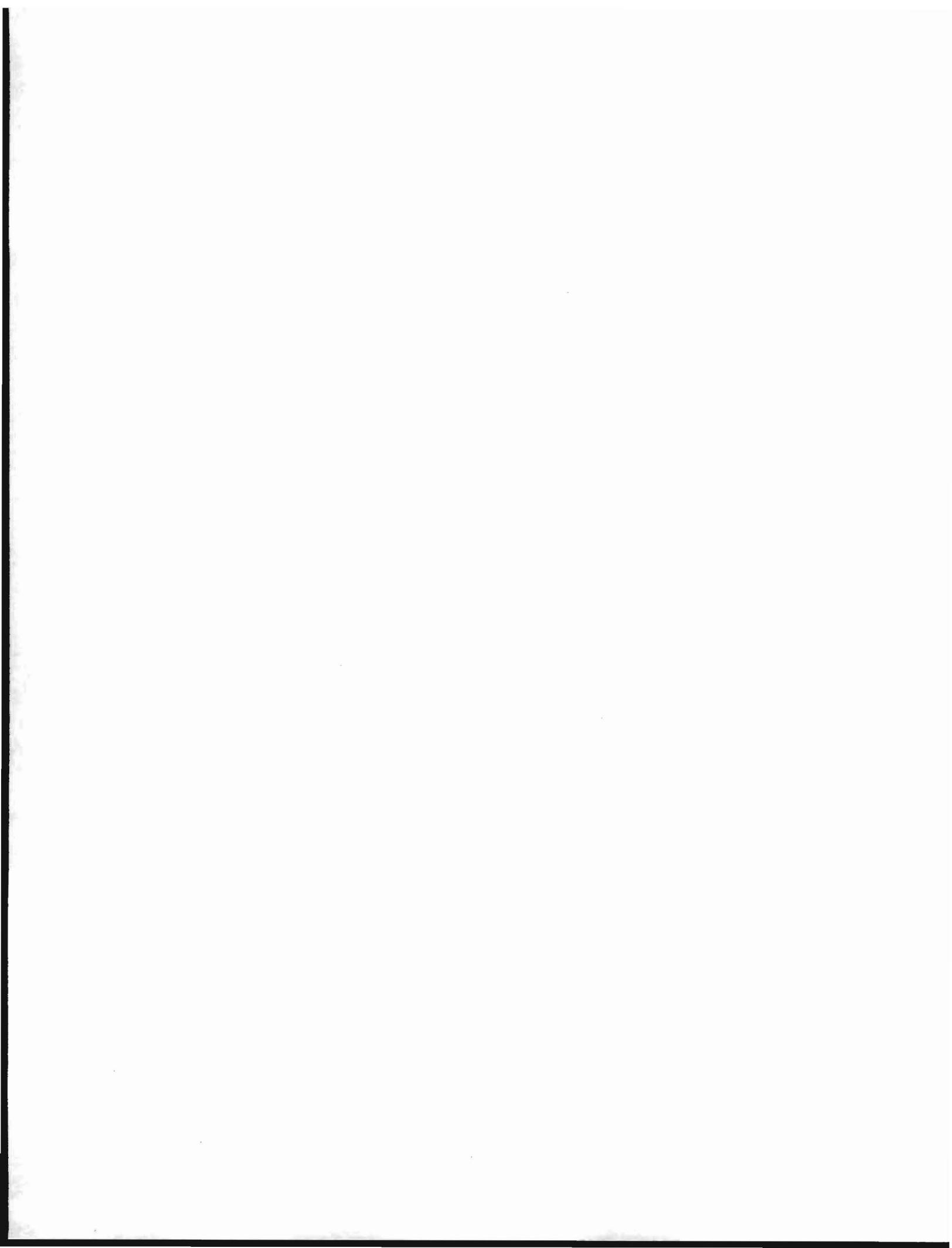


Exhibit A
WORK STATEMENT

- 1 or non-recyclable materials. The product manufacturing effort may
2 include “proof of production processes.”
3 ○ A projected “should cost” for the product when in production.
4 ○ The expected investment threshold to launch the commercial
5 product.
6 ○ An implementation plan to ramp up to full production.
7
8 **Products:**
9 • Draft Production Readiness Plan
10 • Final Production Readiness Plan

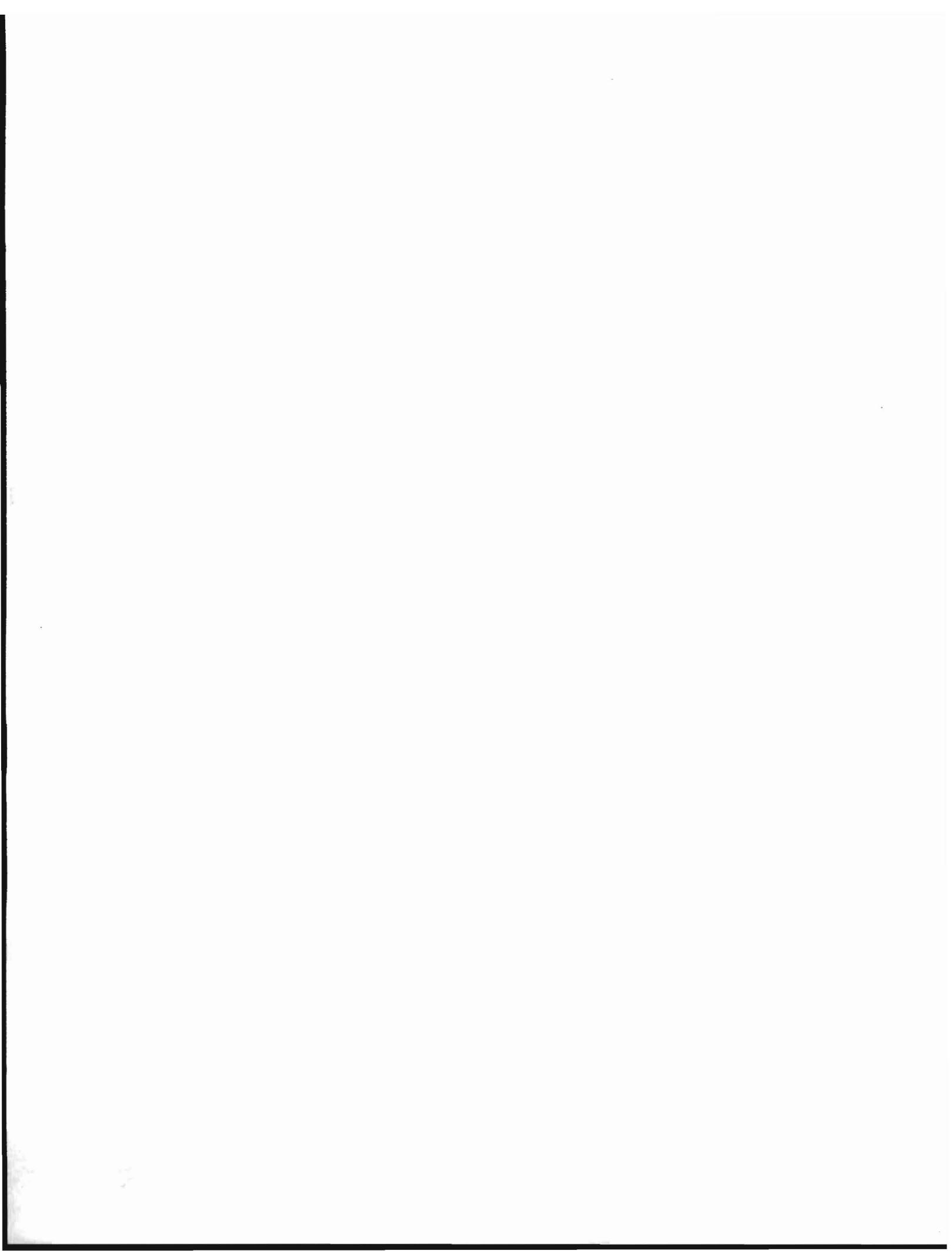


Exhibit A
Attachment A-1
Schedule of Products and Due Dates

Task Number	Task Name	Product(s)	Planned Start Date	Due Date	
1.1	Attend Kick-off Meeting		<u>5/2/2011</u>	<u>7/29/2011</u>	
		Updated Schedule of Products	<u>5/2/2011</u>	<u>7/29/2011</u>	
		Updated List of Match Funds	<u>5/2/2011</u>	<u>7/29/2011</u>	
		Updated List of Permits	<u>5/2/2011</u>	<u>7/29/2011</u>	
		Kick-Off Meeting Agenda (CEC)	<u>5/2/2011</u>	<u>7/29/2011</u>	
1.2	Critical Project Review Meetings		<u>TBD</u>	<u>TBD</u>	
		CPR Report	<u>TBD</u>	<u>TBD</u>	
		1st CPR Meeting	Agenda and a list of expected participants (CEC)	<u>TBD</u>	<u>TBD</u>
			Schedule for written determination (CEC)	<u>TBD</u>	<u>TBD</u>
			Written determination (CEC)	<u>TBD</u>	<u>TBD</u>
			CPR Report	<u>TBD</u>	<u>TBD</u>
		2nd CPR Meeting	Agenda and a list of expected participants (CEC)	<u>TBD</u>	<u>TBD</u>
			Schedule for written determination (CEC)	<u>TBD</u>	<u>TBD</u>
			Written determination (CEC)	<u>TBD</u>	<u>TBD</u>
1.3	Final Meeting		<u>5/15/2014</u>	<u>6/13/2014</u>	
		Written documentation of meeting agreements	<u>5/15/2014</u>	<u>6/13/2014</u>	
		Schedule for completing closeout activities	<u>5/15/2014</u>	<u>6/13/2014</u>	
1.4	Monthly Progress Reports		<u>3/1/2011</u>	<u>3/3/2014</u>	
		Monthly Progress Reports	Upon full execution of agreement	The 10th of each month during the approved term of this Agreement	
1.5	Final Report		<u>2/17/2014</u>	<u>2/28/2014</u>	
		Draft Outline of the Final Report	<u>2/17/2014</u>	<u>2/28/2014</u>	
		Final Outline of the Final Report	<u>2/28/2014</u>	<u>3/17/2014</u>	
		Draft Final Report	<u>3/17/2014</u>	<u>4/17/2014</u>	
		Final Report	<u>4/17/2014</u>	<u>5/15/2014</u>	
1.6	Identify and Obtain Match Funds		<u>5/3/2011</u>	<u>7/29/2011</u>	
		A letter regarding match funds or stating that no match funds are provided	<u>5/3/2011</u>	<u>7/29/2011</u>	
		Copy(ies) of each match fund commitment letter(s) (if applicable)	<u>5/3/2011</u>	<u>7/29/2011</u>	
		Letter(s) for new match funds (if applicable)	<u>N/A</u>	<u>N/A</u>	
		Letter that match funds were reduced (if applicable)	<u>N/A</u>	<u>N/A</u>	
1.7	Identify and Obtain Required Permits		<u>5/3/2011</u>	<u>7/29/2011</u>	
		Letter documenting the permits or stating that no permits are required	<u>5/3/2011</u>	<u>7/29/2011</u>	
		A copy of each approved permit (if applicable)	<u>N/A</u>	<u>N/A</u>	
		Updated list of permits as they change during the term of the Agreement (if applicable)	<u>N/A</u>	<u>N/A</u>	

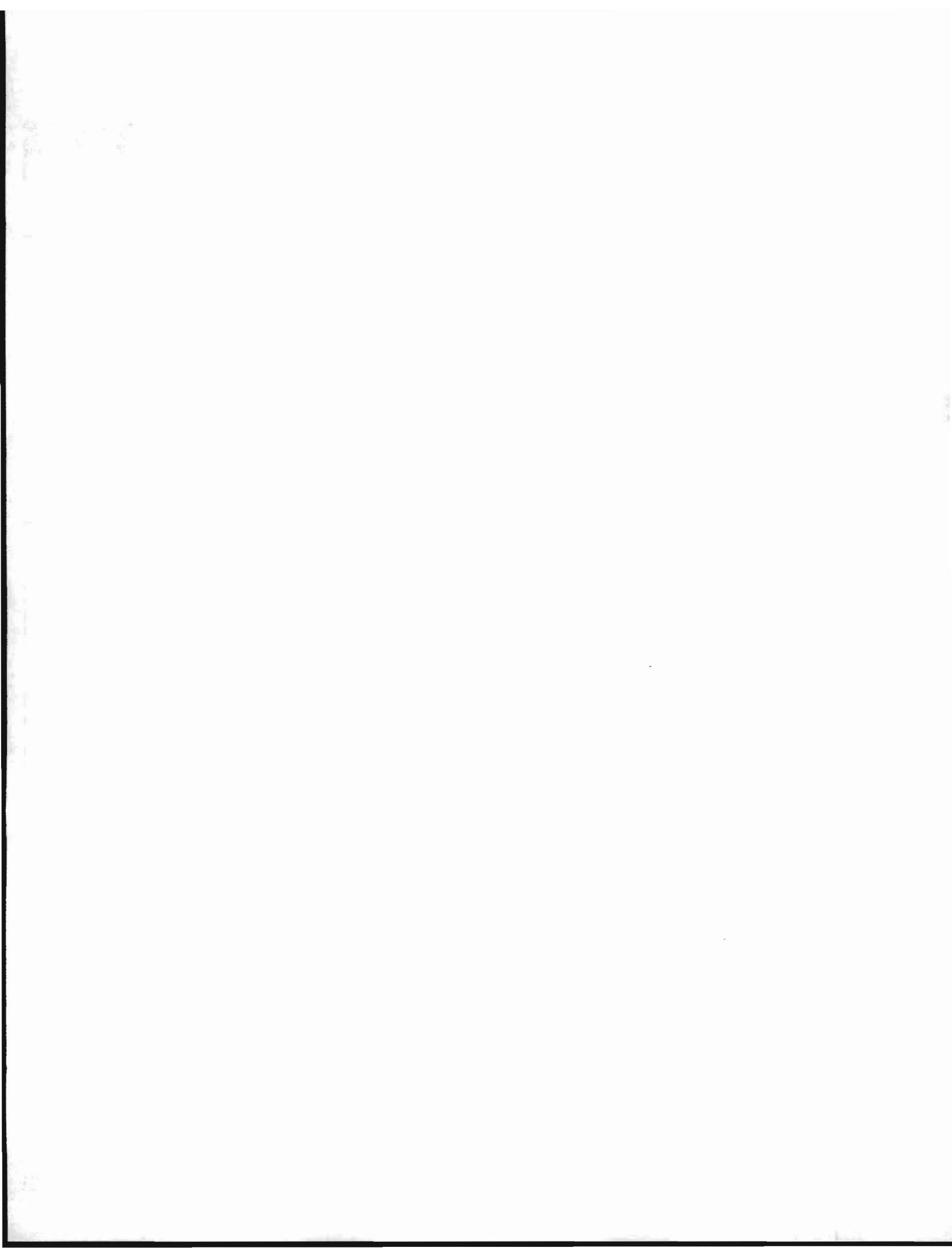


Exhibit A
Attachment A-1
Schedule of Products and Due Dates

	Updated schedule for acquiring permits as changes occur during the term of the Agreement (if applicable)	<u>N/A</u>	<u>N/A</u>
2	SERVER SELECTION & BASELINE	<u>11/1/2011</u>	<u>5/28/2012</u>
2.1	Fan Alone Baseline	<u>11/1/2011</u>	<u>3/30/2012</u>
2.2	Server & Test Platform Finalization Test Plan Discussion & Validation	<u>11/1/2011</u>	<u>3/30/2012</u>
2.3	Server & Test Plan Finalization	<u>12/1/2011</u>	<u>5/28/2012</u>
	Conventional Fans Report (no draft)	<u>12/1/2011</u>	<u>5/28/2012</u>
	Detailed Server Test Plan Report (no draft)	<u>12/1/2011</u>	<u>5/28/2012</u>
3	ITERATE CFD & MESHING PARAMETERS TO ESTABLISH SIMULATION SET-UP	<u>1/2/2012</u>	<u>6/29/2012</u>
	Computation Fluid Dynamics Report (no draft)	<u>1/2/2012</u>	<u>6/29/2012</u>
4	FAN DESIGN PROCESS	<u>7/2/2012</u>	<u>10/31/2012</u>
	Optimized Fan Parameters Report (no draft)	<u>7/2/2012</u>	<u>10/31/2012</u>
	Finalized PAX Design Report (no draft)	<u>7/2/2012</u>	<u>10/31/2012</u>
5	PREPARE SAMPLES & AIRFLOW CORRELATION	<u>11/1/2012</u>	<u>1/30/2013</u>
5.1	Machine PAX Fans	<u>11/1/2012</u>	<u>12/28/2012</u>
5.2	Integrate Motors into Samples	<u>11/1/2012</u>	<u>1/30/2013</u>
5.3	Final Airflow Testing of Samples & Verification		
	Functional Samples Report (no draft)	<u>11/16/2012</u>	<u>1/30/2013</u>
6	COMPARATIVE POWER CONSUMPTION MONITORING & ANALYSIS	<u>2/1/2013</u>	<u>6/28/2013</u>
	Power Consumption Monitoring Report (no draft)	<u>2/1/2013</u>	<u>6/28/2013</u>
7	ADDITIONAL POWER CONSUMPTION MONITORING TESTS (AS NEEDED)	<u>3/1/2013</u>	<u>7/29/2013</u>
	Further Power Consumption Monitoring Report (if Needed) (no draft)	<u>3/1/2013</u>	<u>7/29/2013</u>
8	TECHNOLOGY TRANSFER ACTIVITIES	<u>7/29/2013</u>	<u>10/28/2013</u>
	Draft Technology Transfer Plan	<u>7/29/2013</u>	<u>10/28/2013</u>
	Final Technology Transfer Plan	<u>10/28/2013</u>	<u>11/15/2013</u>
9	PRODUCTION READINESS PLAN	<u>11/15/2013</u>	<u>6/28/2013</u>
	Draft Production Readiness Plan	<u>11/15/2013</u>	<u>1/15/2014</u>
	Final Production Readiness Plan	<u>1/15/2014</u>	<u>2/17/2014</u>

EXHIBIT A, ATTACHMENT A-3 RESUMES

Kimberly Penney **Senior Design Engineer, PAX Scientific, Inc.**

Kimberly Penney uses her background in aerospace engineering to lead the fan design team at PAX Scientific, Inc. Her innovative use of the PAX Streamlining Principle in fan designs has led to several rotor-specific design patents. Her fan design work has been shown to produce a significant drop in noise and increase in efficiency across several industries including, but not limited to, refrigeration, consumer products, information technology, and air conditioning.

In addition to her design work and CAD, Kimberly runs a state-of-the-art fan test laboratory as well. Under her direction, the PAX lab consists of two nozzle-type flowmeters, two fan drive dynamometers, and an anechoic chamber, along with other test equipment, all of which is calibrated regularly to produce precision results used to validate her team's design and simulation work.

Kimberly keeps current on new advances in fan research by attending conferences and professional workshops including those hosted by AMCA (Air Movement and Control Association International, Inc) and the Fan Noise conference in Lyon, France.

Kimberly also pursues her passion for biomimicry and engineering by speaking at high school career days and women in math and science workshops to educate others about this emerging field.

Prior to joining the PAX Scientific team, Kimberly worked at Autodesk and the Wireless Media Lab at UCLA.

Education and Training

University of California, Los Angeles
Bachelor of Science, Aerospace Engineering, 2003

Patents

U.S. Patent No. D585,130: Rotor
U.S. Patent No. D570,999: Rotor
U.S. Patent No. D570,996: Rotor
Others Pending

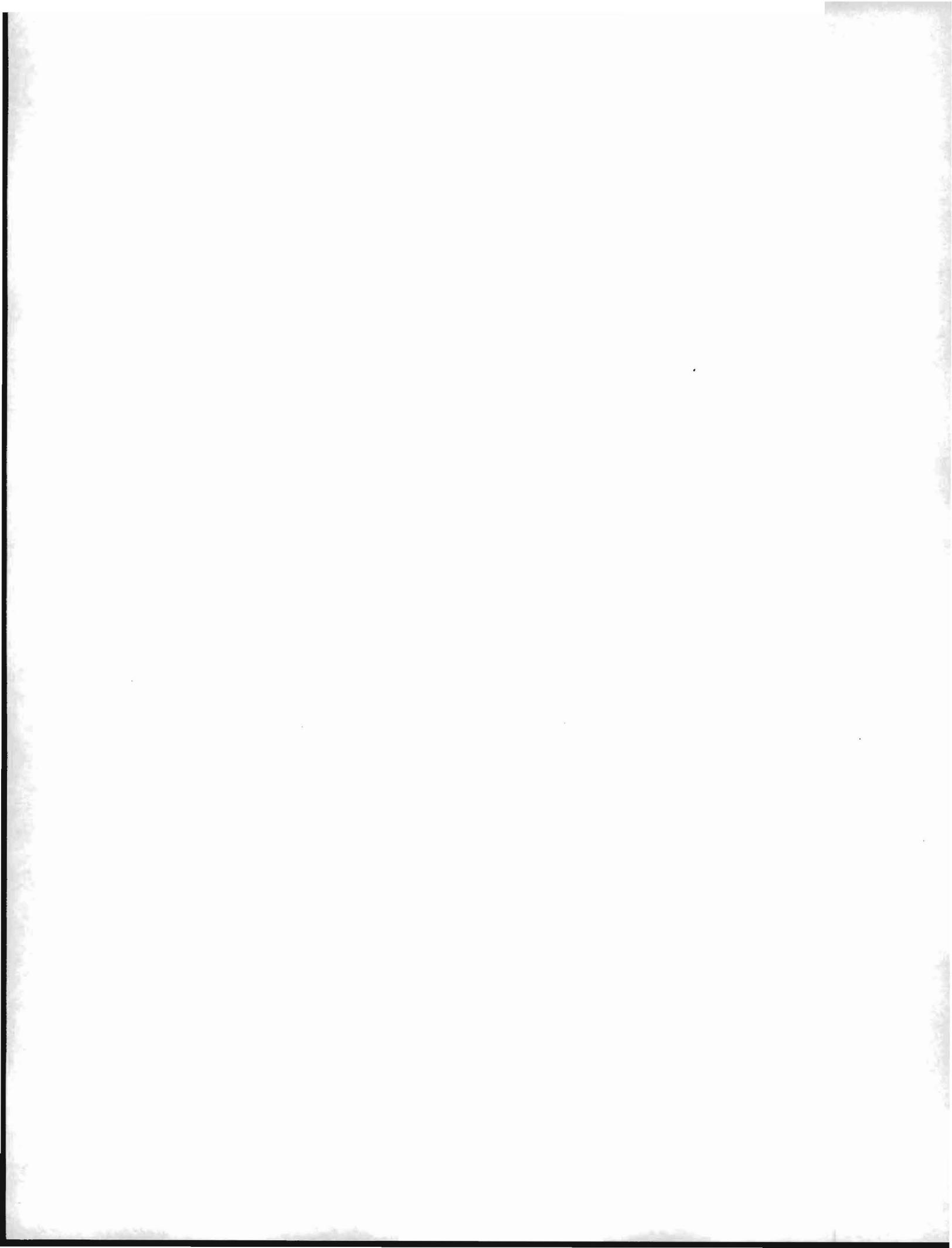


EXHIBIT A, ATTACHMENT A-3 RESUMES

Robin Giguere Process Scientist

Dr. Robin Giguere has expertise in the areas of mixing, multiphase flow, CFD simulation and high performance computation. Since he joined PAX in 2008, Dr. Giguere leads the R&D effort on the parametric design and optimization of impellers for large water storage tank. He has also executed large-scale numerical simulations of fans. He designs and executes CFD models on multiprocessor clusters to predict performance of new impeller design and also conducts experimental validation in a laboratory scale facility.

Before coming to PAX Scientific, he worked with URPEI group at École Polytechnique de Montréal, where he performed research for Total Petrochemicals in Belgium and Atofina in France. He took part in the development of a CFD software and conduct projects on modeling chemical reactors and twin-screw extruders. He worked extensively on image reconstruction techniques for electrical resistance tomography to visualize flow in pipes. He also worked for Petro-Canada's Montréal refinery, developing computer solutions for gasoline blending and assessing mixing tank technologies.

Education and training

Ecole Polytechnique de Montreal, Canada
Bachelor of Chemical Engineering, 2002
Master of Applied Science, 2004
PhD, Chemical Engineering, 2008

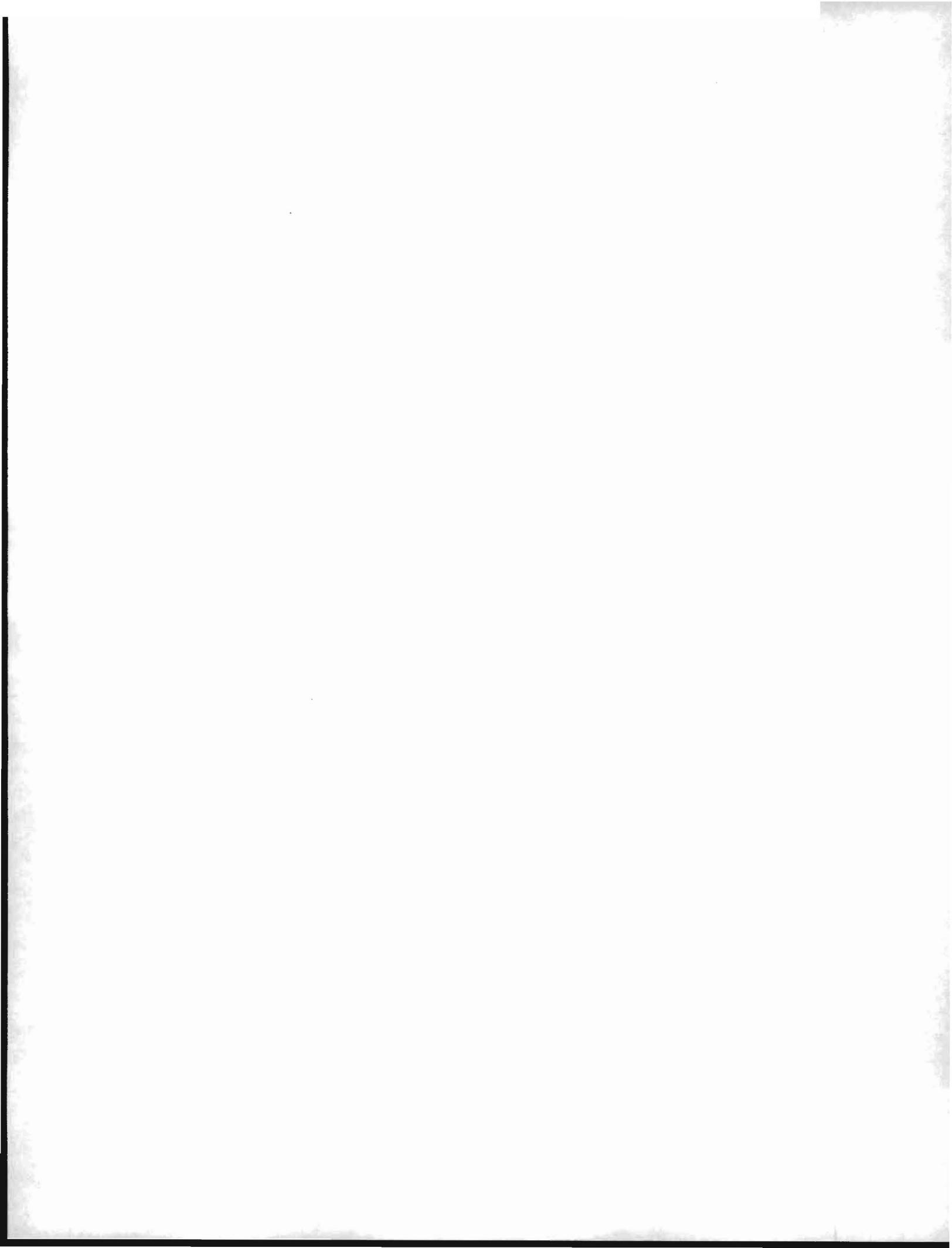


EXHIBIT A, ATTACHMENT A-3 RESUMES

Shadi Mahjoob Principal Scientist

Dr. Shadi Mahjoob has received awards for research in the fields of Aerospace and Mechanical Engineering in the U.S. and abroad. Her deep academic qualifications in both Aerodynamics and Mechanical Engineering are combined with strong skills in experimentation, analysis, programming languages and computational fluid dynamics. In her position as Principal Scientist for PAX Scientific, she is involved with all aspects of design and testing of fans, stators, and housings, from experimental and computational testing on airflow and acoustics to the design and implementation of fan optimization and other software.

Prior to joining PAX Scientific, she acted as a research scientist with the Nano and Micro-Fluidics Institute-Center of Smart Interface at the Institute of Technical Thermodynamics located at the Darmstadt University of Technology in Germany, where she conducted experimental and simulated testing on micro-fluidics. She also worked for four years at the Heat and Mass Transfer Laboratory in the Mechanical Engineering Department of the University of California, Riverside, where she led a variety of analytical projects including modeling for production of an isothermal surface for biological and electronics cooling applications and investigated design, optimization and transport phenomena utilizing computational fluid dynamics and transient flow investigation. These experiences combine to provide an outstanding background for her research and design work at PAX Scientific.

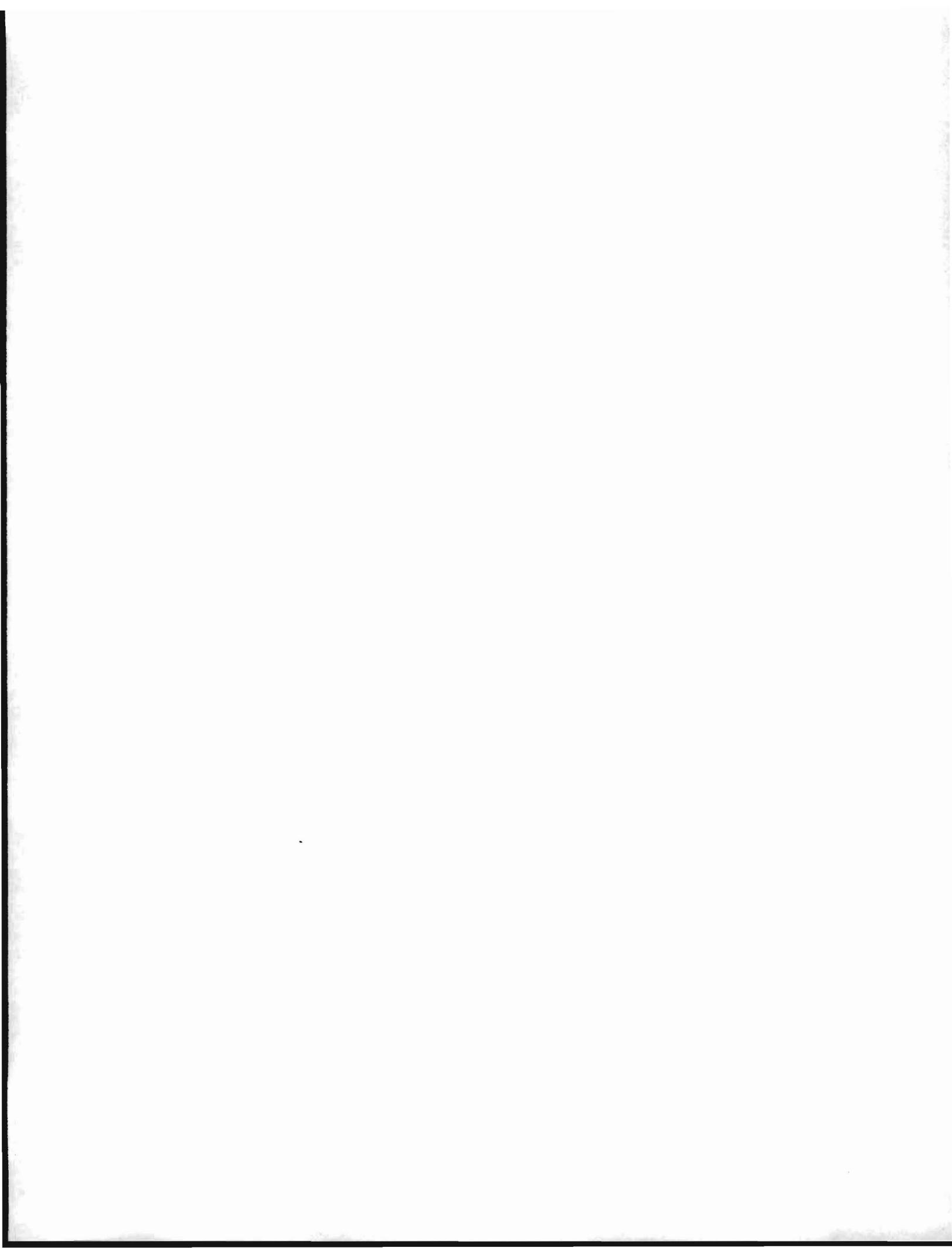
Education and Training

University of California Riverside, CA
PhD, Mechanical Engineering, 2008

Amirkabir University of Technology (Tehran Polytechnic), Iran
MS Aerospace Engineering-Aerodynamic, 2000
BS Aerospace Engineering, 1998

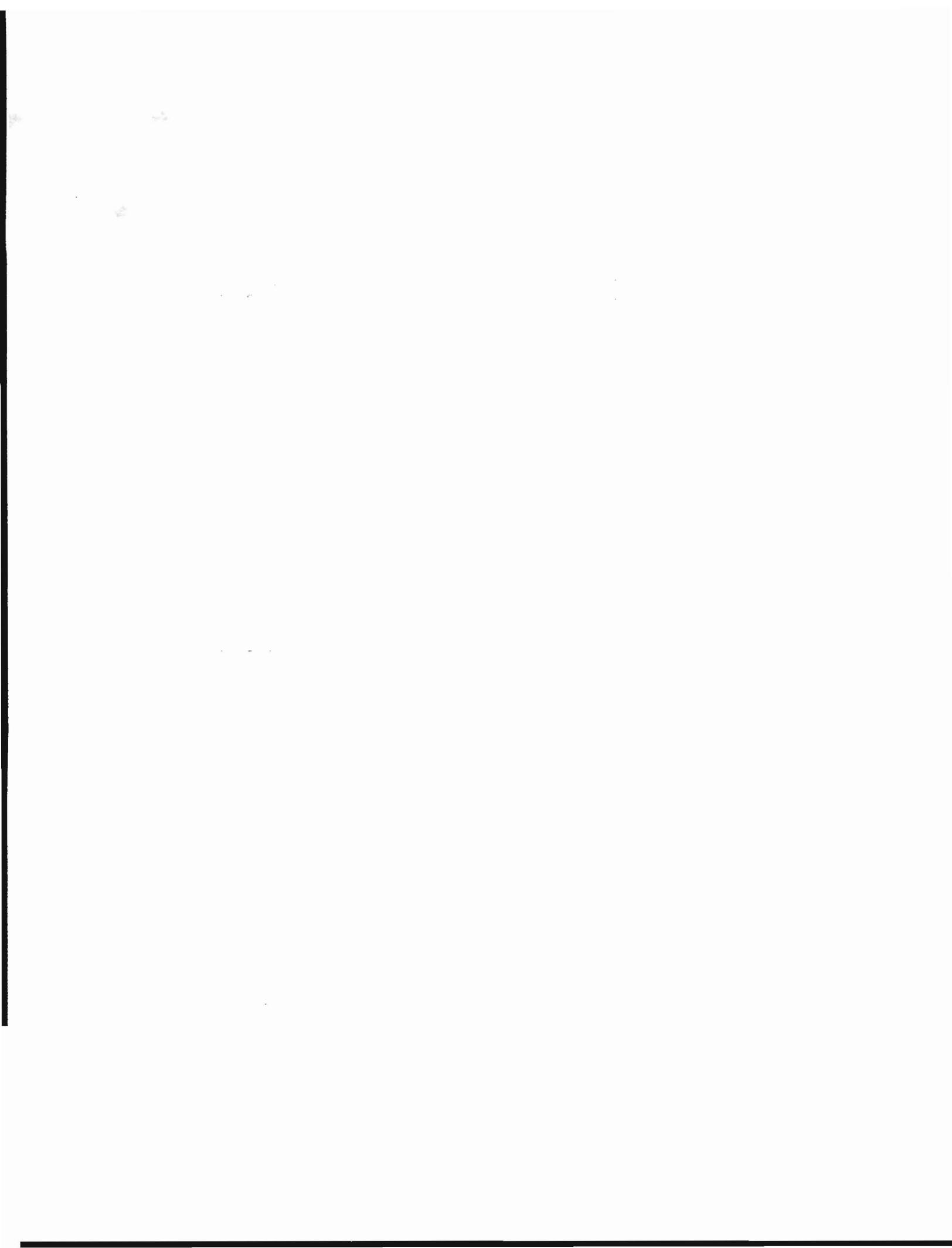
Patents

US Patent Application 20090226971: Portable Rapid Microfluidic Thermal Cycler for Extremely Fast Nucleic Acid Amplification



**Exhibit B
Category Budget**

Budget Category Item	PIER Share (\$)	Match Share (\$)	Total Cost (\$)
Personnel:			
Direct Labor	\$ <u>89,973</u>	\$ <u>29,992</u>	\$ <u>119,965</u>
Fringe Benefits	\$ <u>26,986</u>	\$ <u>8,995</u>	\$ <u>35,981</u>
Total Personal Services	\$ <u>116,959</u>	\$ <u>38,987</u>	\$ <u>155,946</u>
Operating Expenses:			
Travel	\$ <u>1,544</u>	\$ <u>594</u>	\$ <u>2,138</u>
Equipment	\$ -	\$ -	\$ -
Materials/Supplies	\$ <u>29,800</u>	\$ -	\$ <u>29,800</u>
Contractual	\$ <u>101,475</u>	\$ -	\$ <u>101,475</u>
Miscellaneous	\$ -	\$ <u>43,950</u>	\$ <u>43,950</u>
Total Operating Expenses	\$ <u>132,819</u>	\$ <u>44,544</u>	\$ <u>177,363</u>
Overhead:			
Overhead	\$ <u>37,979</u>	\$ <u>12,657</u>	\$ <u>50,635</u>
Total Overhead	\$ <u>37,979</u>	\$ <u>12,657</u>	\$ <u>50,635</u>
Total	\$ <u>287,757</u>	\$ <u>96,188</u>	\$ <u>383,944</u>



**Exhibit B
Budget Details**

Direct Labor, Unloaded Hourly Rates

Title / Job Classification	Maximum Rate to be Billed* (\$ / Hr)	Number of Hours	PIER Share	Match Share	Total Cost
Francesca Bertone/ Project Manager	\$ 88.53	311	\$ 20,650	\$ 6,883	\$ 27,533
Kim Penney/Lead Fan Design Engineer & Team Lead	\$ 49.76	1,230	\$ 45,905	\$ 15,302	\$ 61,207
Robin Giguere/Computational Fluid Dynamicist	\$ 45.67	92	\$ 3,163	\$ 1,055	\$ 4,218
Shadi Majoob/Theoretical Aerodynamicist	\$ 50.48	535	\$ 20,255	\$ 6,752	\$ 27,007
Total Direct Labor			\$ 89,973	\$ 29,992	\$ 119,965

* Maximum salary rates are caps: PIER will not reimburse at a higher rate over the term of the project.

Fringe Benefits

Title / Job Classification	Maximum % Rate to be Billed*	Base (typically Total Direct Labor)	PIER Share	Match Share	Total Cost
Francesca Bertone/ Project Manager	30%	\$ 27,533.00	\$ 6,195	\$ 2,065	\$ 8,260
Kim Penney/Lead Fan Design Engineer & Team Lead	30%	\$ 61,207.00	\$ 13,772	\$ 4,591	\$ 18,363
Robin Giguere/Computational Fluid Dynamicist	30%	\$ 4,218.00	\$ 949	\$ 316	\$ 1,265
Shadi Majoob/Theoretical Aerodynamicist	30%	\$ 27,007.00	\$ 6,070	\$ 2,023	\$ 8,093
Total Fringe Benefits			\$ 26,986	\$ 8,995	\$ 35,981

* Maximum fringe benefit rates are caps: PIER will not reimburse at a higher rate over the term of the project.

Travel**

Location	Purpose	Number of Trips	People per Trip	PIER Share*	Match Share	Total Cost
Jabil Circuits/Cisco Labs	Validation Testing	18	2	\$ 1,350	\$ 450	\$ 1,800
TBD	Additional Validation Testing	2	2	\$ 194	\$ 144	\$ 338
Total Travel				\$ 1,544	\$ 594	\$ 2,138

* PIER Share: Travel is reimbursed at State rates. Higher travel costs can count as Match Share.

** Trips listed as "to be determined (TBD)" require advanced written approval from Commission Project Manager.



**Exhibit B
Budget Details**

Equipment

Item	Quantity	Unit Cost	PIER Share	Match Share	Total Cost
		\$ -	\$ -	\$ -	\$ -
Total Equipment			\$ -	\$ -	\$ -

Materials, Supplies

Item	Quantity	Unit Cost	PIER Share	Match Share	Total Cost
<u>Sample fans</u>			\$ 3,600	\$ -	\$ 3,600
<u>Prototype material (for in-house prototypes), bearings, etc.</u>			\$ 24,400	\$ -	\$ 24,400
<u>Motors</u>	12	\$ 150.00	\$ 1,800	\$ -	\$ 1,800
Total Materials and Supplies			\$ 29,800	\$ -	\$ 29,800

Contractual

Subcontractor Name	Purpose	PIER Share	Match Share	Total Cost
Harvest	3rd party SLS prototype build	\$ 23,400	\$ -	\$ 23,400
OMW, Intersize, Electronic Balancing	3rd party machined prototype build, machine & balancing	\$ 17,550	\$ -	\$ 17,550
Bruce Webster	CFD contractor (807 hours @ \$75.00)	\$ 60,525	\$ -	\$ 60,525
Total Contractual		\$ 101,475	\$ -	\$ 101,475

Miscellaneous

Item	Purpose	PIER Share	Match Share	Total Cost
<u>Computation Time</u>	<u>Cluster use for CFD computations - in house server</u>	\$ -	\$ 43,950	\$ 43,950
Total Miscellaneous		\$ -	\$ 43,950	\$ 43,950

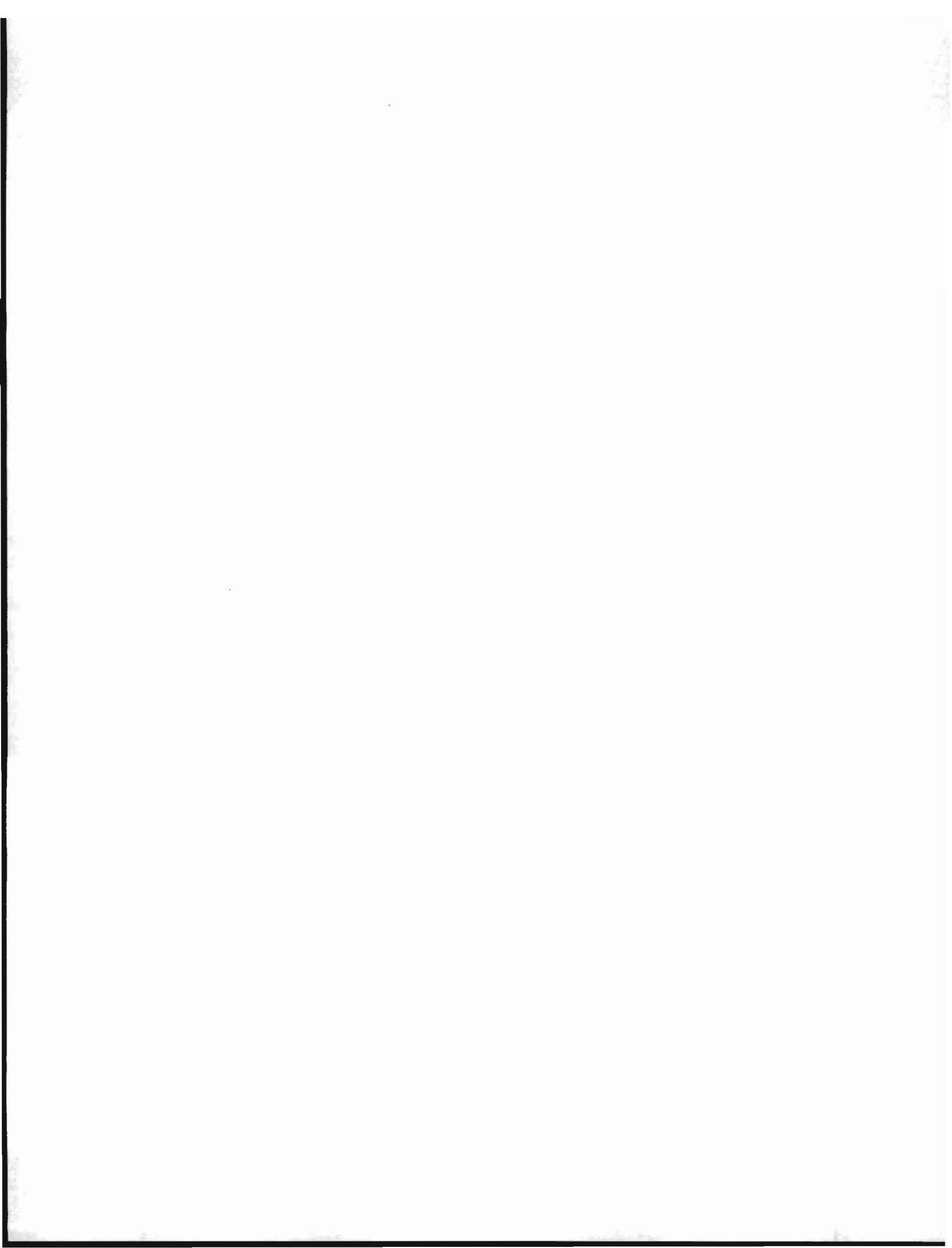
**Exhibit B
Budget Details**

Overhead

Name of Overhead	Overhead Base*	Maximum % Rate to be Billed**	Base Cost	PIER Share	Match Share	Total Cost
FTE Overhead	Direct Labor	36%	\$ 119,965.00	\$ 32,391	\$ 10,794	\$ 43,185
Materials Overhead	Materials	25%	\$ 29,800.00	\$ 5,588	\$ 1,863	\$ 7,450
Total Overhead				\$ 37,979	\$ 12,657	\$ 50,635

* Base: Define cost categories used to charge Overhead rate, e.g., Total Labor, Total Direct Cost, Materials, Subcontracts, etc.

** Maximum Indirect Overhead rates are caps: PIER will not reimburse at higher rates over the term of the project.



**Exhibit B
Budget Summary**

Task #	Task Name	PIER Funding (\$)	Match Funding (\$)	Total (\$)
1.1	Attend Kick-off Meeting	\$ 659	\$ 220	\$ 879
1.2	Critical Project Review Meetings	\$ 3,388	\$ 1,029	\$ 4,417
1.3	Final Meeting	\$ 1,550	\$ 392	\$ 1,942
1.4	Monthly Progress Reports	\$ 9,829	\$ 3,276	\$ 13,105
1.5	Final Report	\$ 7,360	\$ 2,053	\$ 9,413
1.6	Identify & Obtain Matching Funds	\$ -	\$ -	\$ -
1.7	Identify & Obtain Required Permits	\$ -	\$ -	\$ -
2.1	Fan Alone Baseline	\$ 6,468	\$ 2,022	\$ 8,490
2.2	Test Plan Discussion & Validation	\$ 12,163	\$ 4,054	\$ 16,217
2.3	Server & Test Plan Finalization	\$ 4,815	\$ 1,605	\$ 6,420
3.0	Iterate CFD & Meshing Parameters to Establish Simulation Set-Up	\$ 16,866	\$ 5,622	\$ 22,488
4.0	Fan Design Process	\$ 122,235	\$ 43,380	\$ 165,615
5.1	Machine PAX Fans	\$ 3,692	\$ 981	\$ 4,673
5.2	Integrate Motor into Samples	\$ 5,922	\$ 1,724	\$ 7,646
5.3	Final Airflow Testing of Samples & Verification	\$ 15,298	\$ 8,085	\$ 23,383
6.0	Comparative Power Consumption Monitoring & Analysis	\$ 32,769	\$ 11,248	\$ 44,017
7.0	Additional Power Consumption Monitoring Tests (As Needed)	\$ 20,315	\$ 3,605	\$ 23,920
8.0	Techology Transfer Activities	\$ 11,155	\$ 2,968	\$ 14,123
9.0	Production Readiness Plan	\$ 13,273	\$ 3,924	\$ 17,197
	Total	\$ 287,757	\$ 96,188	\$ 383,945

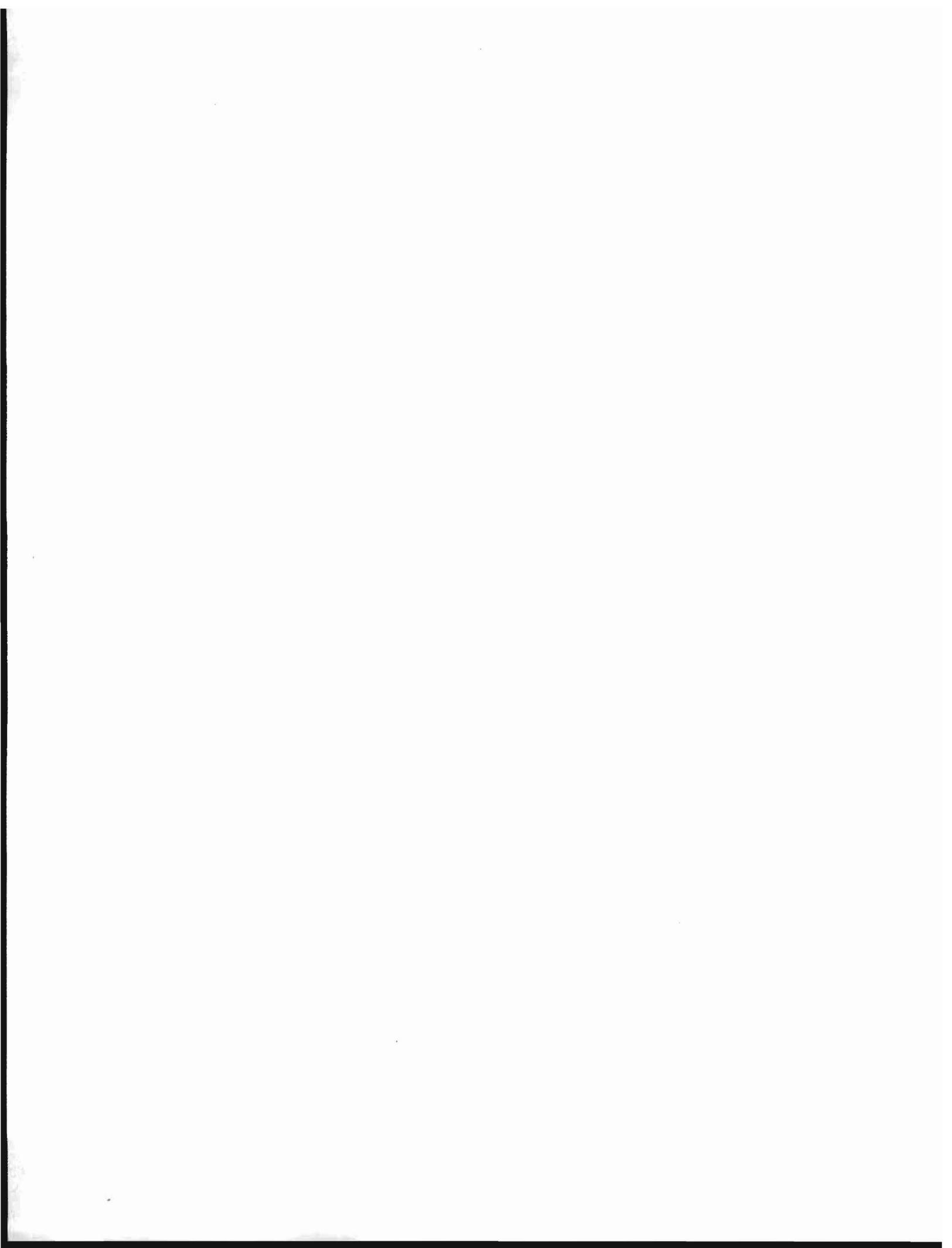


Exhibit B
PIER Funding by Task

PIER Funding (\$)		Direct Labor	Fringe Benefits	Travel	Equipment	Materials	Contractual	Misc	Indirect Overhead	G&A	Total
Task 1	Project Administration Activities										
1.1	Attend Kick-off Meeting	\$ 397	\$ 119	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 143	\$ -	\$ 659
1.2	Critical Project Review Meetings	\$ 1,860	\$ 558	\$ -	\$ -	\$ -	\$ 300	\$ -	\$ 670	\$ -	\$ 3,388
1.3	Final Meeting	\$ 708	\$ 212	\$ -	\$ -	\$ -	\$ 375	\$ -	\$ 255	\$ -	\$ 1,550
1.4	Quarterly Progress Reports	\$ 5,921	\$ 1,776	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,132	\$ -	\$ 9,829
1.5	Final Report	\$ 3,711	\$ 1,113	\$ -	\$ -	\$ -	\$ 1,200	\$ -	\$ 1,336	\$ -	\$ 7,360
1.6	Identify and Obtain Matching Funds	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
1.7	Identify and Obtain Required Permits	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
1.8											\$ -
1.9											\$ -
	Administration Activities Subtotals	\$ 12,597	\$ 3,778	\$ -	\$ -	\$ -	\$ 1,875	\$ -	\$ 4,536	\$ -	\$ 22,786
Task 2	Project Technical Activities										
2.1	Fan Alone Baseline	\$ 3,610	\$ 1,083	\$ -	\$ -	\$ 400	\$ -	\$ -	\$ 1,375	\$ -	\$ 6,468
2.2	Test Plan Discussion & Validation	\$ 7,146	\$ 2,144	\$ 300	\$ -	\$ -	\$ -	\$ -	\$ 2,573	\$ -	\$ 12,163
2.3	Server & Test Plan Finalization	\$ 2,901	\$ 870	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1,044	\$ -	\$ 4,815
3.0	Iterate CFD & Meshing Parameters to Establish Simulation Set-Up	\$ 10,160	\$ 3,048	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 3,658	\$ -	\$ 16,866
4.0	Fan Design Process	\$ 15,100	\$ 4,530	\$ 150	\$ -	\$ 22,900	\$ 69,825	\$ -	\$ 9,730	\$ -	\$ 122,235
5.1	Machine PAX Fans	\$ 1,688	\$ 506	\$ -	\$ -	\$ 750	\$ -	\$ -	\$ 748	\$ -	\$ 3,692
5.2	Integrate Motor into Samples	\$ 2,986	\$ 896	\$ 75	\$ -	\$ 750	\$ -	\$ -	\$ 1,215	\$ -	\$ 5,922
5.3	Final Airflow Testing of Samples & Verification	\$ 6,298	\$ 1,889	\$ 344	\$ -	\$ -	\$ 4,500	\$ -	\$ 2,267	\$ -	\$ 15,298
6.0	Comparative Power Consumption Monitoring & Analysis	\$ 12,062	\$ 3,615	\$ 225	\$ -	\$ -	\$ 12,525	\$ -	\$ 4,342	\$ -	\$ 32,769
7.0	Additional Power Consumption Monitoring Tests (As Needed)	\$ 3,149	\$ 945	\$ 150	\$ -	\$ 5,000	\$ 9,000	\$ -	\$ 2,071	\$ -	\$ 20,315
8.0	Techology Transfer Activities	\$ 5,274	\$ 1,582	\$ 150	\$ -	\$ -	\$ 2,250	\$ -	\$ 1,899	\$ -	\$ 11,155

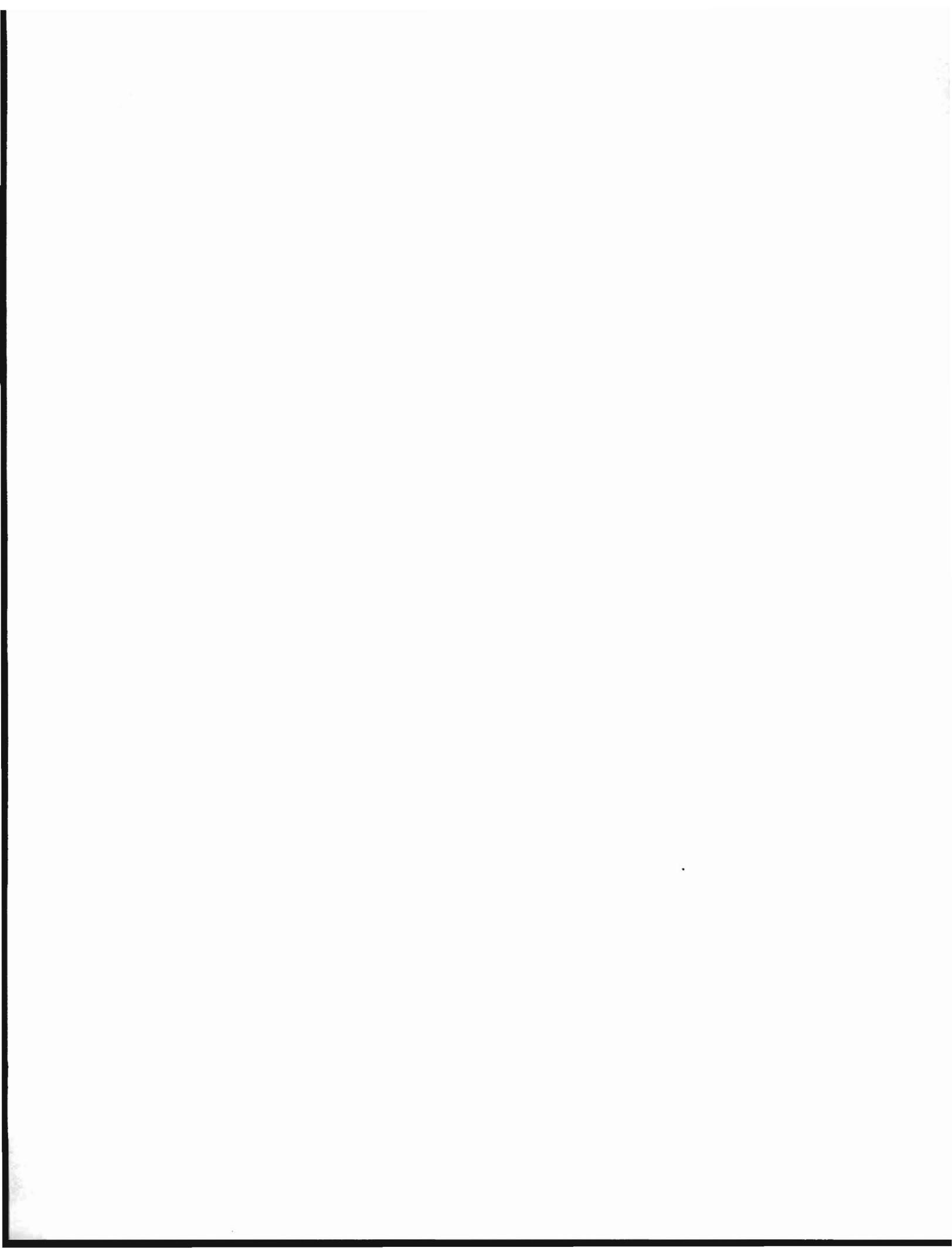


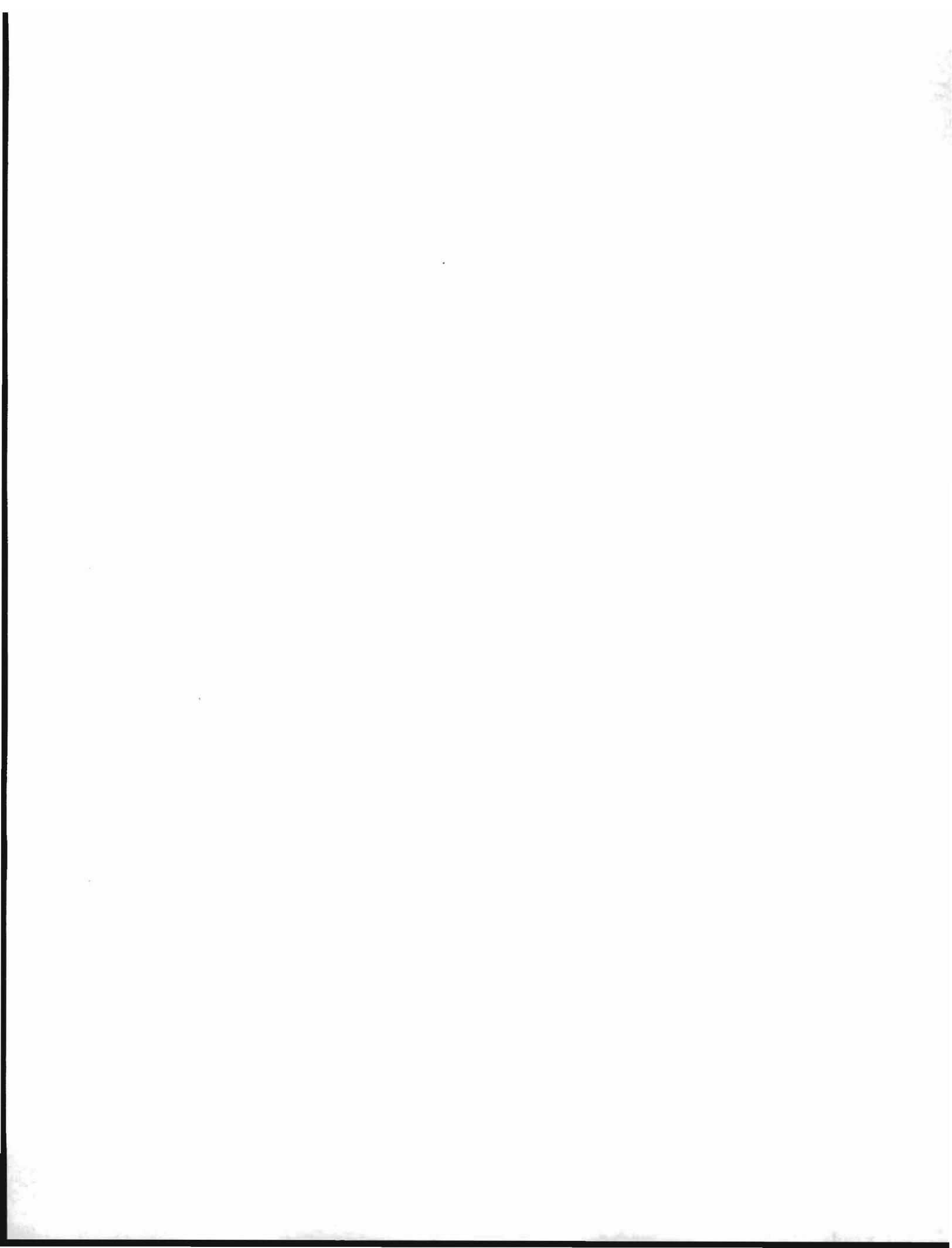
Exhibit B
PIER Funding by Task

PIER Funding (\$)		Direct Labor	Fringe Benefits	Travel	Equipment	Materials	Contractual	Misc	Indirect Overhead	G&A	Total
9.0	Production Readiness Plan	<u>\$ 7,002</u>	<u>\$ 2,100</u>	<u>\$ 150</u>	\$ -	\$ -	<u>\$ 1,500</u>	\$ -	<u>\$ 2,521</u>	\$ -	<u>\$ 13,273</u>
	Technical Activities Subtotals	<u>\$ 77,376</u>	<u>\$ 23,208</u>	<u>\$ 1,544</u>	\$ -	<u>\$ 29,800</u>	<u>\$ 99,600</u>	\$ -	<u>\$ 33,443</u>	\$ -	<u>\$ 264,971</u>
	PIER Reimbursable Totals	<u>\$ 89,973</u>	<u>\$ 26,986</u>	<u>\$ 1,544</u>	\$ -	<u>\$ 29,800</u>	<u>\$ 101,475</u>	\$ -	<u>\$ 37,979</u>	\$ -	<u>\$ 287,757</u>
	Percent of the Total	31%	9%	1%	0%	10%	35%	0%	13%	0%	100%



**Exhibit B
Match Funding**

Match Funding (\$)		Direct Labor	Fringe Benefits	Travel	Equipment	Materials	Contractual	Misc	Indirect Overhead	G&A	Total
Task 1	Project Administration Activities										
1.1	Attend Kick-off Meeting	\$ 132	\$ 40	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 48	\$ -	\$ 220
1.2	Critical Project Review Meetings	\$ 620	\$ 186	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 223	\$ -	\$ 1,029
1.3	Final Meeting	\$ 236	\$ 71	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 85	\$ -	\$ 392
1.4	Quarterly Progress Reports	\$ 1,974	\$ 592	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 710	\$ -	\$ 3,276
1.5	Final Report	\$ 1,237	\$ 371	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 445	\$ -	\$ 2,053
1.6	Identify and Obtain Matching Funds	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
1.7	Identify and Obtain Required Permits	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
1.8											\$ -
1.9											\$ -
		\$ 4,199	\$ 1,260	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1,511	\$ -	\$ 6,970
Task 2	Project Technical Activities										
2.1	Fan Alone Baseline	\$ 1,203	\$ 361	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 458	\$ -	\$ 2,022
2.2	Test Plan Discussion & Validation	\$ 2,382	\$ 715	\$ 100	\$ -	\$ -	\$ -	\$ -	\$ 857	\$ -	\$ 4,054
2.3	Server & Test Plan Finalization	\$ 967	\$ 290	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 348	\$ -	\$ 1,605
3.0	Iterate CFD & Meshing Parameters to Establish Simulation Set-Up	\$ 3,387	\$ 1,016	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1,219	\$ -	\$ 5,622
4.0	Fan Design Process	\$ 5,033	\$ 1,510	\$ 144	\$ -	\$ -	\$ -	\$ 33,450	\$ 3,243	\$ -	\$ 43,380
5.1	Machine PAX Fans	\$ 563	\$ 169	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 249	\$ -	\$ 981
5.2	Integrate Motor into Samples	\$ 995	\$ 299	\$ 25	\$ -	\$ -	\$ -	\$ -	\$ 405	\$ -	\$ 1,724
5.3	Final Airflow Testing of Samples & Verification	\$ 2,099	\$ 630	\$ 100	\$ -	\$ -	\$ -	\$ 4,500	\$ 756	\$ -	\$ 8,085
6.0	Comparative Power Consumption Monitoring & Analysis	\$ 4,022	\$ 1,203	\$ 75	\$ -	\$ -	\$ -	\$ 4,500	\$ 1,448	\$ -	\$ 11,248
7.0	Additional Power Consumption Monitoring Tests (As Needed)	\$ 1,050	\$ 315	\$ 50	\$ -	\$ -	\$ -	\$ 1,500	\$ 690	\$ -	\$ 3,605



**Exhibit B
Match Funding**

8.0	Techology Transfer Activities	\$ 1,758	\$ 527	\$ 50	\$ -	\$ -	\$ -	\$ -	\$ 633	\$ -	\$ 2,968
9.0	Production Readiness Plan	\$ 2,334	\$ 700	\$ 50	\$ -	\$ -	\$ -	\$ -	\$ 840	\$ -	\$ 3,924
										\$ -	\$ -
	Technical Activities Subtotals	\$ 25,793	\$ 7,735	\$ 594	\$ -	\$ -	\$ -	\$ 43,950	\$ 11,146	\$ -	\$ 89,218

	Direct Labor	Fringe Benefits	Travel	Equipment	Materials	Contractual	Misc	Indirect Overhead	G&A	Total
Match Funds Totals	\$ 29,992	\$ 8,995	\$ 594	\$ -	\$ -	\$ -	\$ 43,950	\$ 12,657	\$ -	\$ 96,188
Percentage of the Total	31%	9%	1%	0%	0%	0%	46%	13%	0%	100%

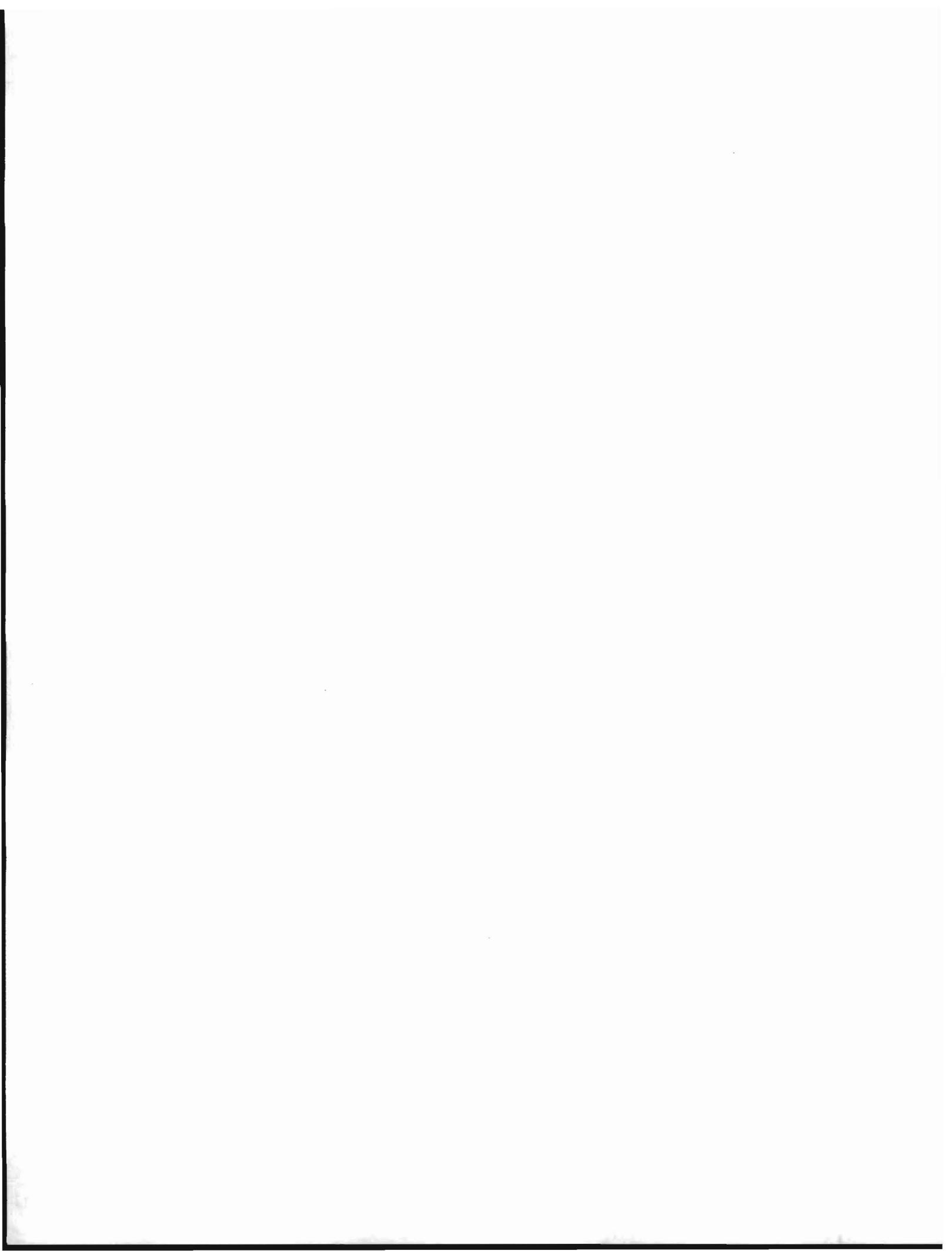


EXHIBIT E

Contact Persons

<p>Commission Contract Manager:</p> <p>Paul Roggensack California Energy Commission 1516 Ninth Street, MS - 43 Sacramento, CA 95814 Phone: (916) 327-2224 Fax: (916) 327-1353 e-mail: proggens@energy.state.ca.us</p>	<p>Contractor Project Manager:</p> <p><u>Francesca Bertone</u> Peter Fiske <u>999 Andersen Suite 100</u> 1615 5th Ave. San Rafael, CA 94901 <u>Phone: 415-256-9900</u> <u>Fax: 415-256-9901</u> <u>e-mail: fbertone@paxscientific.com</u> PAX Scientific, Inc. Phone: 415-256-9900 Fax: 415-256-9901 e-mail: pfiske@paxscientific.com</p>
<p>Commission Grants Officer:</p> <p>Crystal Presley-Willis California Energy Commission 1516 Ninth Street, MS - 1 Sacramento, CA 95814 Phone: (916) 654-5067 Fax: (916) 654-4423 e-mail: Cpresley@energy.state.ca.us</p> <p><i>Deliver confidential deliverables to this location <u>only.</u></i></p>	<p>Contractor's Administrator/Officer:</p> <p><u>Francesca Bertone</u> Peter Fiske <u>999 Andersen Suite 100</u> 1615 5th Ave. San Rafael, CA 94901 <u>Phone: 415-256-9900</u> <u>Fax: 415-256-9901</u> <u>e-mail: fbertone@paxscientific.com</u> PAX Scientific, Inc. Phone: 415-256-9900 Fax: 415-256-9901 e-mail: pfiske@paxscientific.com</p>
<p>Invoices, Progress Reports and Non-Confidential Deliverables to:</p> <p><u>April Albright</u> PIER Contracts Payable, MS-2 California Energy Commission 1516 Ninth Street Sacramento, CA 95814 Phone: 916-654-4847 Fax #: 916-653-1435 E-mail: Aalbrigh@energy.state.ca.us</p>	<p>Contractor Accounting Invoicing Contact:</p> <p>Laura Bertone PAX Scientific, Inc. <u>999 Andersen Suite 100</u> 1615 5th Ave. San Rafael, CA 94901 Phone: 415-256-9900 Fax: 415-256-9901 e-mail: lbertone@paxscientific.com pfiske@paxscientific.com</p>

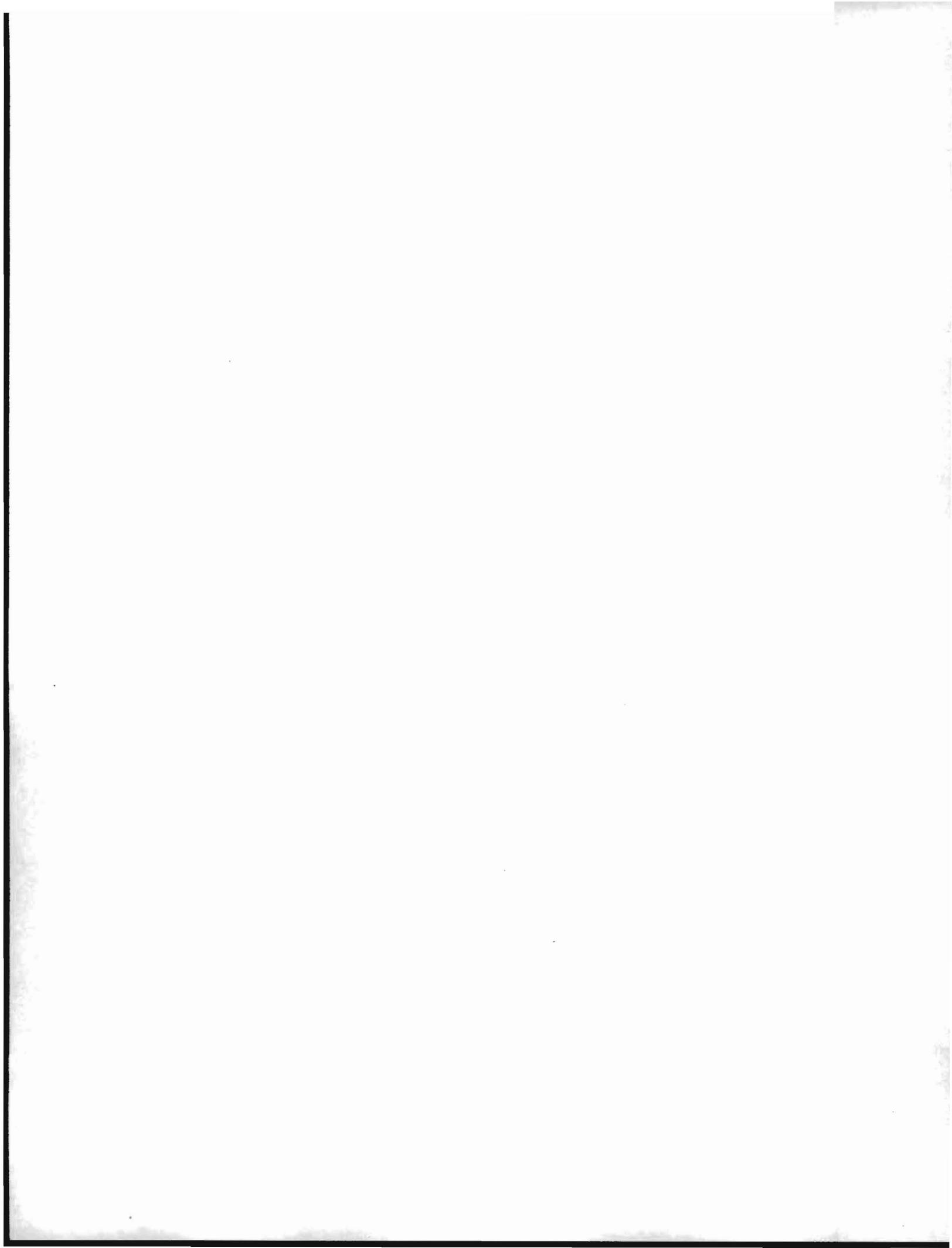


EXHIBIT E

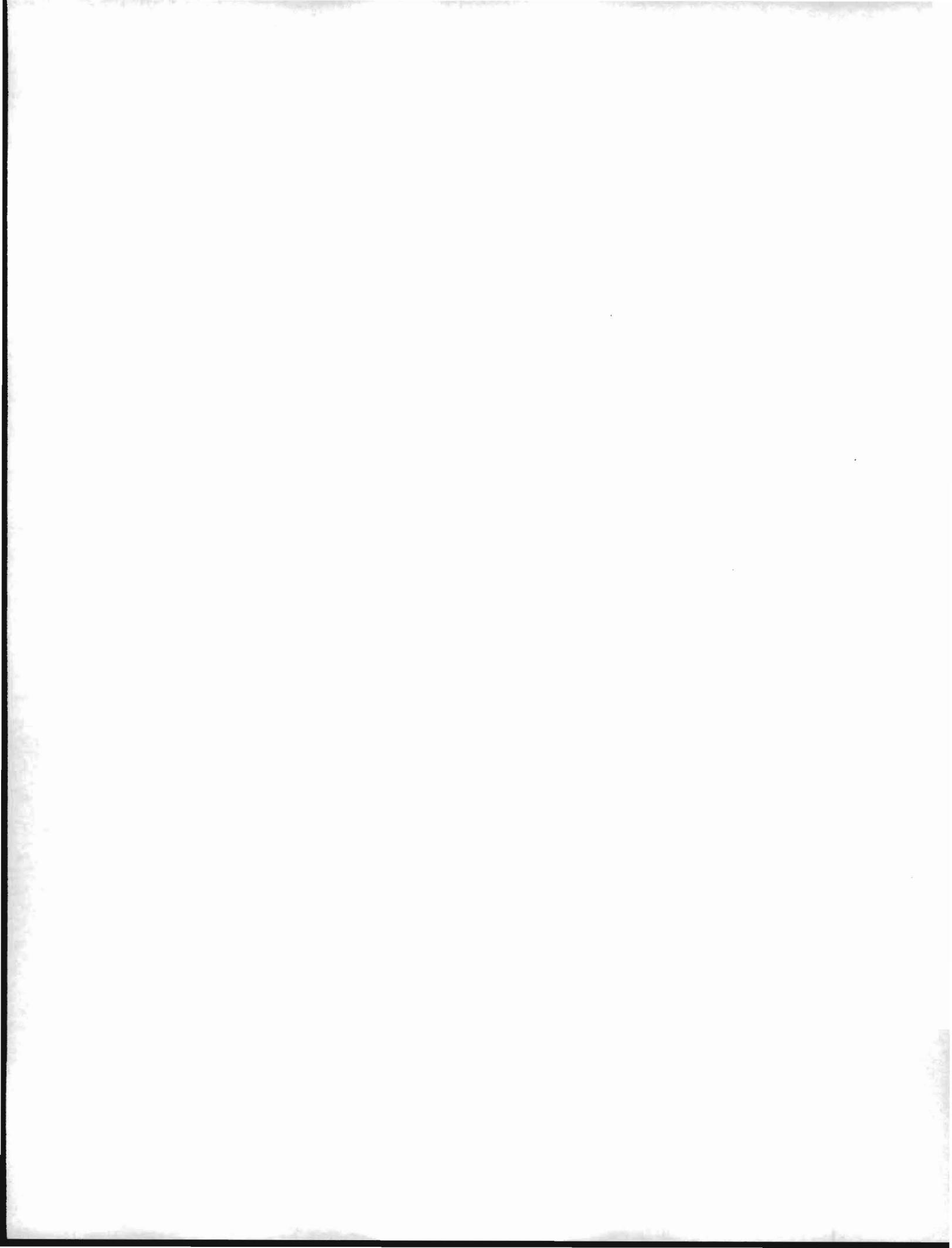
Contact Persons

Commission Legal Notices:

Rachel Grant-Kiley, MS-1
Manager, Grants and Loans Office
California Energy Commission
1516 Ninth Street
Sacramento, CA 95814
Phone: 916-654-**4379**
Fax #: 916-654-4076
E-mail: **rgrant@energy.state.ca.us**

Contractor Legal Notices:

Francesca Bertone
~~Peter Fiske~~
999 Andersen Suite 100
~~1615 5th Ave.~~
San Rafael, CA 94901
Phone: 415-256-9900
Fax: 415-256-9901
e-mail: fbertone@paxscientific.com
PAX Scientific, Inc.
~~Phone: 415-256-9900~~
~~Fax: 415-256-9901~~
~~e-mail: pfiske@paxscientific.com~~





Purpose of Questionnaire

The Energy Commission's protocol for identifying conflicts of interest, real or perceived, requires staff and consultants involved in the development or management of contracts, grants, and loans (sometimes collectively referred to as "agreements") to complete this questionnaire. Energy Commission staff and consultants must, therefore, complete this questionnaire upon assignment to one or more of the following phases:

- 1) draft part or all of a solicitation,
- 2) review or score a proposal, application, or bid for a contract, grant or loan,
- 3) negotiate, draft, or execute an agreement, or
- 4) manage a contract, grant, or loan.

Completed questionnaires shall be returned to the Contracts Office or the Grants and Loans Office to be filed with the related solicitation and/or agreement. **Any questionnaires containing one or more "yes" responses will be referred to the Chief Counsel's Office for further inquiry and direction before release of the solicitation or final approval of the agreement. No agreement shall be scheduled for a business meeting (or sent to the executive director if business meeting approval is not required) until all persons involved in the phases listed above have completed this questionnaire.**

Staff is also strongly encouraged to consult or complete this questionnaire if they have a question about a potential conflict of interest related to their involvement in other kinds of governmental decisions, e.g., developing regulations, testifying in a siting case, recommending funding allocations, etc. Please be advised that the use of this questionnaire is simply a tool to help public officials, including staff, of the Energy Commission assess whether there is a real or perceived conflict of interest in the making of a contract, grant or loan or any other governmental decisions. All public officials are required to be aware of and avoid conflicts of interest as prohibited by the Political Reform Act at Government Code section 81000 et seq., Government Code section 1090 et seq., and other state and federal laws.

Section 1. Employee and Solicitation / Agreement Information

Employee Name: Paul Roggensack		Date: November 14, 2011
Division: Energy Research and Development	Office: Energy Efficiency Research	Job Classification: Mechanical Engineer
Solicitation/Agreement Name: Emerging Technology Demonstration Grant		Solicitation/Agreement Number: PIR-10-20-01
Brief Description of Purpose of the Solicitation/Agreement or Other Assignment: Improve the energy efficiency of server fans.		

Section 2. Phase of Solicitation / Agreement Development

Indicate below the phase of solicitation or agreement development in which you are involved.

<input type="checkbox"/>	Phase 1. Drafting of Part or All of a Solicitation Do you know any persons and/or entities likely to bid on the solicitation? <input type="checkbox"/> No (sign and date the questionnaire and submit to the Contracts Office or Grants and Loans Office) <input type="checkbox"/> Yes (list the persons and/or entities in Section 3 and answer the questions in Section 4)
<input type="checkbox"/>	Phase 2. Review and Scoring of Proposals, Applications, or Bids Please complete Section 4 if you have not previously completed it for the solicitation (identified in Section 1). If you previously completed Section 4 for the identified solicitation, have your answers changed? <input type="checkbox"/> No (sign and date the questionnaire and submit to the Contracts Office or Grants and Loans Office) <input type="checkbox"/> Yes (complete Section 4)



<input checked="" type="checkbox"/> Phase 3. Negotiate, Draft, or Execute Agreement Please complete Section 4 if you are assigned to negotiate any terms or conditions of an agreement whether competitively bid or not or if you have not previously completed it for the solicitation identified in Section 1. If you previously completed Section 4 for the identified solicitation, have your answers changed? <input type="checkbox"/> No (sign and date the questionnaire and submit to the Contracts Office or Grants and Loans Office) <input type="checkbox"/> Yes (complete Section 4)
<input checked="" type="checkbox"/> Phase 4. Contract Management Please complete Section 4 if you have not previously completed it for the solicitation identified in Section 1. If you previously completed Section 4 for the identified solicitation, have your answers changed? <input checked="" type="checkbox"/> No (sign and date the questionnaire and submit to the Contracts Office or Grants and Loans Office) <input type="checkbox"/> Yes (complete Section 4)
<input type="checkbox"/> Other Assignment: (Please Specify) Please complete Section 4. Sign and date the questionnaire and submit to the Office of Chief Counsel.

Section 3. Persons and / or Entities

<p>Phase 1 (Solicitation) – To be completed by the employee based on the best of his her knowledge.</p> <p>Likely Bidder(s)/Applicant(s):</p>
<p>Phase 2 (Review of Proposals, Applications and / Bids) – To be completed by the Contracts Office or Grants and Loans Office.</p> <p>Bidder(s)/Applicant(s):</p>
<p>Phase 3 (Negotiate, Draft, or Execute Agreement) – To be completed by the Contracts Office or Grants and Loans Office.</p> <p>Prime and known Sub-Contractor(s):</p> <p>Grantee(s):</p> <p>Borrower(s):</p>
<p>Phase 4 (Manage Agreement) – To be completed by the employee upon assignment to manage all or part of the agreement.</p> <p>Prime and known Subcontractor(s):</p> <p>Grantee(s) and known Subgrantee(s): PAX Scientific</p> <p>Contractor/Grantee(s)/Borrower(s):</p>

Section 4. Questions

NOTE: Answer each question below with respect to the persons and entities listed in Section 3.

<p>1. Have you, your spouse, or a dependent member of your family received or been promised income aggregating \$500 or more in value from any person or entity listed in Section 3 in the last 12 months for any work outside the Commission, whether or not related to the proposed agreement?</p> <p><input checked="" type="checkbox"/> No</p> <p><input type="checkbox"/> Yes - please identify the person(s) and/or entity(ies)</p>

QUESTIONNAIRE FOR IDENTIFYING CONFLICTS OF INTEREST



2. Have you received or been promised one or more gifts aggregating \$420 or more in value from any person or entity listed in Section 3 in the last 12 months?

No
 Yes - please identify the person(s) and/or entity(ies)

3. Do you or your spouse have an investment worth \$2,000 or more in any person or entity listed in Section 3? If so, please identify each person and/or entity?

No
 Yes - please identify the person(s) and/or entity(ies)

4. Whether compensated or uncompensated, do you or your spouse serve as director, officer, partner, trustee, elected official, employee, or member, hold any other position of management in a business entity, nonprofit organization, government agency, planning commission, or other organization listed in Section 3?

No
 Yes - please identify the person(s) and/or entity(ies)

5. Do you or your spouse have any business affiliation with any person or entity listed in Section 3?

No - skip the following questions and please sign and date the form.
 Yes - answer the following questions and please sign and date the form.

a. Do you or your spouse serve on a board that has a contact with any person or entity listed in Section 3?

No
 Yes

b. Is any person or entity listed in Section 3 a member of a board on which you or your spouse also serve?

No
 Yes

c. Is your spouse a contractor for any person or entity listed in Section 3?

No
 Yes

d. Please describe any other affiliation you or your spouse may have, if any, with each each person or entity listed in Section 3:

Paul Roggensack
 Employee Signature

11/17/11
 Date

 Reviewing Attorney Signature (required for any form with one or more "yes" responses)

 Date

