

**Exhibit A
WORK STATEMENT**

TECHNICAL TASK LIST

Task #	CPR	Task Name
1		Administration
2	X	Evaluate, Design, Build, And Test Prototype Flywheel System
3		Operational Readiness Plan And National Environmental Policy Act (NEPA) Compliance For Project Demonstration
4	X	Activation And Operation
5		Commissioning And Grid Connection Demonstration

KEY NAME LIST

Task #	Key Personnel	Key Subcontractor(s)	Key Partner(s)
1	Rick Chong, Ed Chiao		U.S. Department of Energy
2	Ed Chiao	AFS Trinity Power Corp.	U.S. Department of Energy
3	Ed Chiao		U.S. Department of Energy
4	Ed Chiao	AFS Trinity Power Corp.	U.S. Department of Energy
5	Ed Chiao		U.S. Department of Energy

GLOSSARY

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

Term/ Acronym	Definition
CPR	Critical Project Review
DOE	U.S. Department of Energy
NEPA	National Environmental Policy Act
PAC	Project Advisory Committee
PIER	Public Interest Energy Research
PV	Photovoltaic
RD&D	Research, Development and Demonstration

Problem Statement:

The state of California expects to have a growing need for cost-effective grid energy storage to reliably integrate intermittent renewable energy into tomorrow's electric grid.

1 Integration of large amounts of wind and photovoltaic solar electricity will require fast-
2 response systems that can respond to the instant changes in electricity output of wind
3 and photovoltaic (PV) solar technologies. Furthermore, demand-side variability from
4 plug-in hybrid electric car charging could lead to significant strain on the electric grid in
5 the coming years.

6
7 Current state-of-the-art thermal and combustion generator systems may not provide
8 adequate response speed to meet the rapidly evolving demands on electricity supply
9 and consumption.

10
11 Energy storage could become an adequate solution to effectively mitigate the variability
12 created by wind and PV solar intermittency while simultaneously helping to buffer the
13 electric grid from electric vehicle charging. An adequate storage solution will be both
14 highly responsive and capable of over one hundred thousand full charge / discharge
15 cycles in order to serve a variety of applications.

16
17 This proposal will research and demonstrate flywheel technology, one such promising
18 energy storage technology. Flywheels represent an attractive grid energy storage
19 solution due to the system's inherent ability to withstand virtually limitless full
20 charge/discharge cycles. This program will significantly improve upon the current
21 scientific and technological baseline for flywheels that is publicly known. Today, state-
22 of-the-art flywheels use high-cost carbon fiber flywheel rotors, driven by expensive
23 motors with significant energy losses, and levitated with costly and complex
24 electromagnetic bearing systems. Current start-of-the-art technologies lead to flywheel
25 products that are too costly and store energy for too short a time to be considered for
26 multiple grid energy storage applications.

27
28 **Goals of the Agreement:**

29
30 The goal of this Agreement is to develop new flywheel energy storage technology
31 suitable for reducing peak electricity demand and integrating renewable energy
32 resources. The project aims to develop and demonstrate a prototype flywheel system
33 that clearly showcases the economical and efficient grid energy storage.

34
35 **Objectives of the Agreement:**

36
37 The objectives of this Agreement are to establish the technical and economical
38 benchmarks that this technology must reach in order to be deemed a cost-effective and
39 technically viable energy storage solution.

40
41 The objectives of this project are to determine the technical performance and economic
42 viability of the proposed technology and measure this in accordance with the
43 benchmarks established in this agreement. This will be accomplished through the
44 development and demonstration of a prototype flywheel system in a grid connected
45 application.

1 **Product Guidelines:**

2
3 For complete product guidelines, refer to Section 5 in the Terms and Conditions.

4
5 **TASK 1.0 ADMINISTRATION**

6
7 **Task 1.1 Attend Kick-off Meeting**

8
9 The goal of this task is to establish the lines of communication and procedures for
10 implementing this Agreement.

11
12 **The Recipient shall:**

- 13
14 Attend a “Kick-Off” meeting with the Commission Project Manager, the
15 Grants Officer, and a representative of the Accounting Office. The
16 Recipient shall bring its Project Manager, Agreement Administrator,
17 Accounting Officer, and others designated by the Commission Project
18 Manager to this meeting. The administrative and technical aspects of this
19 Agreement will be discussed at the meeting. Prior to the kick-off meeting,
20 the Commission Project Manager will provide an agenda to all potential
21 meeting participants.

22
23 The administrative portion of the meeting shall include, but not be limited
24 to, the following:

- 25 Discussion of the terms and conditions of the Agreement
26 Discussion of Critical Project Review (Task 1.2)
27 Match fund documentation (Task 1.6)
28 Permit documentation (Task 1.7)

29
30 The technical portion of the meeting shall include, but not be limited to, the
31 following:

- 32 The Commission Project Manager’s expectations for accomplishing
33 tasks described in the Scope of Work
34 An updated Schedule of Products
35 Discussion of Progress Reports (Task 1.4)
36 Discussion of Technical Products (Product Guidelines located in
37 Section 5 of the Terms and Conditions)
38 Discussion of the Final Report (Task 1.5)

39
40 The Commission Project Manager shall designate the date and location of
41 this meeting.

42
43 **Recipient Products:**

- 44 Updated Schedule of Products (no draft)
45 Updated List of Match Funds (no draft)
46 Updated List of Permits (no draft)

1
2 **Commission Project Manager Product:**

- 3 Kick-Off Meeting Agenda (no draft)

4
5 **Task 1.2 Critical Project Review (CPR) Meetings**

6
7 The goal of this task is to determine if the project should continue to receive Energy
8 Commission funding to complete this Agreement and to identify any needed
9 modifications to the tasks, products, schedule or budget.

10
11 CPRs provide the opportunity for frank discussions between the Energy Commission
12 and the Recipient. CPRs generally take place at key, predetermined points in the
13 Agreement, as determined by the Commission Project Manager and as shown in the
14 Technical Task List above. However, the Commission Project Manager may schedule
15 additional CPRs as necessary, and any additional costs will be borne by the Recipient.

16
17 Participants include the Commission Project Manager and the Recipient and may
18 include the Commission Grants Officer, the Public Interest Energy Research (PIER)
19 Program Team Lead, other Energy Commission staff and Management as well as other
20 individuals selected by the Commission Project Manager to provide support to the
21 Energy Commission.

22
23 If DOE is conducting similar meetings, the Recipient shall notify and invite the
24 Commission project manager to participate, either by teleconference or by actual
25 meeting attendance. The DOE required meetings can be used in place of the
26 Commission's CPR meetings, at the discretion of the Commission project manager.

27
28 **The Commission Project Manager shall:**

- 29 Determine the location, date, and time of each CPR meeting with the
30 Recipient. These meetings generally take place at the Energy
31 Commission, but they may take place at another location.
- 32 Send the Recipient the agenda and a list of expected participants in
33 advance of each CPR. If applicable, the agenda shall include a
34 discussion on both match funding and permits.
- 35 Conduct and make a record of each CPR meeting. One of the outcomes
36 of this meeting will be a schedule for providing the written determination
37 described below.
- 38 Determine whether to continue the project, and if continuing, whether or
39 not modifications are needed to the tasks, schedule, products, and/or
40 budget for the remainder of the Agreement. Modifications to the
41 Agreement may require a formal amendment (please see the Terms and
42 Conditions). If the Commission Project Manager concludes that
43 satisfactory progress is not being made, this conclusion will be referred to
44 the Energy Commission's Research, Development and Demonstration
45 (RD&D) Policy Committee for its concurrence.

1 The technical and administrative aspects of Agreement closeout will be
2 discussed at the meeting, which may be two separate meetings at the
3 discretion of the Commission Project Manager.
4

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

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

- 14 ○ What to do with any equipment purchased with Energy Commission
15 funds (Options)
- 16 ○ Energy Commission's request for specific "generated" data (not
17 already provided in Agreement products)
- 18 ○ Need to document Recipient's disclosure of "subject inventions"
19 developed under the Agreement
- 20 ○ "Surviving" Agreement provisions, such as repayment provisions
21 and confidential Products
- 22 ○ Final invoicing and release of retention
- 23 ○ Prepare a schedule for completing the closeout activities for this
24 Agreement.
- 25 ○ Copies of all correspondence and reports discussing DOE's
26 findings on the project, and future disposition of the project, if
27 applicable. When directed by the Commission project manager,
28 recipient will provide copies of any DOE correspondence (emails,
29 reports, letters, etc.) that relate to project performance.
30

31
32 **Products:**

- 33 Written documentation of meeting agreements (no draft)
- 34 Schedule for completing closeout activities (no draft)
- 35 DOE correspondence on project findings and results (no draft)
36

37 **Task 1.4 Monthly Progress Reports**
38

39 The goal of this task is to periodically verify that satisfactory and continued progress is
40 made towards achieving the research objectives of this Agreement on time and within
41 budget.
42

43 The objectives of this task are to summarize activities performed during the reporting
44 period, to identify activities planned for the next reporting period, to identify issues that
45 may affect performance and expenditures, and to form the basis for determining
46 whether invoices are consistent with work performed.

1
2 With Commission project manager approval, the Recipient can submit a DOE Progress
3 Report in lieu of the required Commission report if it contains the information listed in
4 Attachment 1 of the Terms and Conditions.
5

6 **The Recipient shall:**

- 7 Prepare Monthly Progress Reports which summarize all Agreement
8 activities conducted by the Recipient for the reporting period, including an
9 assessment of the ability to complete the Agreement within the current
10 budget and any anticipated cost overruns. Each progress report is due to
11 the Commission Project Manager within 10 days of the end of the
12 reporting period. The recommended specifications for each progress
13 report are contained in the terms and conditions of this Agreement.
- 14 Unless otherwise directed by the Commission project manager, each
15 Progress Report must contain any reports made to DOE, including
16 summaries of meetings with DOE, as it relates to the project outcome and
17 performance. Include names and contacts of DOE representatives.
18

19 **Recipient Product:**

- 20 Monthly Progress Reports of all activities reported.
- 21 Copies of DOE progress reports, correspondence, meeting summaries,
22 and special status reports as set forth in the Federal Financial Assistance
23 Reporting Checklist and Instructions
24
25

26 **Task 1.5 Final Report**
27

28 The goal of the Final Report is to assess the project's success in achieving its goals and
29 objectives, advancing science and technology, and providing energy-related and other
30 benefits to California.
31

32 The Final Report shall describe the following at a minimum: a) original purpose, approach,
33 activities performed, results and conclusions of the work done under this Agreement; b)
34 how the project advanced science and technology to the benefit of California's ratepayers
35 and the barriers overcome; c) assessment of the success of the project as measured by
36 the degree to which goals and objectives were achieved; d) how the project supported
37 California's economic recovery in the near term and number of jobs created or sustained;
38 e) how the project results will be used by California industry, markets and others; f)
39 projected cost reduction impact and other benefits resulting from the project; g)
40 discussion of the project budget, including the total project cost and all the funding
41 partners and their cost share; h) discussion of how the Energy Commission funding was
42 spent on the project, including any unique products and benefits; i) observations,
43 conclusions and recommendations for further RD&D projects and improvements to the
44 PIER project management process.
45

1 If a final report is required by DOE, the Recipient will include a copy of it along with the
2 Energy Commission's final report requirements. In addition, the Recipient shall submit
3 the draft final DOE report to the Energy Commission for review at the same time it
4 submits it to DOE.

5
6 The Final Report shall be a public document. If the Recipient has obtained confidential
7 status from the Energy Commission and will be preparing a confidential version of the
8 Final Report as well, the Recipient shall perform the following activities for both the
9 public and confidential versions of the Final Report.

10
11 **The Recipient shall:**

- 12 Provide a draft copy of the Final Report including a copy of the draft
13 submitted to DOE in response to the American Recovery and
14 Reinvestment Act Funding Opportunity Notice for which an award was
15 received. The Final Report must be completed on or before the end of the
16 Agreement term.
- 17 Provide copies of DOE final closeout reports.
- 18 Submit written correspondence from DOE regarding acceptance of the
19 Final Report.

20
21 **Recipient Products:**

- 22 Draft Final Report, including a copy of the draft report submitted to DOE
- 23 Final Report, including a copy of the final report submitted to DOE
- 24 Copies of DOE final closeout reports
- 25 Written correspondence from DOE regarding acceptance of Final Report
26 (no draft)

27
28 **Task 1.6 Identify and Obtain Matching Funds**

29
30 The goal of this task is to ensure that the match funds planned for this Agreement are
31 obtained for and applied to this Agreement during the term of this Agreement.

32
33 The costs to obtain and document match fund commitments are not reimbursable
34 through this Agreement. Although the PIER budget for this task will be zero dollars, the
35 Recipient may utilize match funds for this task. Match funds shall be spent concurrently
36 or in advance of PIER funds for each task during the term of this Agreement. Match
37 funds must be identified in writing and the associated commitments obtained before the
38 Recipient can incur any costs for which the Recipient will request reimbursement.

39
40 **The Recipient shall:**

- 41 Prepare a letter documenting the match funding committed to this
42 Agreement and submit it to the Commission Project Manager at least 2
43 working days prior to the kick-off meeting. The letter needs to identify the
44 following at a minimum:

- 1 ○ Amount of each cash match fund, its source, including a contact name,
2 address and telephone number and the task(s) to which the match
3 funds will be applied.
- 4 ○ Amount of each in-kind contribution, a description, documented market
5 or book value, and its source, including a contact name, address and
6 telephone number and the task(s) to which the match funds will be
7 applied. If the in-kind contribution is equipment or other tangible or
8 real property, the Recipient shall identify its owner and provide a
9 contact name, address and telephone number, and the address where
10 the property is located.
- 11 □ Provide a copy of the letter of commitment from an authorized
12 representative of each source of cash match funding or in-kind
13 contributions that these funds or contributions have been secured.
- 14 □ Discuss match funds and the implications to the Agreement if they are
15 reduced or not obtained as committed, at the kick-off meeting. If
16 applicable, match funds will be included as a line item in the progress
17 reports and will be a topic at CPR meetings.
- 18 □ Provide the appropriate information to the Commission Project Manager if
19 during the course of the Agreement additional match funds are received.
- 20 □ Notify the Commission Project Manager within 10 days if during the
21 course of the Agreement existing match funds are reduced. Reduction in
22 match funds must be approved through a formal amendment to the
23 Agreement and may trigger an additional CPR.

24
25 **Recipient Products:**

- 26 □ A letter regarding match funds (no draft)
- 27 □ Copy(ies) of each match fund commitment letter(s) (no draft)
- 28 □ Letter(s) for new match funds (if applicable) (no draft)
- 29 □ Letter that match funds were reduced (if applicable) (no draft)

30
31 **Task 1.7 Identify and Obtain Required Permits**

32
33 The goal of this task is to obtain all permits required for work completed under this
34 Agreement in advance of the date they are needed to keep the Agreement schedule on
35 track.

36
37 Permit costs and the expenses associated with obtaining permits are not reimbursable
38 under this Agreement. Although the PIER budget for this task will be zero dollars, the
39 Recipient shall budget match funds for any expected expenditures associated with
40 obtaining permits. Permits must be identified in writing and obtained before the
41 Recipient can make any expenditures for which a permit is required.

42
43 **The Recipient shall:**

- 44 □ Prepare a letter documenting the permits required to conduct this
45 Agreement and submit it to the Commission Project Manager at least 2
46 working days prior to the kick-off meeting. If there are no permits required

1 at the start of this Agreement, then state such in the letter. If it is known at
2 the beginning of the Agreement that permits will be required during the
3 course of the Agreement, provide in the letter:

- 4 ○ A list of the permits that identifies the:
 - 5 ▪ Type of permit
 - 6 ▪ Name, address and telephone number of the permitting
7 jurisdictions
 - 8 ▪ or lead agencies
- 9 ○ The schedule the Recipient will follow in applying for and obtaining
10 these permits.

- 11 Discuss the list of permits and the schedule for obtaining them at the kick-
12 off meeting and develop a timetable for submitting the updated list,
13 schedule and the copies of the permits. The implications to the
14 Agreement if the permits are not obtained in a timely fashion or are denied
15 will also be discussed. If applicable, permits will be included as a line item
16 in the Progress Reports and will be a topic at CPR meetings.
- 17 If during the course of the Agreement additional permits become
18 necessary, provide the appropriate information on each permit and an
19 updated schedule to the Commission Project Manager.
- 20 As permits are obtained, send a copy of each approved permit to the
21 Commission Project Manager.
- 22 If during the course of the Agreement permits are not obtained on time or
23 are denied, notify the Commission Project Manager within 5 working days.
24 Either of these events may trigger an additional CPR.

25 26 **Recipient Products:**

- 27 Letter documenting the permits or stating that no permits are required (no
28 draft)
- 29 A copy of each approved permit (if applicable) (no draft)
- 30 Updated list of permits as they change during the term of the Agreement
31 (if applicable) (no draft)
- 32 Updated schedule for acquiring permits as changes occur during the term
33 of the Agreement (if applicable) (no draft)

34 35 36 37 38 39 **TECHNICAL TASKS**

40 41 **TASK 2 EVALUATE, DESIGN, BUILD, AND TEST PROTOTYPE FLYWHEEL** 42 **SYSTEM**

43
44 The goal of this task is to evaluate, design, build and test a commercial-scale prototype
45 flywheel system.

1 The project team will evaluate magnetic bearing, motor generator, flywheel rotor, and
2 vacuum vessel designs suitable for commercial-scale production and build prototype
3 articles to validate and test the component designs.
4

5 **The Recipient shall:**

- 6 Evaluate magnetic bearing system architecture
 - 7 Identify Bearing Requirements for a sub-scale engineering prototype
 - 8 Identify Bearing Requirements for a commercial-scale prototype
 - 9
- 10 Evaluate motor generator system architecture
 - 11 Identify Motor-Generator Requirements for a sub-scale engineering
 - 12 prototype
 - 13 Identify Motor-Generator Requirements for a commercial-scale prototype
 - 14
- 15 Design and Build a Magnetic Bearing System
 - 16 Develop a design and parts list for engineering and commercial-scale
 - 17 prototypes
 - 18 Fabricate, assemble, test, and verify a magnetic bearing system
 - 19
- 20 Design and Build a Motor-Generator System
 - 21 Develop a design and parts list for engineering and commercial-scale
 - 22 prototypes
 - 23 Fabricate, assemble, test, and verify a motor-generator system
 - 24
- 25 Design and Build a Power Electronics Control System
 - 26 Develop and design circuit schematics for engineering and commercial-
 - 27 scale prototypes
 - 28 Assemble, test, and verify control electronics
 - 29 Perform scaling and trade study for circuit schematics
 - 30
- 31 Design, Build and Test a Flywheel Rotor
 - 32 Perform finite element analysis and modal analysis
 - 33 Develop detailed rotor design and manufacturing process specification
 - 34 Manufacture and test parts
 - 35
- 36 Design, Build, and Evaluate a Vacuum Vessel
 - 37 Design and fabricate parts for engineering and commercial-scale
 - 38 prototypes
 - 39 Test and verify the component system in prototypes
 - 40
- 41 Assemble, Integrate and Evaluate Prototype Flywheel System
 - 42 Assemble and Activate an engineering prototype
 - 43 Assemble and Activate a commercial-scale prototype
 - 44
- 45 Test and Collect Prototype Data
 - 46 Prepare the flywheel test plan

- 1 ○ Test the engineering prototype according to the flywheel test plan
- 2 ○ Test commercial-scale prototype according to the flywheel test plan
- 3
- 4 □ Attend and participate in the CPR meeting as per Task 1.2
- 5
- 6 □ Prepare a Prototype Flywheel System Technical Performance Report
- 7 describing the evaluation, design, fabrication, and testing of the prototype
- 8 flywheel system
- 9

10 **Products:**

- 11 □ Prototype Flywheel System Technical Performance Report
- 12

13 **TASK 3 OPERATIONAL READINESS PLAN AND NEPA COMPLIANCE FOR**

14 **PROJECT DEMONSTRATION**

15

16 The goal of this task is to complete an operational readiness plan and obtain National

17 Environmental Policy Act (NEPA) compliance for demonstration of the Amber Kinetics

18 prototype flywheel system.

19

20 The operational readiness plan will describe the logistical plan for installation and

21 demonstration of the prototype flywheel system. NEPA compliance ensures the

22 demonstration project is in compliance with NEPA rules and regulations prior to

23 installation of the prototype flywheel system.

24

25 **The Recipient shall:**

- 26 □ Prepare and submit an Operational Readiness plan for a grid-connected
- 27 flywheel energy storage demonstration
- 28 □ Obtain NEPA compliance for a grid-connected flywheel energy storage
- 29 demonstration
- 30

31 **Products:**

- 32 □ Operational Readiness Plan
- 33 □ NEPA Compliance Plan
- 34
- 35

36 **TASK 4 ACTIVATION AND OPERATION**

37

38 The goal of this task is to activate and operate the commercial-scale prototype flywheel

39 system at the determined demonstration site prior to grid interconnection.

40

41 Activation of the prototype flywheel system will occur prior to grid interconnection. Data

42 will be collected and system performance will be optimized prior to grid interconnection.

43

44 **The Recipient shall:**

- 45 □ Perform site preparation
- 46 □ Install and activate the prototype flywheel system

- 1 Prepare an operational flywheel system test plan
- 2 Test the flywheel system according to the test plan and collect data in a
- 3 test software program
- 4 Attend and participate in a CPR meeting as per Task 1.2
- 5 Prepare an Operational Flywheel System Technical Performance Report

6
7 **Products:**

- 8 Operational Flywheel System Technical Performance Report

9
10 **TASK 5 COMMISSIONING AND GRID CONNECTION DEMONSTRATION**

11
12 The goal of this task is to connect the flywheel system to the electric grid, obtain
13 necessary permits, and install, test, and record field data at the determined
14 demonstration site.

15
16 **The Recipient shall:**

- 17 Obtain required permits for task activities
- 18 Complete flywheel system installation and interconnection
- 19 Conduct grid connected demonstration of the flywheel system
- 20 Collect performance data
- 21 Prepare a Field Demonstration Technical Performance Report

22
23 **Products:**

- 24 Field Demonstration Technical Performance Report