Exhibit A
SCOPE OF WORK

TECHNICAL TASK LIST

Project & Task #s	CPR	Project & Task Names
Administration		**Program Administration**
Task A.1		Attend Kickoff Meeting
Task A.2		CPR Meetings
Task A.3		Final Meeting
Task A.4		Monthly Progress Reports
Task A.5		Test Plans, Technical Reports, and Interim Deliverables
Task A.6		Final Report
Task A.7		Identify and Obtain Matching Funds
Task A.8		Identify and Obtain Required Permits
Task A.9		Electronic File Format
Task A.10		Establish the PAC
Task A.11		Conduct PAC Meetings
Project 1		**Kiosks and Multimedia Computer Technology Demonstration**
Task 1.1		Efficient Computer Prototypes and Reporting
Task 1.2		Document Results and Savings Potential from Computer Prototypes
Project 2		**Home Audio Equipment Efficiency Assessments and Recommendations**
Task 2.1		Survey of Potential Energy-Efficient Design Techniques for Home Audio Devices
Task 2.2		Develop Home Audio Product Test Method
Task 2.3		Conduct Laboratory and Retail Testing of Product Samples
Task 2.4		Develop Specification for Efficient Home Audio Products
Task 2.5	X	Dissemination of Home Audio Findings to Stakeholders
Project 3		**Efficient Cooking Technology Design and Assessment**
Task 3.1		Status of Induction Cooking and Technological Breakthroughs in the Marketplace
Task 3.2		Total Cost of Ownership and User Preferences Analysis
Task 3.3		System Compatibility Impact
Task 3.4		Total Energy “Cook-off”
Task 3.5	X	Options for Significant Induction Cooking Promotion
Project 4		**Power Factor Requirements for Electronic Loads in California**
Task 4.1		Literature Review and Survey of Building Wiring Practices
Task 4.2		End-Use Load Characterization and Survey of Building Wiring Practices
Task 4.3		Power Factor Induced-Loss Measurement
Task 4.4		Distribution Circuit Loss Characterization
Task 4.5	X	Estimate Power Factor Correction Impact on Energy Savings
Project 5		**Efficient Motor-Driven Appliances using Embedded Adjustable-Speed Drives**
Task 5.1		Survey of the Current State of ASDs in Consumer Applications
Task 5.2		ASD Energy Savings Measurements

DRAFT

Project & Task #s	CPR	Project & Task Names
Task 5.3		ASD Communication and Demand Reduction
Task 5.4		Impacting the ASD Marketplace
Project 6		**Technology Transfer Plan and Stakeholder Outreach**
Task 6.1		Technology Transfer Plan
Task 6.2		Stakeholder Engagement
Task 6.3		Web Updates

KEY NAME LIST

Task #	Key Personnel	Key Subcontractor(s)	Key Partner(s)
Task A. 1-11	Doug Dorr	Ecos	
Task 1	Laura Moorefield, Baskar Vairamohan	Ecos, KEMA	
Task 2	John Halliwell, Chris Calwell	Ecos, KEMA, Brad Connatser, Morton Blatt	
Task 3	Tom Geist	Dr. Jason Lai, KEMA, Brad Connatser	
Task 4	Brian Fortenbery, Dr. Paul Bendt	Ecos, DVBE electrical contractors, KEMA, Dr. Jonathan Koomey	
Task 5	Dr. Faisal Khan	Ecos, KEMA, Morton Blatt	
Task 6	Chris Calwell, Doug Dorr, Brian Fortenbery	Ecos, Morton Blatt, Brad Connatser	

GLOSSARY

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

Acronym	Definition
ACEEE	American Council for an Energy Efficient Economy
AMD	Advanced Micro Devices
APEC	Applied Power Electronics Conference
ASD	Adjustable-Speed Drive
CO_2	Carbon Dioxide
CPR	Critical Project Review
DOE	Department of Energy
DSS	Distribution System Simulator
ECCE	Energy Conversion Congress and Expo
Energy Commission	California Energy Commission
EPA	Environmental Protection Agency
EPRI	Electric Power Research Institute
HVAC	Heating, ventilating and air conditioning
I^2R	the current squared times the resistance
IC	Integrated Circuit
IEC	International Electrotechnical Commission
kWh	Kilowatt-hours

DRAFT

Acronym	Definition
MS	Microsoft
PAC	Project Advisory Committee
PFC	Power Factor Correction
PIER	Public Interest Energy Research
Title 20	California Code of Regulations, Title 20
U.S.	United States
UCC.1	Uniform Commercial Code (Financing Statement)

Problem Statement

As of 2009, federal and state energy-efficiency standards have now addressed many of the largest residential end uses (such as refrigerators, heating, ventilating and air conditioning systems (HVAC), and dishwashers) while demand-response programs are geared to address certain others (such as lighting and water heating). Unfortunately, there are still a handful of significant product categories that remain largely unaddressed or are not fully addressed in terms of potential for energy savings.

This project is intended to quantify, document, improve, demonstrate, and standardize the energy efficiency of a several electronic plug loads and cross-cutting components that show significant promise for energy savings that are currently untapped. The electronic plug loads are:

- Computers: kiosks (low-end) and multimedia (high-end)
- Home audio equipment
- Cooking technology

Cross-cutting components are:

- Power factor
- Adjustable-speed drives

Today there is evidence of consumer interest in efficiency of high-end computers like the recently released HP Firebird 802. This gaming computer utilizes energy-efficient components such as liquid cooling and mobile components. However, the typical manufacturer perception tends to be that “lowest cost” is what consumers want, and manufacturers have completely ignored the fact that given a “green choice,” some consumers will make the higher-cost choice, just as they have done with higher-cost green-energy purchases.

Goals of the Agreement

The goal of this agreement is to promote market adoption of more efficient power electronics technologies in key consumer (plug load) product categories to include: induction cooking, home audio equipment, kiosk and multimedia computers, adjustable-speed drive applications in motorized appliances, and electronic devices currently lacking power-factor correction. These are the presently unaddressed categories that offer the non-energy benefits of controllability, reliability, and cost-reduction potential as well as the greatest remaining energy-savings impacts.

Objectives of the Agreement

The objectives of this agreement are to provide California and others with the tools needed to cost-effectively reduce energy use from electronic and motorized consumer products. These tools should reduce residential electrical end use demand by 3.6 percent (based on 100% penetration in the subject product categories).

ADMINISTRATION

MEETINGS

Task A.1 Attend Kickoff Meeting

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

The Contractor Shall:

- Attend a "kick-off" meeting with the Commission Contract Manager, the Contracts Officer, and a representative of the Accounting Office. The Contractor shall bring to this meeting its Project Manager, Contracts Administrator, Accounting Officer, and others designated by the Commission Contract Manager. The administrative and technical aspects of this Agreement will be discussed at the meeting. Prior to the kick-off meeting, the Commission Contract Manager will provide an agenda to all potential meeting participants.

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

- Terms and conditions of the Agreement
- CPRs (Task A.2)
- Match fund documentation (Task A.7)
- Permit documentation (Task A.8)

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

- The Commission Contract Manager's expectations for accomplishing tasks described in the Scope of Work
- An updated Schedule of Deliverables
- Progress reports (Task A.4)
- Technical deliverables (Task A.5)
- Final report (Task A.6)
- Establishment of the PAC (Task A.10)
- PAC meetings (Task A.11)

The Commission Contract Manager shall designate the date and location of this meeting.

Contractor Deliverables:

- An updated Schedule of Deliverables
- An updated List of Match Funds
- An updated List of Permits
- Schedule for recruiting PAC members

Commission Contract Manager Deliverables:

- Final Report Instructions

Task A.2 CPR Meetings

The goal of this task is to determine whether the project should continue to receive Energy Commission funding to complete this Agreement, and if it should, are there any modifications that need to be made to the tasks, deliverables, schedule, or budget.

CPRs provide the opportunity for frank discussions between the Energy Commission and the Contractor. CPRs generally take place at key, predetermined points in the Agreement, as determined by the Commission Contract Manager and as shown in the Technical Task List above and in the Schedule of Deliverables. However, the Commission Contract Manager may schedule additional CPRs as necessary, and any additional costs will be borne by the Contractor.

Participants include the Commission Contract Manager and the Contractor and may include the Commission Contracts Officer, the PIER Program Team Lead, other Energy Commission staff and management as well as other individuals selected by the Commission Contract Manager to provide support to the Energy Commission.

The Commission Contract Manager Shall:

- Determine the location, date, and time of each CPR meeting with the Contractor. These meetings generally take place at the Energy Commission, but they may take place at another location.
- Send the Contractor the agenda and a list of expected participants in advance of each CPR. If applicable, the agenda shall include a discussion on both match funding and permits.
- Conduct and make a record of each CPR meeting. One of the outcomes of the first CPR meeting will be a schedule for providing the written determination described below.
- Determine whether to continue the project, and if continuing, whether or not to modify the tasks, schedule, deliverables, and budget for the remainder of the Agreement, including not proceeding with one or more tasks. If the Commission Contract Manager concludes that satisfactory progress is not being made, this conclusion will be referred to the Energy Commission's Research, Development, and Demonstration Policy Committee for its concurrence.
- Provide the Contractor with a written determination in accordance with the schedule. The written response may include a requirement for the Contractor to revise one or more deliverable(s) that were included in the CPR.

The Contractor Shall:

- Prepare a CPR report for each CPR that discusses the progress of the Agreement toward achieving its goals and objectives. This report shall include recommendations and conclusions regarding continued work of the projects. This report shall be submitted along with any other deliverables identified in this Scope of Work. Submit these

documents to the Commission Contract Manager and any other designated reviewers at least 15 working days in advance of each CPR meeting.
- Present the required information at each CPR meeting and participate in a discussion about the Agreement.

Contractor Deliverables:

- CPR report(s)
- CPR deliverables identified in the Scope of Work

Commission Contract Manager Deliverables:

- Agenda and a List of Expected Participants
- Schedule for Written Determination
- Written Determination

Task A.3 Final Meeting

The goal of this task is to closeout this Agreement.

The Contractor Shall:

- Meet with the Energy Commission to present the findings, conclusions, and recommendations. The final meeting must be completed during the closeout of this Agreement.
- This meeting will be attended by, at a minimum, the Contractor, the Commission Contracts Officer, and the Commission Contract Manager. The technical and administrative aspects of Agreement closeout will be discussed at the meeting, which may be two separate meetings at the discretion of the Commission Contract Manager.
- The technical portion of the meeting shall present findings, conclusions, and recommended next steps (if any) for the Agreement. The Commission Contract Manager will determine the appropriate meeting participants.
- The administrative portion of the meeting shall be a discussion with the Commission Contract Manager and the Contracts Officer about the following Agreement closeout items:
  - What to do with any state-owned equipment (options)
  - Need to file UCC.1 form re: Energy Commission's interest in patented technology
  - Energy Commission's request for specific "generated" data (not already provided in Agreement deliverables)
  - Need to document Contractor's disclosure of "subject inventions" developed under the Agreement
  - "Surviving" Agreement provisions, such as repayment provisions and confidential deliverables
  - Final invoicing and release of retention
- Prepare a schedule for completing the closeout activities for this Agreement.

Deliverables:

- Written documentation of meeting agreements and all pertinent information

DRAFT

- Schedule for completing closeout activities

REPORTING

See Exhibit D, Reports/Deliverables/Records.

Task A.4 Monthly Progress Reports

The goal of this task is to periodically verify that satisfactory and continued progress is made towards achieving the research objectives of this Agreement.

The Contractor Shall:

- Prepare progress reports that summarize all Agreement activities conducted by the Contractor for the reporting period, including an assessment of the ability to complete the Agreement within the current budget and any anticipated cost overruns. Each progress report is due to the Commission Contract Manager within 10 working days after the end of the reporting period. Attachment A-2, Progress Report Format, provides the recommended specifications.

Deliverables:

- Monthly progress reports

Task A.5 Test Plans, Technical Reports, and Interim Deliverables

The goal of this task is to set forth the general requirements for submitting test plans, technical reports, and other interim deliverables, unless described differently in the Technical Tasks. When creating these deliverables, the Contractor shall use and follow, unless otherwise instructed in writing by the Commission Contract Manager, the latest version of the PIER Style Manual published on the Energy Commission's Web site:

http://www.energy.ca.gov/contracts/pier/contractors/index.html

The Contractor Shall:

- Unless otherwise directed in this Scope of Work, submit a draft of each deliverable listed in the Technical Tasks to the Commission Contract Manager for review and comment in accordance with the approved Schedule of Deliverables. The Commission Contract Manager will provide written comments back to the Contractor on the draft deliverable within 10 working days of receipt. Once an agreement has been reached on the draft, the Contractor shall submit the final deliverable to the Commission Contract Manager. The Commission Contract Manager shall provide written approval of the final deliverable within 5 working days of receipt. Key elements from this deliverable shall be included in the final report for this project.

Task A.6 Final Report

The goal of this task is to prepare a comprehensive written final report that describes the original purpose, approach, results, and conclusions of the work done under this Agreement. The Commission Contract Manager will review and approve the final report. The final report must be completed on or before the termination date of the Agreement. When creating these deliverables, the Contractor shall use and follow, unless otherwise instructed in writing by the Commission Contract Manager, the latest version of the PIER Style Manual published on the Energy Commission's Web site:

http://www.energy.ca.gov/contracts/pier/contractors/index.html

The final report shall be a public document. If the Contractor has obtained confidential status from the Energy Commission and will be preparing a confidential version of the final report as well, the Contractor shall perform the following subtasks for both the public and confidential versions of the final report.

Task A.6.1 Final Report Outline

The Contractor Shall:

- Prepare a draft outline of the final report.
- Submit the draft outline of the final report to the Commission Contract Manager for review and approval. The Commission Contract Manager will provide written comments back to the Contractor on the draft outline within 10 working days of receipt. Once agreement has been reached on the draft, the Contractor shall submit the final outline to the Commission Contract Manager. The Commission Contract Manager shall provide written approval of the final outline within 5 working days of receipt.

Deliverables:

- Draft Outline of the final report
- Final Outline of the final report

Task A.6.2 Final Report

The Contractor Shall:

- Prepare the draft final report for this Agreement in accordance with the approved outline.
- Submit the draft final report to the Commission Contract Manager for review and comment. The Commission Contract Manager will provide written comments within 10 working days of receipt. Once agreement on the draft final report has been reached, the Commission Contract Manager shall forward the electronic version of this report for Energy Commission internal approval. Once the approval is given, the Commission Contract Manager shall provide written approval to the Contractor within 5 working days.
- Submit one bound copy of the final report with the final invoice.

Deliverables:

- Draft final report
- Final report

MATCH FUNDS, PERMITS, AND ELECTRONIC FILE FORMAT

Task A.7 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. While the PIER budget for this task will be zero dollars, the Contractor may utilize match funds for this task. Match funds shall be spent concurrently or in advance of PIER funds during the term of this Agreement. Match funds must be identified in writing, and the associated commitments obtained before the Contractor can incur any costs for which the Contractor will request reimbursement.

The Contractor Shall:

- Prepare a letter documenting the match funding committed to this Agreement and submit it to the Commission Contract Manager at least 2 working days prior to the kick-off meeting:
  1. 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 that this Agreement starts, then state such in the letter.
  2. 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 Contractor shall identify its owner and provide a contact name, address, and telephone number, and the address where the property is located.
  - 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.

- At the kick-off meeting, discuss match funds and the implications to the Agreement if they are significantly reduced or not obtained as committed. 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 Contract Manager if during the course of the Agreement additional match funds are received.
- Notify the Commission Contract Manager within 10 working days if during the course of the Agreement existing match funds are reduced. Reduction in match funds may trigger an additional CPR.

Deliverables:

- Letter(s) for new match funds
- A copy of each match fund commitment letter
- Letter that match funds were reduced (if applicable)

Task A.8 Identify and Obtain Required Permits

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

Permit costs and the expenses associated with obtaining permits are not reimbursable under this Agreement. While the PIER budget for this task will be zero dollars, the Contractor shall show match funds for this task. Permits must be identified in writing and obtained before the Contractor can incur any costs related to the use of the permits for which the Contractor will request reimbursement.

The Contractor Shall:

- Prepare a letter documenting the permits required to conduct this Agreement and submit it to the Commission Contract Manager at least 2 working days prior to the kick-off meeting:

  1. If there are no permits required at the start of this Agreement, then state such in the letter.

  2. If it is known at the beginning of the Agreement that permits will be required during the course of the Agreement, provide in the letter:

     - A list of the permits that identifies the:
       - Type of permit
       - Name, address, and telephone number of the permitting jurisdictions or lead agencies
     - Schedule that the Contractor will follow in applying for and obtaining these permits.

- The list of permits and the schedule for obtaining them will be discussed at the kick-off meeting, and a timetable for submitting the updated list, schedule, and the copies of the permits will be developed. The implications to the Agreement if the permits are not obtained in a timely fashion or are denied will also be discussed. If applicable, permits will be included as a line item in the progress reports and will be a topic at CPR meetings.

- If during the course of the Agreement additional permits become necessary, then provide the appropriate information on each permit and an updated schedule to the Commission Contract Manager.
- As permits are obtained, send a copy of each approved permit to the Commission Contract Manager.
- If during the course of the Agreement permits are not obtained on time or are denied, notify the Commission Contract Manager within 5 working days. Either of these events may trigger an additional CPR.

Deliverables:

- A letter documenting the permits or stating that no permits are required
- Updated list of permits as they change during the term of the Agreement
- Updated schedule for acquiring permits as it changes during the term of the Agreement
- A copy of each approved permit

Task A.9 Electronic File Format

The goal of this task is to unify the formats of electronic data and documents provided to the Energy Commission as contract deliverables. Another goal is to establish the computer platforms, operating systems, and software that will be required to review and approve all software deliverables.

The Contractor Shall:

- Deliver documents to the Commission Contract Manager in the following formats:
  - Data sets shall be in Microsoft (MS) Access or MS Excel file format.
  - PC-based text documents shall be in MS Word file format.
  - Documents intended for public distribution shall be in PDF file format, with the native file format provided as well.
  - Project-management documents shall be in MS Project file format.
- Request exemptions to the electronic file format in writing at least 90 days before the deliverable is submitted.

Deliverables:

- A letter requesting exemption from the electronic file format (if applicable)

Task A.10 Establish the PAC

The goal of this task is to create an advisory committee for this Agreement.

The PAC should be composed of diverse professionals. The number can vary depending on potential interest and time availability. The Contractor's Project Manager and the Commission Contract Manager shall act as co-chairs of the PAC. The exact composition of the PAC may change as the need warrants. PAC members serve at the discretion of the Commission Contract Manager.

DRAFT

The PAC may be composed of qualified professionals spanning the following types of disciplines:

- Researchers knowledgeable about the project subject matter
- Members of the trades who will apply the results of the project (such as designers, engineers, architects, contractors, and trade representatives)
- Public interest market transformation implementers
- Product developers relevant to project subject matter
- U.S. Department of Energy research manager
- Public interest environmental groups
- Utility representatives
- Members of the relevant technical society committees

The purpose of the PAC is to:

- Provide guidance in research direction. The guidance may include scope of research, research methodologies, timing, and coordination with other research. The guidance may be based on:
    - Technical area expertise
    - Knowledge of market applications
    - Linkages between the agreement work and other past, present, or future research (both public and private sectors) that they are aware of in a particular area
- Review deliverables. Provide specific suggestions and recommendations for needed adjustments, refinements, or enhancement of the deliverables.
- Evaluate tangible benefits to California of this research and provide recommendations, as needed, to enhance tangible benefits.
- Provide recommendations regarding information dissemination, market pathways, or commercialization strategies relevant to the research products.

The Contractor Shall:

- Prepare a draft list of potential PAC members that includes name, company, physical and electronic address, and phone number and submit it to the Commission Contract Manager at least two working days prior to the kick-off meeting. This list will be discussed at the kick-off meeting, and a schedule for recruiting members and holding the first PAC meeting will be developed.
- Recruit PAC members and ensure that each individual understands the member obligations described above, as well as the meeting schedule outlined in Task 1.11.
- Prepare the final list of PAC members.
- Submit letters of acceptance or other comparable documentation of commitment for each PAC member.

Deliverables:

- Draft list of PAC members
- Final list of PAC members
- Letters of acceptance, or other comparable documentation of commitment for each PAC member

Task A.11 Conduct PAC Meetings

The goal of this task is for the PAC to provide strategic guidance to this project by participating in regular meetings or teleconferences.

The Contractor Shall:

- Discuss the PAC meeting schedule at the kick-off meeting. The number of face-to-face meetings and teleconferences and the location of PAC meetings shall be determined in consultation with the Commission Contract Manager. This draft schedule shall be presented to the PAC members during recruiting and finalized at the first PAC meeting.
- Organize and lead PAC meetings in accordance with the schedule. Changes to the schedule must be pre-approved in writing by the Commission Contract Manager.
- Prepare PAC meeting agenda(s) with backup materials for agenda items.
- Prepare PAC meeting summaries, including recommended resolution of major PAC issues.

Deliverables:

- Draft PAC meeting schedule
- Final PAC meeting schedule
- PAC meeting agenda(s) with backup materials for agenda items
- Written PAC meeting summaries, including recommended resolution of major PAC issues

TECHNICAL TASKS

The Contractor shall prepare all deliverables in accordance with the requirements in Task A.5. Deliverables not requiring a draft version are indicated by marking "(no draft)" after the deliverable name.

Project 1 Kiosks and Multimedia Computer Technology Demonstration

The goal of this project is to build on the success of recent PIER funded research 500-06-007 on desktop computer efficiency, extending the scope of this research beyond commercial and home office productivity desktops downward into "low-end" kiosk, point-of-sale, and "bare bones" computing applications and upward into "high-end" multimedia and gaming applications.

Project Objectives:

- Assemble and test a series of efficient computer prototypes for three (3) system types: ultimate-efficiency multimedia computer, market-ready kiosk computer, and ultimate-efficiency kiosk computer.
- Estimate efficiency gains and national energy-savings potential of all three prototype systems relative to typical products offered in the kiosk/low-end and gaming/media market segments.

DRAFT

- Conduct outreach activities with appropriate decision makers and influencers through conference attendance and distribution of project findings.
- Promote project results to mass market, technology trade, and energy-efficiency media outlets.

Task List

The project's work scope involves the following technical tasks:

Project & Task #s	CPR	Project & Task Names
Project 1		**Kiosks and multimedia computer technology demonstration**
Task 1.1		Efficient Computer Prototypes and Reporting
Task 1.2		Document Results and Savings Potential from Computer Prototypes

Task 1.1 Efficient Computer Prototypes and Reporting

The goal of this task is to design and build efficient computer prototypes for high-end (multi-media/gaming) and low-end (kiosk) computers.

The Contractor Shall:

- Manage the project to include but not be limited to:
  - Client interface
  - Team meetings
  - Risk management
  - Management of project budget, timelines, and subcontractors
- Identify computer sub-systems in both kiosk and media desktop computers that most heavily influence total computer energy use, drawing heavily on research findings from earlier PIER-funded research under contract 500-06-007. Candidates to include but not be limited to:
  - Processor
  - Chipset
  - Power supply
  - Video card
  - Memory
  - Secondary power supplies
  - Hard drive.
- Conduct outreach to multiple solution providers for the key computing sub-systems in both the kiosk and gaming segments to identify current and emerging technologies that could significantly reduce energy consumption. This task is to include multiple face-to-face site visits with technology partners or industry conference attendance to examine promising technologies for integration in efficient computer prototypes.
- Procure, test, and identify the most efficient components.
- Assemble and test a series of efficient computer prototypes. Testing shall be conducted using two mainstream computer efficiency test methodologies:
  - ENERGY STAR v5.0 battery of modal power consumption tests

DRAFT

- Recently released EECoMark efficiency benchmarking program developed by BAPCo. The computer prototypes will be the following three systems:
    - Ultimate efficiency multimedia computer, which demonstrates the efficiency possibilities of technologies specific to media/gaming computers and high-definition set-top boxes not yet widely available and likely not yet cost-effective
    - Market-ready kiosk computer, which contains components available in the marketplace and is cost-effective based on typical price points for kiosk and bare-bones computer applications
    - Ultimate efficiency kiosk computer, which demonstrates the efficiency possibilities of technologies specific to kiosk computers not yet widely available and likely not yet cost-effective
- Conduct outreach activities with appropriate decision makers and influencers through conference attendance and distribution of project findings. Stakeholders to include but not be limited to:
    - Energy efficiency advocacy groups, such as the American Council for an Energy Efficient Economy, and the Consortium for Energy Efficiency
    - United States and Canadian electric utilities
    - Regulatory agencies
    - Universities and research organizations
    - State and national procurement organizations
    - Technology industry partners, such as Intel, Advance Micro Devices (AMD), and Via Technologies
    - Technology industry associations, such as the Power Sources Manufacturers Association
    - Technology industry consortia, such as the Climate Savers Computing Initiative
- Promote project results to mass-market, technology trade, and energy-efficiency media outlets through press releases and direct communication and document outreach efforts and successes to be included Outreach Report.
- Prepare an Outreach Report to include but not be limited to a description of all the outreach activities, mass market, media and press activities completed in response to this task.

Deliverables:

- Ultimate efficiency multimedia sample computer (draft N/A)
- Market-ready kiosk sample computer (draft N/A)
- Ultimate efficiency kiosk sample computer (draft N/A)
- Outreach report (no draft)

Task 1.2 Document Results and Savings Potential from Computer Prototypes

The goal of this task is to estimate potential for state and national energy savings if all computers in these categories were to have similar efficiencies as the prototypes. Based on the work of Energy Commission contract number 500-06-007, energy savings of 60 to 80% should be possible based on the ENERGY STAR specification requirements.

The Contractor Shall:

- Estimate efficiency gains and national energy savings potential of all three prototype systems relative to typical products offered in the kiosk/low-end and multimedia market segments.
- Develop an energy-efficient computer executive summary. This professionally-designed summary will provide a high-level view of the findings targeting either the kiosk or multimedia market segment, depending on which segment yields the most compelling findings. This document will be distributed to stakeholders and made available electronically through the Web per task 6.3 after approval by the Energy Commission.
- Develop an efficient computer technology demonstration white paper to include but not be limited to:
  - The discussion of task objectives
  - Detailed technical findings and outcomes
  - Estimated energy-savings potential for all kiosk and gaming prototype systems

  This document will be distributed to stakeholders and made available electronically through the Web per task 6.3 after approval by the Energy Commission.

Deliverables:

- Energy-efficient computer executive summary
- Efficient computer technology demonstration white paper

Project 2 – Home Audio Equipment Efficiency Assessments and Recommendations

The goal of this project is to assess the current energy efficiency of home audio products through literature review and laboratory testing. This information will be used to inform home audio manufacturers, retailers, and buyers of opportunities for cost-effective energy savings and associated non-energy benefits. The project will also recommend ways to accelerate sales of efficient audio equipment through new utility programs and possible Title 20 standards.

Project Objectives:

- Develop a test method to evaluate the efficiency of home audio products.
- Conduct laboratory measurements of energy efficiency for at least 30 home audio products to create a baseline efficiency of home audio devices.
- Conduct outreach activities with appropriate decision makers and influencers through conference attendance and distribution of project findings.
- Promote project results to mass-market, technology trade, and energy-efficiency media outlets.

Task List

The project's work scope involves the following technical tasks:

DRAFT

Project & Task #s	CPR	Project & Task Names
Project 2		**Home Audio Equipment Efficiency Assessments and Recommendations**
Task 2.1		Survey of Potential Energy-Efficient Design Techniques for Home Audio Devices
Task 2.2		Develop Home Audio Product Test Method
Task 2.3		Conduct Laboratory and Retail Testing of Product Samples
Task 2.4		Develop Specification for Efficient Home Audio Products
Task 2.5	X	Dissemination of Home Audio Efficiency Findings to Stakeholders

Task 2.1 Survey of Potential Energy-Efficient Design Techniques for Home Audio Devices

The goal of this task is to survey existing technologies and products in the home audio marketplace with special emphasis on seeking out highly efficient products.

The Contractor Shall:

- Manage the project to include but not be limited to:
  - client interface
  - team meetings
  - risk management
  - subcontractors
  - project budget and timelines
- Conduct a survey to identify potentially more energy-efficient design techniques applicable to the home audio market. This would include but not be limited to examining the impact of switch-mode power supplies and the use of class-D audio amplifier technology.
- Prepare a concise, highly visual report summarizing the findings of the survey.

Deliverables:

- Summary report

Task 2.2 Develop Home Audio Product Test Method

The goal of this task is to define a metric and test method whereby the efficiencies of home audio products can be compared.

The Contractor Shall:

- Develop, for a wide range of home audio products, a test method specific to the United States (U.S.) market providing consistent measurement of power efficiency, total harmonic distortion, and power factor. The test method will be designed to accommodate a broad range of product types. Where applicable, the test method will rely on International Electrotechnical Commission (IEC) Standard 62087, with expanded content as needed to address active mode and the wide range of affected product

DRAFT

types. The test method will accommodate measurement of products that have integrated, standalone, internal, and external power supplies.

Deliverables:

- Home audio efficiency test method

Task 2.3 Conduct Laboratory and Retail Testing of Product Samples

The goal of this task is to apply the home audio efficiency test method developed in Task 2.2 to actual laboratory and retail store testing of home audio equipment.

The Contractor Shall:

- Using the test method developed in Task 2.2, conduct active-mode efficiency and standby power laboratory measurements on the following products: a minimum of 30 individual consumer home audio products. Measurements will include power efficiency (useful output power divided by total input power), input current total harmonic distortion, and input power factor.
- Products will be selected from a range of applications, to include but not be limited to:
  - Stereo receivers
  - Surround-sound audio systems
  - Audio power amplifiers
  - Guitar amplifiers
- For each product, the power supply type will also be documented.
- Prepare an Excel spreadsheet which includes the laboratory test data collected in this task for each project. The file is to be sent electronically to the Energy Commission Contract Manager.

Deliverables:

- Excel Spreadsheet (no draft)

Task 2.4 Develop Specification for Efficient Home Audio Products

The goal of this task is to develop a two-tiered specification, with the more stringent tier used as the basis for utilities to provide financial incentives to efficient audio equipment and the less stringent tier recommended as a Title 20 standard level to regulate the sale of inefficient audio equipment in California.

The Contractor Shall:

- Prepare a home audio efficiency specification and compliant technology summary report to include but no be limited by:
  - Description of the two tier specification
  - Proposed multiple efficiency equations for home audio products for each tier, along with charts illustrating the number and types of tested products complying with each, technologies employed, and the estimated annual energy savings (kWh) and load reductions (kW) associated with each tier.

Deliverables:

- Home audio equipment efficiency specification and compliant technology summary report

Task 2.5 Disseminate Findings to Stakeholders

DRAFT

The goal of this task is to estimate potential for state and national energy savings if all home audio equipment were designed with realizable improved efficiency.

The Contractor Shall:

- Estimate efficiency gains and national energy savings potential of home audio systems relative to currently available products.
- Develop an efficient home audio technology white paper to include but not be limited to:
  - The discussion of Project objectives
  - Detailed technical findings and outcomes
  - Estimated annual energy-savings potential for all home audio systems
- Conduct outreach activities with appropriate decision makers and influencers through conference attendance and distribution of project findings.
- Promote project results to mass-market, technology trade, and energy-efficiency media outlets.
- Prepare an outreach report to include but not be limited to the outreach plan and the planned distribution of the white paper to stakeholders and through the Web per task 6.3 after approval by the Energy Commission.
- Participate in CPR as per Task A.2

Deliverables:

- Efficient home audio white paper
- Outreach report
- CPR Report

PROJECT 3 - Efficient Cooking Technology Design and Assessment

The goal of this project is to lay the groundwork for the potential penetration of induction cooking in the residential marketplace. To accomplish this goal, the project will first inform the marketplace and manufacturing community about the potential for three key breakthroughs:

- Induction cooking product designs that have lower cost and have higher reliability for the near term (next ten years)
- Ability to accommodate multiple induction cook tops without cross interference
- Application of frequency control to the induction process to utilize aluminum cooking pans

Project Objectives:

DRAFT

In conjunction with informing the marketplace regarding key induction cooking breakthroughs, the project objectives include:

1. Inform the marketplace of key technology breakthroughs that will reduce overall product cost and improve product reliability.
2. Inform the marketplace of enhanced ability to operate multiple hubs on the same cook top and describe the technology breakthroughs whereby the consumers would not need to buy new cookware for their induction cook tops.
3. Investigate opportunities to enhance the system compatibility by assessing the various electrical parameters of induction cooking related to grid impacts, cascade savings, and standby losses.
4. Determine appropriateness of incentives to assist in promotion of induction cooking and the appropriateness of supporting development of ENERGY STAR labeling for the cooking category.
5. Release project's findings to the media through a press release, project briefs, and a white paper to be made available through the web per task 6.3 after approval by the Energy Commission.

Task List

The project's work scope involves the following technical tasks:

Project & Task #s	CPR	Project & Task Names
Project 3		**Efficient Cooking Technology Design and Assessment**
Task 3.1		Status of Induction Cooking and Technological Breakthroughs in the Marketplace
Task 3.2		Total Cost of Ownership and User Preferences Analysis
Task 3.3		System Compatibility Impact
Task 3.4		Total Energy "Cook-Off"
Task 3.5	X	Options for Significant Induction Cooking Promotion

Task 3.1 Status of Induction Cooking and Technological Breakthroughs in the Marketplace

The goals of this task are to assess the state-of-the-art designs for residential induction cooking and to study factors that have led to the slow adoption of this promising technology.

The Contractor Shall:

- Manage the project to include but not be limited to:
  - Client interface
  - Team meetings
  - Risk management
  - Subcontractors
  - Project budget and timelines
- Conduct a comprehensive assessment of the newest technological results in induction designs such as multi-hub systems, use of aluminum cookware, and higher-reliability designs. The assessment results will be used to prepare a white paper on the subject.

- Survey the residential cooking appliance marketplace to assess the level of penetration of induction cooking appliances. The survey will include an analysis of factors that have hindered adoption of induction cooking appliances. The survey results will be used to generate a technical brief on the factors hindering wider adoption of induction cooking appliances

Deliverables:

- Technology assessment results white paper
- Technical brief on the factors hindering induction cooking appliances

Task 3.2 Total Cost of Ownership and User Preferences Analysis

The goal of this task is to compare the financial value of lifetime energy savings from induction cooking with its incremental cost and to quantify potential savings from a real-world cook top usage survey.

The Contractor Shall:

- Quantify cook top energy usage patterns, including natural gas and resistive electric based upon a real-world monitoring study and generate a report on the subject. Prepare an energy use survey report to include but not be limited to the annual energy use associated with type of cook top surveyed.
- Prepare a total cost of ownership report to include but not be limited to a discussion of the estimated total cost of ownership of conventional cook tops using resistive electricity and natural gas with induction cook tops. Determine the time required to recoup the price premium for an induction appliance (including cookware costs, if any), given the range of retail prices for current models and the projections for model costs ten years out. Also, discuss cookware costs, if any, associated with induction cook tops.

Deliverables:

- Energy use survey report (no draft)
- Total cost of ownership data report

Task 3.3 System Compatibility Impact

The goal of this task is to assess the impact of induction appliances on the power grid.

The Contractor Shall:

- Prepare an Excel spreadsheet that summarizes the measurements of power input properties (current, voltage, distortion, and power factor) for at least three induction cooking appliances and assess the extent to which peak current requirements represent a benefit or drawback to utilities relative to conventional cooking equipment. The spreadsheet will be transmitted electronically to the Energy Commission Contract Manager.
- Prepare a white paper on the power properties and opportunities associated with induction cooking to include but not be limited to:
  - Grid impacts
  - Cascade savings
  - Standby losses
  - Potential for improvement

DRAFT

Deliverables:

- Excel spreadsheet (no draft)
- White paper

Task 3.4 Total Energy "Cook-Off"

The goal of this task is to compare the total power and time required by a cooking appliance (resistive electric, gas, and inductive) to heat a fixed volume of water over a fixed temperature range.

The Contractor Shall:

- Perform a laboratory comparison of the time and power required to heat a fixed volume of water from 25C to 100C for a resistive electric cook-top, a gas cook-top, and an induction cook-top appliance. The analysis will include estimates for the total amount of heat energy conveyed to the water, the pan, and the room in each case.
- Prepare an Excel spreadsheet documenting the power requirements associated with each type of cook top. The spreadsheet will be transmitted electronically to the Energy Commission Contract Manager.

Deliverables:

- Excel spreadsheet (no draft)

Task 3.5 Options for Significant Induction Cooking Promotion

The goal of this task is to assess ways that PIER and the utility industry can promote induction cooking appliances and clearly understand how the new technology developments may positively impact this opportunity.

The Contractor Shall:

- Develop efficiency and power quality specifications for induction cooking equipment, along with guidelines for utility incentive and promotion programs for the products.
- Develop an energy-efficient induction cooking executive summary. This summary will provide a high-level view of the findings of Tasks 2.1 to 2.4 and targeting the new design potentials for induction cook tops and use of normal aluminum cookware.
- Develop an energy-efficient induction cooking white paper to include but not be limited to:
  - Discussion of project objectives
  - Detailed technical findings and outcomes (Tasks 2.1 to 2.4)
  - Estimated annual energy-savings for induction cook tops
- Prepare an outreach report that describes how the white paper and the executive summary will be distributed to stakeholders and made available electronically through the Web per task 6.3 after approval by the Energy Commission
- Participate in CPR per Task A.2

Deliverables:

- Energy efficiency and power quality specification for induction cooking equipment
- Energy-efficient induction cooking executive summary
- Energy-efficient induction cooking white paper
- Outreach report (no draft)

DRAFT

- CPR Report

PROJECT 4 - Power Factor Requirements for Electronic Loads in California

The goal of this project is to definitively quantify energy savings potential due to wire losses in building distribution systems – comparing power-factor correction (PFC) to non-PFC in various end-use electronic products – then to recommend appropriate Title 20 requirements for securing those savings cost-effectively.

Project Objectives:

- Through measurement and modeling, determine whether power factor is a significant factor in energy loss in the power system.
- Quantify the potential energy savings benefit to California rate payers for widespread adoption of products that have high power factors.
- Conduct outreach activities with appropriate decision makers and influencers through conference attendance and distribution of project findings.
- Promote project results to mass-market, technology trade, and energy-efficiency media outlets.

Task List

The project's work scope involves the following technical tasks:

Project & Task #s	**CPR**	**Project & Task Names**
Project 4		**Power Factor Requirements for Electronic Loads in California**
Task 4.1		Literature Review and Survey of Building Wiring Practices
Task 4.2		End-Use Load Characterization and Survey of Building Wiring Practices
Task 4.3		Power Factor-Induced Loss Measurement
Task 4.4		Distribution Circuit Loss Characterization
Task 4.5	X	Estimate Power-Factor Correction Impact on Energy Savings

Task 4.1 Literature Review and Survey of Building Wiring Practices

The goal of this task is to review and summarize existing knowledge in the area of power-factor impact on energy efficiency and losses in the power-delivery grid.

The Contractor Shall:

- Manage the project to include but not be limited to:
  - Client interface
  - Team meetings
  - Risk management
  - Project budget and timelines
  - Subcontractors
- Review literature on previous power-factor research to understand what is known about its effects on energy consumption, with some attention to non-energy benefits

DRAFT

associated with reduced harmonics, product failure rates, safety risks from overloading the neutral, etc.

- Prepare a section in the final report synthesizing a literature review to include but not be limited to:
  - Summary of the literature review of power factor research, non energy benefits, mathematical relationships used to evaluate savings
  - Instances of actual measured energy savings
  - Any differences between papers, methods and results
  - Recommendations regarding power factor impact on energy efficiency and losses in the power delivery grid

Deliverables:

- None

Task 4.2 End-Use Load Characterization and Survey of Building Wiring Practices

The goal of this task is to establish a baseline of wiring diagrams for residential and commercial buildings, electronic products in use, and where the products are connected in those diagrams. This will provide detailed data that can be used for laboratory measurements and in simulations of power losses due to the power factor of loads.

The Contractor Shall:

- Determine typical wiring layouts for residential and commercial buildings. This will include apartments, condos, townhouses, single-family dwellings, mobile homes, and various types of offices and retail buildings for both older and new buildings. Typical wire runs, wire sizes, and the location of plugs and lights on each circuit will be determined. As needed, investigation will be by field examination of buildings, scanning blue prints, and interpreting building codes.
- Analyze existing field data to determine the types and relative numbers of electronic loads in use and their relative locations in residential and commercial settings.
- Determine the typical assortments of appliances and lights on each circuit. As needed, subcontractors will conduct field surveys and provide estimates of energy use derived from previous PIER-funded residential and commercial field monitoring studies (contract number 500-06-007).
- Develop one-line wiring diagrams for three typical residential layouts, noting wiring lengths, gauges, and mix of end uses associated with each circuit.
- Develop one-line wiring diagrams for three typical commercial layouts, noting wiring lengths, gauges, and mix of end uses associated with each circuit.
- Generate a report on the spectral plots of current for each device tested.
- Generate a summary Excel spreadsheet summarizing loads found in commercial and residential buildings. The spreadsheet will be transmitted electronically to the Energy Commission Contract Manager.
- Generate a report of the data on load types in use to be used in lab measurements, simulations, and the final report

Deliverables:

- One-line wiring diagrams – residential (no draft)
- One-line wiring diagrams - commercial (no draft)

DRAFT

- Spectral Plots Report (no draft)
- Excel spreadsheet (no draft)
- Load Type Report (no draft)

Task 4.3 Power Factor-Induced Loss Measurement

The goals of this task are to:

- Estimate the coincidence of operation of electronic loads in order to determine cumulative I^2R (the current squared times the resistance) losses.
- Collect laboratory measurements of current spectra and power consumption for the typical devices compiled in Task 4.2 to be used in software modeling.
- Apply the knowledge gained in previous tasks to conduct software simulations of plug-load power-factor impact on system power losses from the substation to the appliance.
- Measure, in laboratory setting, actual power losses due to power factor for typical electronic loads in order to validate the software models developed above.

The Contractor Shall:

- Determine usage patterns of each appliance type identified in Task 4.2. Determine coincidental use of appliances that may be on the same circuit during active mode. For example: What other adjacent equipment is normally switched on when the TV is operating? Analyze, residential and commercial field monitoring data from previous PIER-funded research (Contract number 500-06-007) to gather information on coincident use. Apply informed estimates and additional field survey data as needed.
- Measure the line losses associated with electronic loads with power factors expected from the previous task to determine the energy and non-energy effects. This includes but is not limited to surveying a number of commercial buildings to understand the typical wiring profile and then conducting field or controlled lab testing with electronic loads with expected power factors.
- Perform lab tests to determine the current spectra and power consumption of the devices identified in Task 4.2.
- Construct some of the circuits considered in the model. Use laboratory testing to validate that the model calculates energy consumption and energy losses in the wiring with sufficient accuracy such that the results are meaningful. The validation should include circuits with both typical and power-factor-corrected devices.
- Using a sample house, measure power consumption with inefficient devices, efficient-but-low-power-factor devices, and efficient-with-good-power-factor devices to show both agreement with the model and resulting energy savings.
- Perform lab tests to determine the current spectra and power consumption of the devices identified in Task 4.2.
- Generate an Excel spreadsheet summarizing usage patterns of devices. The spreadsheet will be transmitted electronically to the Energy Commission Contract Manager.
- Generate an Excel spreadsheet summarizing load profile measurements for each device including harmonic distortion and power consumption data. The spreadsheet will be transmitted electronically to the Energy Commission Contract Manager.
- Generate a report on harmonic profile and energy loss measurements for each device (data to be used in the final report)

Deliverables:

- Excel spreadsheet summarizing usage patterns (no draft)
- Excel spreadsheet summarizing load profile measurements (no draft)
- Report on harmonic profile and energy loss measurements for devices (no draft)

Task 4.4 Distribution Circuit Loss Characterization

The goal of this task is to establish a baseline for typical utility distribution circuits and analyze the losses caused by nonlinear loads inside the buildings served by those circuits. The potential for energy savings through power-factor correction will be evaluated. This task will help determine whether the proliferation of nonlinear loads affects line losses or grid congestion.

The Contractor Shall:

- Apply SuperHarm (harmonics analysis software) and DSS (Distribution System Simulator software) to perform the harmonic analysis and to evaluate the system losses. The system models will be developed using the system data collected in the previous tasks.
- Validate simulations by making use of the monitoring data. For the power factor and loss impacts, the DSS model will be utilized to conduct an 8760 simulation (hourly resolution for a full year) based on feeder load shape data that will be extrapolated from demand interval data archived at the substation for each of the feeders.
- For several appliance types, model the impact of replacement power supplies with improved power factor. Compare the final energy consumption to determine energy savings potential.
- Prepare a section for the final report containing:
  - Description of the system and a summary of the electrical parameters for the various system components and loads
  - Details of the modeling and simulation results
  - Conclusions and recommendations

Deliverables:

- None

Task 4.5 Estimate Power-Factor Correction Impact on Energy Savings

The goal of this task is to use data, analysis, and lab measurements from Tasks 4.1 through 4.4 to calculate the overall impact of power factor-induced power losses for the California power grid.

The Contractor Shall:

- Estimate residential and commercial building energy savings and California-wide energy savings associated with widespread use of power-factor correction in electronic loads, while summarizing any non-energy benefits.
- Determine the mix of power-factor correction and efficiency in electronic designs that yields the greatest overall energy savings.
- Analyze impacts of harmonics on the grid (upstream of the meter) and other impacts, such as the safety advantages of reduced heating of the distribution wiring.

DRAFT

- Determine requirements and appropriate language for inclusion into Title 20 standards for a wide variety of products that will result in reduced power-factor-related losses.
- Provide a memo that documents the recommended language and requirement for inclustion into the Title 20 standards.
- Prepare a report to include but not be limited to:
  - Documentation of field, laboratory and software simulation results based on Tasks 4.1 to 4.4
  - Estimate of residential and commercial building energy savings and California-wide energy savings associated with widespread use of power-factor correction in electronic loads, and summarize any non-energy benefits.
- Participate in CPR as per Task A.2

Deliverables:

- Title 20 Standards Memo (no draft)
- Field, laboratory, and software simulation results Report (no draft)
- CPR Report

PROJECT 5 - Efficient Motor-Driven Appliances Using Embedded Adjustable-Speed Drives (ASD)

The goal of this project is to accelerate adoption of ASD technology and embedded communication and control technologies in the appliance market.

Project Objectives:

- Quantify the energy-savings potential of widespread adoption of ASDs in motor-driven consumer applications.
- Make laboratory measurements of energy consumption for conventional and ASD-driven motors in appliances.
- Establish the potential for enhanced demand-response control through embedded intelligence in motor-control applications.
- Conduct outreach activities with appropriate decision makers and influencers through conference attendance and distribution of project findings.
- Promote project results to mass market, technology trade, and energy efficiency media outlets.

Task List

The project's work scope involves the following technical tasks:

DRAFT

Project & Task #s	CPR	Project & Task Names
Project 5		**Efficient Motor-Driven Appliances Using Embedded Adjustable-Speed Drives**
Task 5.1		Survey of the Current State of ASD in Consumer Applications
Task 5.2		ASD Energy-Savings Measurements
Task 5.3		ASD Communication and Demand Responsiveness
Task 5.4		Impacting the ASD Marketplace

Task 5.1 Survey of the Current State of ASDs in Consumer Applications

The goals of this task are to assess motorized residential equipment to determine the total energy usage of small- and medium-sized motors in homes today, to survey the market to quantify the prevalence of ASDs in those equipment types, and to determine how much energy savings could be achieved through wider market penetration of ASDs.

The Contractor Shall:

- Manage the project to include but not be limited to:
  - Client interface
  - Team meetings
  - Risk management
  - Subcontractors
  - Project budget and timelines
- Prepare a listing of consumer appliances that would benefit from motor speed control, based on duty cycle.
- Conduct a survey of the current market penetration of ASDs in the consumer market and prepare an Excel spreadsheet summarizing results.
- Coordinate with subcontractor and prepare a consumer survey to determine prevalence and usage patterns of motorized consumer products.
- Prepare an Excel spreadsheet that quantifies energy savings potential for the various product categories assuming broad penetration of ASDs in the motor applications. The spreadsheet will be transmitted electronically to the Energy Commission Contract Manager.
- Prepare an Excel spreadsheet quantifying ASD energy-savings potential. The spreadsheet will be transmitted electronically to the Energy Commission Contract Manager.

Deliverables:

- Excel spreadsheet on ASD penetration (no draft)
- Excel spreadsheet quantifying ASD energy-savings potential (no draft)

Task 5.2 ASD Energy-Savings Measurements

The goal of this task is to perform laboratory measurements and use them to quantify ASD energy-savings potential for motorized consumer appliances.

The Contractor Shall:

- Replace the conventional motors in at least two types of motorized consumer products with ASD-driven motors. Energy usage will be measured using standard test procedures with data used to validate ASD energy-savings potential.
- Conduct a laboratory comparison of energy usage for two equivalent commercially available products, one equipped with a conventional motor and one equipped with an ASD-driven motor.
- Prepare a concise, visual report summarizing the findings, including but not limited to comparison of energy usage for two equivalent commercially available products, one equipped with a conventional motor and one equipped with an ASD-driven motor

Deliverables:

- Report of energy-savings findings (no draft)

Task 5.3 ASD Communication and Demand Responsiveness

The goal of this task is to assess the potential for demand reduction and additional energy savings when embedded controls and price/decision capabilities are embedded in motor-driven appliances.

The Contractor Shall:

- Quantify the potential for demand reduction through the embedding of communications, control, and intelligence in motor-driven appliances without ASDs.
- Quantify the potential for demand reduction when embedded communication and ASDs are combined.
- Quantify any changes in product availability or reductions in convenience/performance that could limit consumer acceptance.
- Generate a report of demand reduction findings, to include but not be limited to:
  - Quantification of the potential for demand reduction through the embedding of communications, control, and intelligence in motor-driven appliances without ASDs
  - Quantification of the potential for demand reduction when embedded communication and ASDs are combined
  - Quantify any changes in product availability or reductions in convenience/performance that could limit consumer acceptance.

Deliverables:

- Report of demand reduction findings (no draft)

Task 5.4 Impacting the ASD Marketplace

The goal of this task is to document the project results in technical papers and industry presentations.

The Contractor Shall:

- Publish at least one white paper on the benefits of ASDs in consumer appliances based on the findings in Tasks 5.1 to 5.3.
- Seek support from public and private utilities such as PG&E, Sempra, Southern California Edison, and Sacramento Municipal Utility District, for modifications to future Title 20 standards to capture energy savings from widespread use of ASDs.
- Prepare a report detailing the support efforts of Title 20 standards.
- Prepare a Title 20 ASD recommendations report.

DRAFT

- Prepare a report on utility and Energy Commission support for Title 20 standards change.

Deliverables:

- ASD white paper
- Title 20 Standards Support Effort Report (no draft)
- Title 20 ASD recommendations report
- Report of utility and Energy Commission support for Title 20 standards change (no draft)

PROJECT 6 Technology Transfer Plan and Stakeholder Outreach

The goal of this project is to ensure that the scientific findings of our research change market outcomes through new product introductions by manufacturers, new codes and standards at the Commission, and new program offerings and approaches to saving energy from California's utilities.

Project Objectives:

- Prepare a comprehensive technology-transfer plan.
- Conduct outreach activities with appropriate decision makers and influencers through conference attendance and distribution of project findings.
- Promote project results to mass market, technology trade, and energy efficiency media outlets.

Task List

The project's work scope involves the following technical tasks:

Project & Task #s	CPR	Project & Task Names
Project 6		**Technology Transfer Plan and Stakeholder Outreach**
Task 6.1		Technology Transfer Plan
Task 6.2		Stakeholder Engagement
Task 6.3		Web Updates

Task 6.1 Technology Transfer Plan

The Contractor 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 plan 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.
- Meet with PAC members to assess their interest in pursuing new market strategies and technology introductions.
- Assemble elements of a draft technology transfer plan from conversations with stakeholders.
- Share policy proposals and concepts with PAC participants.

- Prepare a final technology transfer plan summarizing policy and market outcomes from the project for PIER.

Deliverables:

- Technology transfer plan

Task 6.2 Stakeholder Engagement

The goal of this task is to attend trade and utility conferences, present and popularize key research findings, and interface with international policymakers to harmonize market approaches to improve the efficiency of electronic and motorized consumer products sold globally.

The Contractor Shall:

- Present research findings on computer, audio, cooking, power factor, and adjustable-speed drive projects at a minimum of three of the following conferences: Applied Power Electronics Conference (APEC), American Council for an Energy Efficient Economy (ACEEE), ESOURCE Forum, Emerging Technologies Summit, EPRI annual meeting, and Energy Conversion Congress and Expo (ECCE).
- Distribute CCM approved highly visual summaries of key research findings to the trade and popular press, tracking resulting coverage for PIER.
- Author articles for computer and audio enthusiast publications regarding key findings from our research.
- Prepare an outreach report describing all activities to inform stakeholders of research findings and copies of articles published.

Deliverables:

- Electronic copies of conference presentations delivered and articles published (no draft)
- Media coverage summaries for computer, audio, and cooking research topics (no draft)
- Outreach/stakeholder report

Task 6.3 Web Updates

The goal of this task is to keep interested parties up-to-date on recent research developments through the Web site that Ecos Consulting, Incorporated and EPRI have traditionally used to share PIER-funded research work: efficientproducts.org.

The Contractor Shall:

- Through the Web site www.efficientproducts.org, post Energy Commission approved technical findings, data, and other developments with industry, utilities, consumer advocate groups, and energy-efficiency advocates as they unfold over the course of the research. The Web site will contain draft and final test procedures; links to efficient home audio, cooking, computer, power-factor correction, and adjustable-speed drive technologies; results of survey research to determine energy usage of those products; and links to California, U.S., and international policy initiatives affecting each technology.
- Update CCM on these postings as part of the monthly progress reports

Deliverables:

- none

DRAFT