

CONTRACT REQUEST FORM (CRF)



A) New Agreement 800-13-001 (To be completed by CGL Office)

B) Division	Agreement Manager:	MS-	Phone
800 Electricity Supply Analysis Division	Doug Kemmer	22	916-651-0481

C) Contractor's Legal Name	Federal ID Number
Aspen Environmental Group	95-4337914

D) Title of Project
Technical Support and Training for Electricity Supply Analysis

E) Term and Amount	Start Date	End Date	Amount
	11 / 1 / 2013	3 / 31 / 2017	\$ 3,000,000

F) Business Meeting Information

Operational agreement (see CAM Manual for list) to be approved by Executive Director

ARFVTP agreements under \$75K delegated to Executive Director.

Proposed Business Meeting Date	10 / 9 / 2013	<input type="checkbox"/> Consent	<input checked="" type="checkbox"/> Discussion
Business Meeting Presenter	Doug Kemmer	Time Needed:	5 minutes

Please select one list serve. EnergyPolicy (Integrated Energy Policy Report)

Agenda Item Subject and Description

Possible approval of a three-year contract with Aspen Environmental Group for \$3,000,000 in response to RFP-13-801. Aspen will provide technical assistance and training to the Electricity Supply Analysis Division in the areas of generation and transmission system analysis, electricity demand forecasting methodologies, analytical methods to evaluate utilities' resource portfolios, the analytical methods used to prepare year-ahead electricity load forecasts, the evaluation of natural gas market parameters, and evaluating central station and distributed generation market.(Funding Source: ERPA)

G) California Environmental Quality Act (CEQA) Compliance

1. Is Agreement considered a "Project" under CEQA?
 Yes (skip to question 2) No (complete the following (PRC 21065 and 14 CCR 15378)):
 Explain why Agreement is not considered a "Project":
 Agreement will not cause direct physical change in the environment or a reasonably foreseeable indirect physical change in the environment because the contract is not building any type of physical structure, nor is it issuing any permits. The work in this contract is providing technical expertise to the Electricity Supply Analysis Division, which involves forecasting and demand analysis.

2. If Agreement is considered a "Project" under CEQA:
 a) Agreement **IS** exempt. (Attach draft NOE)
 Statutory Exemption. List PRC and/or CCR section number: _____
 Categorical Exemption. List CCR section number: _____
 Common Sense Exemption. 14 CCR 15061 (b) (3)
 Explain reason why Agreement is exempt under the above section: _____

b) Agreement **IS NOT** exempt. (Consult with the legal office to determine next steps.)
 Check all that apply
 Initial Study Environmental Impact Report
 Negative Declaration Statement of Overriding Considerations
 Mitigated Negative Declaration

H) List all subcontractors (major and minor) and equipment vendors: (attach additional sheets as necessary)

Legal Company Name:	Budget	SB	MB	DVBE
See attachment 1 for subcontractor list.	\$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	\$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	\$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

I) List all key partners: (attach additional sheets as necessary)

Legal Company Name:



J) Budget Information			
Funding Source	Funding Year of Appropriation	Budget List No.	Amount
State - ERPA	2013/2014	800.001	\$1,000,000
State - ERPA	2014/2015	800.001	\$1,000,000
State - ERPA	2015/2016	800.001	\$1,000,000
Funding Source			\$
Funding Source			\$
R&D Program Area: N/A		TOTAL:	\$3,000,000
Explanation for "Other" selection N/A			
Reimbursement Contract #: N/A		Federal Agreement #: N/A	

K) Contractor's Administrator/ Officer				Contractor's Project Manager			
Name: Tom Murphy		Name: Catherine Elder		Address:		Address:	
City, State, Zip:		City, State, Zip:		Phone: - -		Fax: - -	
Phone: - -		Fax: - -		Phone: - -		Fax: - -	
E-Mail:				E-Mail:			

L) Selection Process Used (For amendments, address amendment exemption or NCB, do not identify solicitation type of original agreement.)			
<input checked="" type="checkbox"/> Solicitation RFP	Solicitation #: RFP-13-801	# of Bids: 4	Low Bid? <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes
<input type="checkbox"/> Non Competitive Bid (Attach CEC 96)			
<input type="checkbox"/> Exempt Select Exemption (see instructions)			

M) Contractor Entity Type
<input checked="" type="checkbox"/> Private Company (including non-profits)
<input type="checkbox"/> CA State Agency (including UC and CSU)
<input type="checkbox"/> Government Entity (i.e. city, county, federal government, air/water/school district, joint power authorities, university from another state)

N) Is Contractor a certified Small Business (SB), Micro Business (MB) or DVBE?	<input checked="" type="checkbox"/> No <input type="checkbox"/> Yes
If yes, check appropriate box:	<input type="checkbox"/> SB <input type="checkbox"/> MB <input type="checkbox"/> DVBE

O) Civil Service Considerations
<input type="checkbox"/> Not Applicable (Agreement is with a CA State Entity or a membership/co-sponsorship)
<input type="checkbox"/> Public Resources Code 25620, et seq., authorizes the Commission to contract for the subject work. (PIER)
<input checked="" type="checkbox"/> The Services Contracted:
<input type="checkbox"/> are not available within civil service
<input type="checkbox"/> cannot be performed satisfactorily by civil service employees
<input checked="" type="checkbox"/> are of such a highly specialized or technical nature that the expert knowledge, expertise, and ability are not available through the civil service system.
<input type="checkbox"/> The Services are of such an:
<input type="checkbox"/> urgent
<input type="checkbox"/> temporary, or
<input type="checkbox"/> occasional nature
that the delay to implement under civil service would frustrate their very purpose.
Justification:
This generation and transmission system, forecasting, resources, analytical methods, and energy market professional services technical support contract will provide the Energy Commission access to energy science and economic experts that are not available within state service. The Contractor will work under the direction of the Energy Commission to complete the aforementioned analyses.

P) Payment Method
<input checked="" type="checkbox"/> A. Reimbursement in arrears based on:
<input checked="" type="checkbox"/> Itemized Monthly <input type="checkbox"/> Itemized Quarterly <input type="checkbox"/> Flat Rate <input type="checkbox"/> One-time
<input type="checkbox"/> B. Advanced Payment
<input type="checkbox"/> C. Other, explain:



Q) Retention		
1. Is Agreement subject to retention?	<input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes
If Yes, Will retention be released prior to Agreement termination?	<input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes

R) Justification of Rates
The rates are similar to the rates for this company in a previous contract.

S) Disabled Veteran Business Enterprise Program (DVBE)		
1. <input type="checkbox"/> Exempt (Interagency/Other Government Entity)		
2. <input checked="" type="checkbox"/> Meets DVBE Requirements	DVBE Amount:\$ _____	DVBE %: 10%
<input type="checkbox"/> Contractor is Certified DVBE		
<input checked="" type="checkbox"/> Contractor is Subcontracting with a DVBE:	Granite Financial Solutions, Inc.	
3. <input type="checkbox"/> Contractor selected through CMAS or MSA with no DVBE participation.		
4. <input type="checkbox"/> Requesting DVBE Exemption (attach CEC 95)		

T) Miscellaneous Agreement Information		
1. Will there be Work Authorizations?	<input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes
2. Is the Contractor providing confidential information?	<input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes
3. Is the contractor going to purchase equipment?	<input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes
4. Check frequency of progress reports		
<input checked="" type="checkbox"/> Monthly <input type="checkbox"/> Quarterly <input type="checkbox"/> Other...		
5. Will a final report be required?	<input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes
6. Is the Agreement, with amendments, longer than a year? If yes, why?	<input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes
A multi-year contract is necessary to complete the required technical support and training.		

U) The following items should be attached to this CRF (as applicable)		
1. Exhibit A, Scope of Work	<input type="checkbox"/> N/A	<input checked="" type="checkbox"/> Attached
2. Exhibit B, Budget Detail	<input type="checkbox"/> N/A	<input checked="" type="checkbox"/> Attached
3. CEC 96, NCB Request	<input checked="" type="checkbox"/> N/A	<input type="checkbox"/> Attached
4. CEC 30, Survey of Prior Work	<input type="checkbox"/> N/A	<input checked="" type="checkbox"/> Attached
5. CEC 95, DVBE Exemption Request	<input checked="" type="checkbox"/> N/A	<input type="checkbox"/> Attached
6. CEQA Documentation	<input checked="" type="checkbox"/> N/A	<input type="checkbox"/> Attached
7. Resumes	<input checked="" type="checkbox"/> N/A	<input type="checkbox"/> Attached
8. CEC 105, Questionnaire for Identifying Conflicts	<input checked="" type="checkbox"/> N/A	<input checked="" type="checkbox"/> Attached

_____ Agreement Manager _____ Date _____ Office Manager _____ Date _____ Deputy Director _____ Date

Attachment 1

H) List all subcontractors (major and minor) and equipment vendors: (attach additional sheets as necessary)				
Legal Company Name:	Budget	SB	MB	DVBE
EnerNex LLC	\$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Flynn Resource Consultants Inc.	\$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GEI Consultants, Inc.	\$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Granite Financial Solutions Inc.	\$	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Itron	\$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lumina Decision Systems, Inc.	\$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
MRW Associates	\$	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Navigant	\$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
New Power Technologies	\$	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
RAND Corporation	\$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sustainable Energy Futures	\$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SymSoft Solutions	\$	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Utility System Efficiencies, Inc.	\$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Xanthus Consulting International	\$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Better Climate Research and Policy Analysis (Jim McMahon)	\$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Energy Exemplar	\$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Energy Modeling Forum (Hill Huntington)	\$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Jensen Associates	\$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lawrence Berkeley National Laborator (Alan Sanstad)	\$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mobius Risk Group	\$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Power Innovation Consultants, Inc.	\$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Simon Fraser University (Mark Jaccard)	\$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Exhibit A Scope of Work

TASK 1- AGREEMENT MANAGEMENT

TASK 1.1 KICK-OFF 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 CAM, the Contracts Officer, and a representative of the Accounting Office. The meeting will be held in Sacramento, CA and the CAM will designate the specific location. The Contractor shall include their Project Manager, Contracts Administrator, Accounting Officer, and others designated by the CAM in this meeting. The administrative and technical aspects of this Agreement will be discussed at the meeting.

If necessary, prepare an updated Schedule of Deliverables based on the decisions made in the kick-off meeting.

The CAM shall:

Arrange the meeting including scheduling the date and time.

Provide an agenda to all potential meeting participants prior to the kick-off meeting.

Deliverables:

An Updated Schedule of Deliverables (if applicable)

TASK 1.2 INVOICES

The Contractor shall:

Prepare invoices for all reimbursable expenses incurred performing work under this Agreement in compliance with the Exhibit B of the Terms and Conditions of the Agreement. Invoices shall be submitted with the same frequency as progress reports (task 1.4). Invoices must be submitted to the Energy Commission’s Accounting Office.

Deliverables:

Invoices

TASK 1.3 MANAGE SUBCONTRACTORS

The goal of this task is to ensure quality products, to enforce subcontractor Agreement provisions, and in the event of failure of the subcontractor to satisfactorily perform services, recommend solution to resolve the problem.

The Contractor shall:

Manage and coordinate subcontractor activities. The Contractor is responsible for the quality of all subcontractor work and the Energy Commission will assign all work to the Contractor. If the Contractor decides to add new subcontractors, they shall 1) comply with the Terms and Conditions of the Agreement, and 2) notify the CAM who will follow the Energy Commission's process for adding or replacing subcontractors.

TASK 1.4 PROGRESS REPORTS

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

The Contractor shall:

Prepare progress reports which 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 within 15 calendar days after the end of the reporting period. The CAM will provide the format for the progress reports.

Deliverables:

Monthly Progress Reports

TASK 1.5 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 completed under this Agreement. The Final Report shall be prepared in language easily understood by the public or layperson with a limited technical background.

The Final Report must be completed before the termination date of the Agreement in accordance with the Schedule of Deliverables.

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

TECHNICAL TASKS

TASK 2 ELECTRICITY SYSTEM AND INFRASTRUCTURE ANALYSIS

The goal of this task is to obtain a range of analytical studies in the field of electric transmission, distribution and generation system analysis, planning and regulation. These assignments will be varied, complex, and technical, including engineering and economic studies related to integrated transmission, distribution and generation reliability issues. [The following sub-tasks are divided into core electricity system topic areas.]

Generation & Transmission System Assessment

At the direction of the CAM through a properly executed Work Authorization, the Contractor shall:

- 2.1. Conduct analysis of local capacity area capacity requirements within the CAISO annually over a 10, 15 and 20-year time frame under alternative energy demand, power plant retirement/development, and transmission system upgrade scenarios. Contractor shall acquire, or if not available, develop power flow base and transient stability base cases and prepare analyses of scenario variants to a base case using power flow and transient stability techniques equivalent to those prepared by the CAISO. Contractor should be prepared to address comparable analytic work for publicly-owned balancing authority areas operating systems in parallel with the CAISO.
- 2.2. Undertake analyses of the feasibility and costs of reducing power plant capacity that currently must be located in the immediate coastal zone of Southern California. Feasibility shall examine the impacts of upgrades to transmission system elements (line rating increases through reconductoring, upgraded substations, additional interconnections between substations, developing reactive power elements that can substitute for power plant inertia, etc.). For feasible upgrades, contractor shall develop preliminary cost estimates of comparable certainty to industry-standard cost of generation assessments to allow initial tradeoff analyses.
- 2.3. Develop an analysis that illustrates the tradeoffs between imports into Southern California versus internal capacity that must be on line and available to assure system stability under generator and transmission contingencies, including variable energy resources and energy storage. It is expected that this analysis would resemble conversion of the seasonal Southern California Import Transmission (SCIT) Nomogram from the operating time horizon to the planning time horizon in order to guide development of power plant configurations and locations necessary to support system stability under one or more transmission system development patterns.
- 2.4. Provide technical assistance for studying the implications of the development of specific bulk transmission projects, both planned and conceptual, for the integration of new renewable resources, the need for local capacity in transmission-constrained areas, energy storage and the ability to import energy from and rely upon generation capacity in neighboring states.

- 2.5. Provide technical assistance for evaluating the need for transmission system upgrades to meet the state's environmental policy goals and ensure reliable service under different scenarios regarding future load-growth, impacts of demand-side programs (energy efficiency, demand response), energy storage, renewable and fossil generation resource development., and new grid management techniques for managing variable energy resources.
- 2.6. Identify, assess, and make recommendations regarding the feasibility of improvements in modeling techniques and data acquisition related to electricity system integration including, but not limited to, integration of intermittent renewables with "must take" provisions thus influencing how the balance of the system resources must be dispatched, dispatch of use-limited resources like hydro-electric generation or demand response programs, and distributed generation not visible to the system operator. This can include modifications to existing modeling techniques (e.g. – production cost models) or the applicability of new modeling techniques (e.g. – power flow studies).
- 2.7. Collaborate with Energy Commission's staff to define policy relevant scenarios compatible with modeling techniques and availability of data, and assist Energy Commission's staff to translate the general concepts of the new scenarios/cases into simulation models and risk analysis datasets.
- 2.8. Collaborate with Energy Commission's staff to identify, test and correct data inputs to production cost models currently used for the Energy Commission's system studies (Plexos), including the ability of translating other production cost model data sets (PROMOD, Gridview,etc.) to a Plexos format in order to improve simulation studies.
- 2.9. Assist in the development of in-house tools for compiling, analyzing, and presenting data, including but not limited to hourly data on generation, electrical loads, and transmission flows. Provide technical support for the development of spreadsheet- and programming-based tools designed to facilitate the compilation and representation of data in useful formats, and summarize said data both statistically and graphically. Develop interfaces which facilitate ease of use.
- 2.10. Evaluate, develop, design, and assist with the implementation of a data management system and data center structure to organize and manage electricity supply and demand data. The desired system will incorporate data collection, data housing, and data dissemination incorporating measures to ensure data confidentiality and security are adequately addressed. Evaluate and develop appropriate security protocols for the data collection efforts together with the Energy Commission emphasizing the importance of confidentiality in the handling of protected and sensitive data.
- 2.11. Perform an assessment of implementing a consistent, standardized, comprehensive, streamlined, cost-effective, and well-protected data management system for statewide utility data to assist with the development of forecasting related activities. The assessment will include analyses supporting the development of a Feasibility Study Report.
- 2.12. Provide technical assistance on evaluating the variability and other uncertainties affecting the availability of hydro-generation and how hydro dispatch may change to accommodate intermittent renewable generation, San Francisco Bay Area and Delta water quality regulation changes associated with biological requirements for the water systems and potential long-term climate change implications.

- 2.13. Assist staff in evaluating and weighing the various sources of uncertainty that will affect integration of higher levels of renewables into the California and Western grid.
- 2.14. Provide technical support to implement exploratory modeling and other risk assessment techniques in conducting resource planning and policy decision support for the electricity and natural gas systems. Assist in development of low resolution models, meta-models, sampling techniques and other tools necessary to conduct exploratory modeling, interpret results and present results and findings in easily understandable graphics and formats.
- 2.15. Provide technical support to analyze the role of coal in the California and western electricity market, particularly under what conditions and how much coal power is sold into California's unspecified imports market. Identify potential methodologies for estimating the role of coal in the electricity market. If methodologies are viable, conduct analysis and studies.
- 2.16. Provide assessment of current and projected coal fuel costs for individual power plants in the west, differences between long term contract cost provisions and short-term market prices, related delivery costs, cost differentials with other fuels that may induce plant closures or fuel switching decisions, and other variables that may affect coal plant costs and wholesale electricity prices.
- 2.17. Provide technical assistance in updating California generation unit emission factors and developing emission factor sub models for the criteria pollutants pursuant to the federal Clean Air Act for fossil generating facilities that are responsive to alternative duty cycle predictions from production simulation models, e.g. numbers of hot and cold starts/stops, part or full load dispatch, response to AGC or load following instructions from a system operator and other relevant drivers of emissions.
- 2.18. Provide analysis on the planning implications of large amounts of generation (e.g. solar, wind, etc.) or transmission resources that could have potential to shift peak or critical periods. The analysis will investigate mitigation steps that can be taken and alternatives to additional capacity.

Distribution System Planning

At the direction of the CAM through a properly executed Work Authorization, the Contractor shall:

- 2.19. Provide technical support for analysis of the costs, economics, operating characteristics, regulation/incentives, and other factors which influence deployment and impact of distributed generation technologies.
- 2.20. Provide technical support for evaluating the upgrades to the distribution system and changes in distribution engineering practices or inter-connection requirements needed to incorporate high levels of distributed generation into the electricity system.
- 2.21. Provide technical support for evaluating smart grid technologies, including but not limited to; distribution automation, analysis, methodologies, and inverters, which enable distribution system infrastructure modernization and distributed energy resource penetration.

TASK 3 IMPROVE DEMAND FORECASTING METHODS

The goal of this task is to obtain technical assistance in the preparation of, and recommendations for the improvement of, both year-ahead forecasts of monthly peak demand and longer-term forecasts of annual peak and energy demand.

At the direction of the CAM through a properly executed Work Authorization, the Contractor shall:

- 3.1. Identify and assess various peak demand forecasting methodologies and techniques currently being used by other industry and academic experts to forecast electricity peak demand.
- 3.2. Identify methods to improve the usefulness of staff peak demand forecasting methods, and implement those methods.
- 3.3. Provide recommendations for new energy demand forecasting models and identify ways to improve the usefulness of staff energy demand forecasting methods, and implement those methods. This potentially includes separate projects for individual sectors, including:
 - Residential
 - Commercial
 - Industrial
 - Agricultural
 - Other
- 3.4. Transfer sector models to improved platforms.
- 3.5. Provide analysis of information gathered during energy end use survey and develop inputs to the forecasting models from new residential and commercial survey results.
- 3.6. Provide analysis and data collection in support of efforts related to building and appliance standards, energy efficiency and demand side programs and energy demand. Within this context, develop mechanisms and identify data sources for generating hourly load profiles by customer class. Provide the capability of disaggregating hourly loads by factors such as end uses, energy efficiency measures, demand response participation and self generation. Provide analysis capabilities that can capture consumption changes due to economic and behavioral conditions. Provide scenarios of impacts of photovoltaics and other demand side measures on customer load shapes.

TASK 4 IMPROVE ENERGY DEMAND ANALYSES

The goal of this task is to obtain technical assistance and recommendations related to other analyses conducted in the Demand Analysis Office that are not directly related to energy demand forecast methods.

At the direction of the CAM through a properly executed Work Authorization, the Contractor shall:

- 4.1. Provide analytical support for sensitivity analysis and exploratory modeling to identify key uncertainties regarding customer demand and resources. Provide recommendations and strategies to incorporate uncertainty analysis and risk assessments into the forecasting process through meta-modeling and other analytical techniques.
- 4.2. Identify, assess, and implement behavioral methodologies to forecast adoption of efficiency measures and demand response participation.
- 4.3. Develop a forecasting methodology for commercial sector adoption of electricity self-generation technologies, including photovoltaic systems.
- 4.4. Provide review and analyses of publicly owned utility evaluation, measurement, and verification (EM&V) studies in support of AB 2021 efficiency goals. Provide training where needed for the publicly owned utilities in conducting these studies. Develop and implement strategies for EM&V collaboration among utilities. Provide review and analysis of POU yearly efficiency progress report and target setting studies.
- 4.5. Provide coordination and other support for activities involving the Demand Analysis Office and outside agencies, including the Demand Analysis Working Group (DAWG).
- 4.6. Develop recommendations for further disaggregation of Energy Commission demand forecasts. Identify the level of geographic disaggregation that can be supported, given availability of utility customer data, economic-demographic historical and forecast data, efficiency program and self-generation data, and other required inputs. Provide recommendations for modifying Energy Commission models to have the capability to forecast at higher levels of disaggregation and assist staff in implementing these recommendations. Assist staff in developing existing and projected hourly load shapes for different geographic zones throughout the Western Electricity Coordinating Council region.
- 4.7. Identify and assist staff in implementing methods to further incorporate climate change in Energy Commission demand forecasts within the agricultural and water pumping sectors, the industrial sector, and the municipal and state government sectors. Provide analysis of climate change impacts on temperatures and temperature variability at the regional level.
- 4.8. Provide analysis on current and forecasted efficiency programs of California utilities, a breakdown of the hourly, daily and seasonal demand reductions from different programs types and their impacts on state energy consumption.
- 4.9. Provide analysis on and evaluation of methodologies to determine energy efficiency potential and establish goals of California utilities and other entities supplying efficiency services.
- 4.10. Develop a retail electricity and natural gas price forecasting methodology for residential, commercial and industrial sectors incorporating input variables used in developing the electricity demand forecast.
- 4.11. Provide analysis on different electricity rate structures that may encourage consumer investments in load reduction, storage or distributed generation technologies.

- 4.12. Provide analysis and evaluation of existing and future issues associated with the adoption of electric and plug-in hybrid electric vehicles in California including the influence of federal and state policy and technology development.
- 4.13. Identify California electrification strategies and activities, evaluate the schedules and uncertainty of these activities, quantify associated electricity demand implications and develop demand forecast methodologies including, but not limited to: transportation port electrification, residential and commercial electrification, and truck stop electrification.

TASK 5 NATURAL GAS ASSESSMENT AND FORECASTING

The goal of this task is to obtain expert technical assistance on a variety of natural gas issues. Assistance will be provided in the areas of infrastructure analysis, supply and production cost analysis, gas demand analysis, price forecasting, risk analysis, and data collection.

At the direction of the CAM through a properly executed Work Authorization, the Contractor shall:

- 5.1. Evaluate the potential operational and planning role of natural gas storage facilities in California and the United States in providing fuel system reliability to the electric generation sector and mitigating price spikes to customers.
- 5.2. Assess the potential need for new or expanded pipeline capacity in California and the United States to meet economic or reliability needs.
- 5.3. Evaluate potential impact to natural gas supplies and prices in California from a switch from coal-fired generation in other states to natural gas and renewables.
- 5.4. Evaluate California's natural gas infrastructure to identify potential operational, safety, and reliability risks related to providing natural gas to power plants in the state in a 33% or greater renewable generation environment.
- 5.5. Assess the trends, risks, and consequences of potential regulatory action related to shale gas supply and other unconventional sources of natural gas over the next 20 years.
- 5.6. Assess the effects to California's natural gas markets resulting from the construction and operation of LNG import or export terminals over the next 20 years.
- 5.7. Assist staff in refining the methods and methodologies used to forecast natural gas parameters.
- 5.8. Help staff in collecting data and information necessary to assess or model natural gas markets.
- 5.9. Assist staff in designing and applying probabilistic methods to evaluate results from natural gas forecasting models.
- 5.10. Assess the operational and planning implications of difference in market structures and operations between natural gas and electricity.

- 5.11. Utilize hydraulic modeling methods to assess short run flow effects of large swings in fossil generation demands resulting from high renewable energy penetration.
- 5.12. Assess changes in the supply and demand profiles of Canada and Mexico and their potential effects on natural gas prices, availability, and operations.
- 5.13. Investigate the effects of transportation and industrial demand for natural gas on the prices and availability of natural gas for electric generation in California and the West.

TASK 6 CENTRAL STATION AND DISTRIBUTED GENERATION MARKET ASSESSMENT AND ANALYSIS

The goal of this task is to obtain expert technical analysis and support of assessments and analyses related to the costs, locations, and other relevant factors associated with investments in central station and distributed generation. Assistance will be focused on the areas of understanding the underlying factors associated with investment decisions as well as the potential future decisions under various policy regimes.

At the direction of the CAM through a properly executed Work Authorization, the Contractor shall:

- 6.1. Provide assistance in developing estimates of technical and market potential for Combined Heat Power (CHP) for different technologies, in different sectors of the economy and in different locations. Identify economic incentives for the development of CHP and their potential and likely impact.
- 6.2. Evaluate dispatchability options for CHP. Assess impacts on performance and overall efficiency of existing and new CHP by technology, economic sector and location. Assist in the development of daily output curves, on-site use, GHG implications and exports by sector.
- 6.3. Provide technical assistance in developing analyses of the impact of large-scale deployment of on-site and export CHP. Assess the implications of the large-scale deployment of CHP from various economic sectors and their implications for the development of other generation resources needed to meet electricity demand, reliability and emissions reductions in California
- 6.4. Provide technical support for the evaluation of the operation of renewable resources based on technology and location. Assist in developing operating profiles, capacity factor estimates, variability and peak hour availability estimates based on historical output and/or generation source (solar irradiation, wind density, and others) data.
- 6.5. Provide technical support for the modeling and evaluation of the performance, operating characteristics, costs, and emissions of flexible CHP systems.
- 6.6. Provide technical support for analysis of the costs, operating characteristics, regulation, incentives and other factors that influence deployment and impact of flexible CHP.

- 6.7. Provide technical support for analysis of the costs, economics, operation characteristics, regulation/incentives, and other factors that influence deployment of thermal metering technologies.
- 6.8. Provide technical support for the economic assessment of emerging and mature solar thermal and photovoltaic technologies. Assist in the development of cost estimates for project construction, associated transmission costs, and levelized energy cost estimates based on technology and location.
- 6.9. Provide technical support to evaluate new market structures or regulatory mechanisms to encourage investments in the generation and storage technologies needed to integrate intermittent renewable technologies and other system reliability requirements.
- 6.10. Provide technical support to assess the revenue requirements to implement and integrate a combination of electricity supply and demand programs associated with target policy goals.
- 6.11. Provide technical support to update the cost drivers and associated uncertainties affecting the calculated levelized costs of fossil generation technologies. Provide technical assistance to evaluate the probabilities that a combination of uncertainties will result in higher or lower levelized costs to inform decision makers about the possibility that certain policies may impact overall electricity system costs.

TASK 7 DISTRIBUTION SYSTEM AND DISTRIBUTED GENERATION ASSESSMENT AND ANALYSIS

The goal of this task is to obtain expert technical assistance on a variety of issues related to distribution system planning and costs, interconnection and integration of distributed generation, as well as integrated regional transmission and distribution power flow analysis.

At the direction of the CAM through a properly executed Work Authorization, the Contractor shall:

- 7.1. Provide expert technical assistance on a variety of issues related to distribution system planning and costs, interconnection and integration of distributed generation, as well as integrated regional transmission and distribution power flow analysis.
- 7.2. Provide technical support for the development and evaluation of distribution system planning processes and methodologies.
- 7.3. Provide distribution circuit and power flow modeling expertise and technical support to assist with assessments of a range of infrastructure investments necessary to ensure the safe interconnection of distributed generation resources to the utility's distribution system.
- 7.4. Provide expertise and support for regional modeling of the impacts of renewable generation on the integrated transmission and distribution system.
- 7.5. Provide technical support for evaluating the upgrades to the distribution system and changes in distribution engineering practices of interconnection requirements needed to incorporate high levels of distributed generation into the electricity system.

TASK 8 DEVELOPMENT OF PREFERRED DISTRIBUTED RENEWABLE ENERGY DEVELOPMENT ZONES

The goal of this task is to obtain expert technical assistance to evaluate development zones where renewable distributed resources can be developed cost effectively. This task will focus primarily on identifying the desirable characteristics, location and project size for renewable project development in rural and urban areas in the state. The goal will be to minimize environmental impacts while controlling or minimizing costs to the state.

At the direction of the CAM through a properly executed Work Authorization, the Contractor shall:

- 8.1. Provide technical expertise in Geographical Information System program and various mapping tools to assist staff provide comprehensive representations of distributed renewable resource development zone attributes.
- 8.2. Assist staff with an analysis of a pilot study area to determine the optimal mix of locations, technologies, and projects sizes that minimize environmental and distribution system impacts with an emphasis on cost containment.
- 8.3. Provide technical expertise to help develop a technical and regulatory framework to be used to develop distributed renewable energy development zones throughout the state.